6 Epidemiology of Chronic Non-communicable Diseases and Conditions

"While there are many diseases, there is, in a sense, only one health"

Chronic diseases and conditions have been variously defined. An EURO symposium in 1957 *(1)* gave the following definition :

> "An impairment of bodily structure and/or function that necessitates a modification of the patient's normal life, and has persisted over an extended period of time".

Another EURO symposium in 1965 *(2)* observed:

> "Upto now no widely acceptable definition (of acute or chronic patients) has been found. Some authors maintain that an acute illness usually consists of a simple episode of fairly short duration from which the patient returns to normal activity, whereas a chronic illness is one of long duration in which the patient is permanently incapacitated to a more or less marked degree. There is also the view that progress in the technology of resuscitation and haemobiology has blurred the borderline between acute and chronic conditions".

The Commission on Chronic Illness in USA *(3)* has defined "chronic diseases" as "comprising all impairments or deviations from normal, which have one or more of the following characteristics :

a. are permanent
b. leave residual disability
c. are caused by non-reversible pathological alteration
d. require special training of the patient for rehabilitation
e. may be expected to require a long period of supervision, observation or care."

In short, there is no international definition of what duration should be considered long-term *(4)*, although many consider that chronic conditions are generally those, that have had a duration of at least 3 months *(5)*. A practical definition should be established which will suit the particular conditions of the community *(4)*.

Non-communicable diseases (NCDs) include cardiovascular, renal, nervous and mental diseases, musculo-skeletal conditions such as arthritis and allied diseases, chronic non-specific respiratory diseases (e.g., chronic bronchitis, emphysema, asthma), permanent results of accidents, senility, blindness, cancer, diabetes, obesity and various other metabolic and degenerative diseases and chronic results of communicable diseases. Disorders of unknown cause and progressive course are often labelled "degenerative".

The problem

Chronic non-communicable diseases are assuming increasing importance among the adult population in both developed and developing countries. Cardiovascular diseases and cancer are at present the leading causes of death in developed countries. The prevalence of chronic disease is showing an upward trend in most countries, and for several reasons this trend is likely to increase. For one reason, life expectancy is increasing in most countries and a greater number of people are living to older ages, and are at greater risk to chronic diseases of various kinds. For another, the life-styles and behavioural patterns of people are changing rapidly, these being favourable to the onset of chronic diseases. Modern medical care is now enabling many with chronic diseases to survive. The impact of chronic diseases on the lives of people is serious when measured in terms of loss of life, disablement, family hardship and poverty, and economic loss to the country. Developing countries are now warned to take appropriate steps to avoid the "epidemics" of non-communicable diseases likely to come with socio-economic and health developments.

A total of 68.28 million deaths occurred worldwide during 2021. Of these, 43.31 million were due to NCDs, principally cardiovascular diseases, cancer and chronic respiratory diseases. Nearly three quarters of these NCD deaths (31.4 million about 77 per cent) occurred in low-and middle-income countries. The number of NCD deaths has increased worldwide and in every region since year 2000, when there were 31 million NCD deaths. The leading cause of NCD death in 2021 were: cardiovascular diseases (19.2 million deaths or 44.32 per cent of NCD deaths), cancers (9.79 million or 22.6 per cent of NCD deaths), respiratory disease, including asthma and chronic obstructive pulmonary disease (4.2 million or 9.87 per cent of NCD deaths), and diabetes (16,17,855 or 3.73 per cent of NCD deaths) *(6)*. In 2016, the age standardized NCD death rate was 539 per 100,000 population globally. The rate was lowest in high-income countries (397 per 100,000) and highest in low-income countries (625 per 100,000) and lower-middle income countries (673 per 100,000) *(7)*. Approximately 17 million of the deaths were before the age of 70 years *(8)*.

India is experiencing a rapid health transition with a rising burden of NCDs causing significant morbidity and mortality, both in urban and rural population, with considerable loss in potentially productive years (age 35–64 years) of life. NCDs

are estimated to account for about 68 per cent of all deaths. India shares more than two-thirds of the total deaths due to NCDs in the SEAR of WHO. Four types of NCDs – cardiovascular diseases, cancer, chronic respiratory diseases and diabetes make the largest contribution to morbidity and mortality due to NCDs. The probability of dying between ages 30 and 70 years from four major NCDs is 24 per cent (27 per cent in men and 20 per cent in women), which means that a 30 year old individual has a one-fourth chance of dying from these diseases before the age of 70 years *(9)*. Fig. 1 shows the proportional mortality in the country.

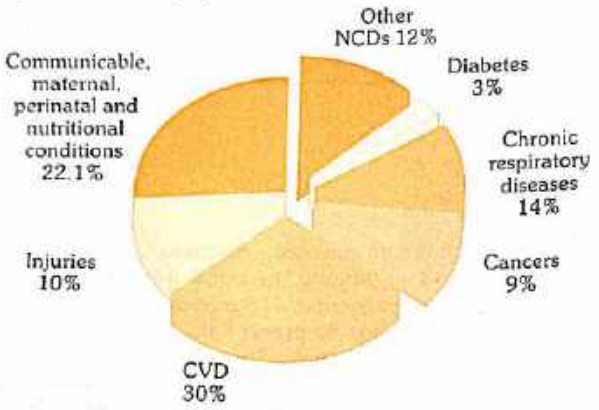

FIG. 1

Proportional mortality in India (% of total deaths, all ages) 2021
Total deaths 1,30,46,300

Source : *(6)*

Epidemiological transition ratio *(10)*

Epidemiological transition ratio is defined as the ratio of DALYs caused by CMNNDs (Communicable, Maternal, Neonatal and Nutritional Diseases) to those caused by NCDs and injuries. A ratio greater than one indicates a higher burden of CMNNDs than NCDs and injuries, while a ratio less than one indicates the opposite. The lower the ratio, the greater the contribution of NCDs and injuries to a state's overall disease burden. Most of the states had ratios more than one in 1990, whereas all states had ratios less than one in 2016. This means that the proportion of DALYs caused by NCDs and injuries has increased heavily across the country since 1990, and in 2016 accounted for the majority of premature death and disability for all states – a major shift in drivers of health loss.

There are wide variations in the epidemiological transition ratio between individual states, ranging from 0.16 in Kerala, which is far along in this progression, to 0.74 in Bihar, where the challenge of the double burden of diseases is more acute. The states with ratio 0.56–0.75 in 2016 were considered as having the lowest epidemiological transition level (ETL), those with ratio 0.41–0.55 as lower-middle ETL, those with ratio 0.31–0.40 as higher-middle ETL, and those with ratio 0.30 or less as highest ETL.

India's health system therefore faces a dual challenge. Although the absolute burden from diseases such as diarrhoea, lower respiratory infections, tuberculosis, and neonatal disorders is being reduced, it remains high. At the same time, the contribution to health loss of non-communicable conditions such as heart disease, stroke and diabetes is rising. The precise nature of this challenge varies across the country. While all states have experienced a change in disease patterns to some degree, clear differences emerge both in terms of the extent of this change and the rate at which it has occurred *(10)*.

Non-communicable disease risk factors *(7)*

Most epidemiologists accept that a sets of "risk factors" are responsible for a major share of adult non-communicable disease morbidity and premature mortality. A large percentage of NCDs are preventable through the changes in these factors. The influences of these risk factors and other underlying metabolic/physiological causes, on the non-communicable disease epidemic is as shown in Fig.2.

Tobacco : Almost 8 million people die from tobacco use each year, both from direct tobacco use and second-hand smoke. About 600,000 deaths are caused by second hand smoke, of these 170,000 are children. In 2016, there were 1.1 billion smokers worldwide with over 80% every day smokers *(11)*. By 2020, this number will increase to 7.5 million, accounting for 10% of all deaths. Smoking is estimated to cause about 71% of lung cancer, 42% of chronic respiratory disease and nearly 10% of cardiovascular disease. The highest incidence of smoking among men is in lower-middle-income countries; for total population, smoking prevalence is highest among upper–middle–income countries.

Insufficient physical activity : WHO defines physical activity as any bodily movement produced by skeletal muscles that requires energy expenditure. Physical activity refers to all movement including during leisure time, for transport to get to and from places, or as part of a person's work. Both moderate - and vigorous-intensity physical activity improve health. Physical activity has significant health benefits for heart, body and mind; it contributes to preventing and managing noncommunicable diseases such as cardiovascular diseases, cancer and diabetes; it reduces symptoms of depression and anxiety; it enhances thinking, learning, and judgment skills; it ensures healthy growth and development in young people; it improves overall well-being.

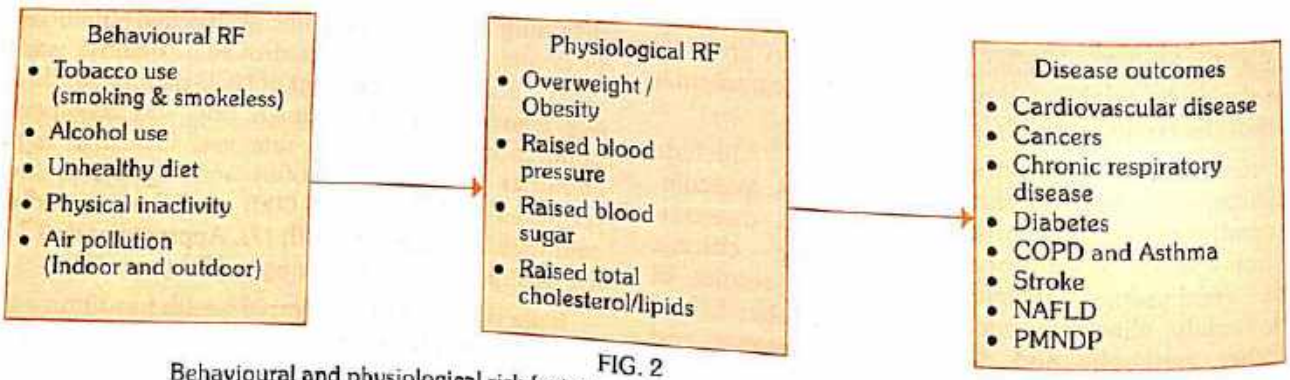

FIG. 2

Behavioural and physiological risk factors associated with NCDs and the disease outcome

Source : *(12)*

Globally, 1 in 4 adults do not meet the global recommended levels of physical activity. Upto 5 million deaths a year could be averted if the global population was more active. People who are insufficiently active have a 20 per cent to 30 per cent increased risk of death compared to people who are sufficiently active. More than 80 per cent of the world's adolescent population is insufficiently physically active.

People living with chronic conditions (hypertension, type 2 diabetes, HIV and cancer survivors), should do at least 150–300 minutes of moderate-intensity aerobic physical activity or at least 75–150 minutes of vigorous-intensity aerobic physical activity; or an equivalent combination of moderate- and vigorous-intensity activity throughout the week. They should also do muscle-strengthening activities at moderate or greater intensity that involve all major muscle groups on 2 or more days a week, as these provide additional health benefits. As part of their weekly physical activity, older adults should do varied multicomponent physical activity that emphasizes functional balance and strength training at moderate or greater intensity, on 3 or more days a week, to enhance functional capacity and to prevent falls. They may increase moderate-intensity aerobic physical activity to more than 300 minutes; or do more than 150 minutes of vigorous-intensity aerobic physical activity; or an equivalent combination of moderate - and vigorous-intensity activity throughout the week for additional health benefits. They should limit the amount of time spent being sedentary. Replacing sedentary time with physical activity of any intensity (including light intensity) provides health benefits, and to help reduce the detrimental effects of high levels of sedentary behaviour on health, all adults and older adults should aim to do more than the recommended levels of moderate - to vigorous-intensity physical activity *(13)*.

Harmful use of alcohol : Approximately 3.3 million people die each year from the harmful use of alcohol, accounting for about 5.9% of all deaths in the world and 5.1 per cent DALYs were attributable to alcoholism *(11)*. More than half of these deaths occur from NCDs including cancers, cardiovascular disease and liver cirrhosis. Moreover there is a close relationship between drinking and violent crime including domestic violence. Alcohol related harm is determined by three related dimensions : the volume of alcohol consumed, the pattern of drinking and quality of alcohol consumed *(11)*. While adult per capita consumption is highest in high-income countries, it is nearly as high in the populous upper-middle-income countries.

Unhealthy diet : Adequate consumption of fruit and vegetables reduces the risk for cardiovascular diseases, stomach cancer and colorectal cancer. Most populations consume much higher levels of salt than recommended by WHO for disease prevention; high salt consumption is an important determinant of high blood pressure and cardiovascular risk. 1.8 million deaths from CVD causes have been attributed to excess salt/sodium intake *(6)*. High consumption of saturated fats and trans-fatty acids is linked to heart disease. Unhealthy diet is rising quickly in lower-resource settings. Available data suggest that fat intake has been rising rapidly in lower-middle-income countries since the 1980s. Fat intake, especially saturated fat and industrially-produced trans-fat intake, can be reduced by : (a) steaming or boiling instead of frying when cooking; (b) replacing butter, lard and ghee with oils rich in polyunsaturated fats, such as soybean, canola (rapeseed), corn, safflower and sunflower oils; (c) eating reduced-fat dairy foods and lean meats, or trimming visible fat from meat; and (d) limiting the consumption of baked and fried foods, and pre-packaged snacks and foods (e.g. doughnuts, cakes, pies, cookies, biscuits and wafers) that contain industrially-produced trans-fats.

In both adults and children, the intake of free sugars should be reduced to less than 10 per cent of total energy intake. A reduction to less than 5 per cent of total energy intake would provide additional health benefits. Sugar intake can be reduced by : (a) limiting the consumption of foods and drinks containing high amounts of sugars, such as sugary snacks, candies and sugar-sweetened beverages (i.e. all types of beverages containing free sugars - these include carbonated or non-carbonated soft drinks, fruit or vegetable juices and drinks, liquid and powder concentrates, flavoured water, energy and sports drinks, ready-to-drink tea, ready-to-drink coffee and flavoured milk drinks); and (b) eating fresh fruit and raw vegetables as snacks instead of sugary snacks *(14)*.

Raised blood pressure : Raised blood pressure is estimated to cause 9.4 million deaths, about 12.8% of all deaths. It is a major risk factor for cardiovascular disease. The prevalence of raised blood pressure is similar across all income groups. During the year 2015, the global prevalence of raised blood pressure in adults 18 year and above was around 22 per cent *(11)*.

Overweight and obesity : At least 2.8 million people die each year as a result of being overweight or obese. Risks of heart disease, stroke and diabetes increase steadily with increasing body mass index (BMI). Raised BMI also increases the risk of certain cancers. The prevalence of overweight is highest in upper-middle-income countries, but very high levels are also reported from some lower-middle income countries. In the year 2016, 11% of men and 15% of women aged 18 years and above were obese. More than 42 million children under the age of 5 years were overweight in 2015 *(11)*. Factors driving this rise include poor diet and lack of exercise. Many children are growing up in a society which promotes high energy intake while encouraging physical inactivity. Most of these children will become obese adults, which makes them more susceptible to develop NCDs *(11)*.

Raised cholesterol : Raised cholesterol is estimated to cause 2.6 million deaths annually; it increases the risk of heart disease and stroke. Raised cholesterol is highest in high-income countries.

Cancer-associated infections : At least 2 million cancer cases per year, 18% of the global cancer burden, are attributable to a few specific chronic infections, and this fraction is substantially larger in low-income countries. The principal infectious agents are human papillomavirus, Hepatitis B virus, Hepatitis C virus and *Helicobacter pylori*. These infections are largely preventable through vaccinations and measures to avoid transmission, or treatable. For example, transmission of Hepatitis C virus has been largely stopped among high–income populations, but not in many low–resource countries.

Environmental risk factors : occupational hazards, air and water pollution, and possession of destructive weapons in case of injuries.

Gaps in natural history

There are many gaps in our knowledge about the natural history of chronic diseases. These gaps cause difficulties in aetiological investigations and research *(15)*. These are :–

1. Absence of a known agent

There is much to learn about the cause of chronic diseases. Whereas in some chronic diseases the cause is

known (e.g., silica in silicosis, asbestos in mesothelioma), for many chronic diseases the causative agent is not known. The absence of a known agent makes both diagnosis and specific prevention difficult.

2. Multifactorial causation

Most chronic diseases are the result of multiple causes – rarely is there a simple one-to-one cause-effect relationship. In the absence of a known agent, the term "risk factor(s)" is used to describe certain factors in a person's background or life-style that make, the likelihood of the chronic condition more probable. Further, chronic diseases appear to result from the cumulative effects of multiple risk factors. These factors may be both environmental and behavioural, or constitutional. Epidemiology has contributed massively in the identification of risk factors of chronic diseases. Many more are yet to be identified and evaluated.

3. Long latent period

A further obstacle to our understanding of the natural history of chronic disease is the long latent (or incubation) period between the first exposure to "suspected cause" and the eventual development of disease (e.g., cervical cancer). This makes it difficult to link suspected causes (antecedent events) with outcomes, e.g., the possible relation between oral contraceptives and the occurrence of cervical cancer. In an attempt to overcome this problem, a search has been made for precursor lesions in, for example, cancer cervix, oral cancer and gastric cancer. But this is not possible in all chronic diseases. However, it has now become increasingly evident that the factors favouring the development of chronic disease are often present early in life, preceding the appearance of chronic disease by many years. Examples include hypertension, diabetes, stroke, etc.

4. Indefinite onset

Most chronic diseases are slow in onset and development, and the distinction between diseased and non-diseased states may be difficult to establish (e.g., diabetes and hypertension). In many chronic diseases (e.g., cancer) the underlying pathological processes are well established long before the disease manifests itself. By the time the patient seeks medical advice, the damage already caused may be irreversible or difficult to treat.

Prevention

The preventive attack on chronic diseases is based on the knowledge that they are multifactorial in causation, so their prevention demands a complex mix of interventions. Previously only tertiary prevention seemed possible to prevent or delay the development of further disability or the occurrence of premature death. But, now, with the identification of risk factors, health promotion activities aimed at primary prevention are being increasingly applied in the control of chronic diseases. Some of the interventions that should be undertaken immediately to produce accelerated results in terms of lives saved, disease prevented and heavy cost avoided are as follows *(16)* :

1. Protecting people from tobacco smoke and banning smoking in public places, warning about the dangers of tobacco use, enforcing bans on tobacco advertising, promotion and sponsorships and raising taxes on tobacco;
2. Restricting access to retailed alcohol, enforcing bans on alcohol advertising and raising taxes on alcohol;
3. Reduce salt intake and salt content of food;
4. Replacing trans-fat in food with polyunsaturated fat; and
5. Promoting public awareness about diet and physical activity, including through mass media.

In addition, there are many other cost-effective and low-cost population-wide interventions that can reduce risk factors for NCDs. These include :

1. Nicotine dependence treatment;
2. Enforcing drink-driving laws;
3. Restrictions on marketing of foods and beverages high in salt, fats and sugar;
4. Food taxes and subsidies to promote healthy diets;
5. Healthy nutrition environments in schools;
6. Nutrition information and counselling in health care; and
7. National physical activity guidelines (school based physical activity programmes for children and workplace programmes for physical activity and healthy diets).

There also are population-wide interventions that focus on cancer prevention, like vaccination against Hepatitis B, a major cause of liver cancer. Vaccination against human papillomavirus (HPV), the main cause of cervical cancer, is also recommended. Protection against environmental or occupational risk factors for cancer, such as aflatoxin, asbestos and contaminants in drinking-water can be included in effective prevention strategies.

Present knowledge indicates that the chronically ill require a wide spectrum of services – case finding through screening and health examination techniques; application of improved methods of diagnosis, treatment and rehabilitation; control of food, water and air pollution; reducing accidents; influencing patterns of human behaviour and life-styles through intensive education; upgrading standards of institutional care and developing and applying better methods of comprehensive medical care including primary health care. Political approaches are also needed as in the case of smoking control, control of alcohol and drug abuse. The approach should be holistic in handling the complex medical and social needs of the chronically ill and should always be considered in relation to the family and community.

Integrated approach

It is now felt that the principles of prevention of CHD can be applied also to other major non-communicable diseases (NCDs) because of common risk factors. A broader concept is emerging, that is, to develop an overall integrated programme for the **Prevention and Control of NCDs** as part of primary health care systems, simultaneously attacking several risk factors known to be implicated in the development of non-communicable diseases. Such concerted preventive action should reduce not only cardiovascular diseases but also other major NCDs, with an overall improvement in health and length of life *(17)*.

The WHO has developed a survey methodology known as *"the STEPS Non-communicable Disease Risk Factors Survey"* to help countries establish NCD surveillance system. Some surveys are conducted at the country level and others at the subnational level. The methodology prescribes three steps – questionnaire, physical measurements, and biochemical measurements. The core topics covered by most surveys are demographic, health status and health behaviours. These provide data on socio-economic risk factors and metabolic,

nutritional and lifestyle risk factors. Details may differ from country to country and from year to year *(18)*.

In India, the survey was conducted from April 2003 to March 2005 in 6 states and again in 2007 in 7 states.

WHO Global Action Plan for the Prevention and Control of NCDs (2013–2020 to 2030) *(19, 20)*

The Global Action Plan provides member states with a road map and menu of policy options which, when implemented collectively between 2013 and 2020, will contribute to progress on 9 global NCD targets including that of 25 per cent relative reduction in premature mortality from cardiovascular diseases, cancer, diabetes and chronic respiratory diseases by 2025. These four diseases make the largest contribution to mortality and morbidity due to NCDs. It will target four behavioural risk factors – tobacco use, unhealthy diet, physical inactivity and harmful use of alcohol. The voluntary global targets are for prevention and control of NCD (as of August 2023) :

1. A one third relative reduction in risk of premature mortality from cardiovascular diseases, cancer, diabetes and chronic respiratory disease;
2. At least 20 per cent relative reduction in the harmful use of alcohol as appropriate within national context;
3. A 15 per cent relative reduction in prevalence of insufficient physical activity;
4. A 30 per cent relative reduction in mean population intake of salt/sodium;
5. A 30 per cent relative reduction in prevalence of current tobacco use in persons aged 15+ years;
6. A 25 per cent relative reduction in prevalence of raised blood pressure;
7. Halt the rise of diabetes and obesity;
8. At least 50 per cent of eligible people receive drug therapy and counselling (including glycaemic control) to prevent heart attacks and strokes; and
9. An 80 per cent availability of the affordable basic technology and essential medicines including generics, required to treat major NCDs in both public and private facilities.

2030 Agenda for Sustainable Development

The Sustainable Development Goals include a specific target for NCDs and several NCD – related targets. Target 3.4 calls for a one third reduction in premature mortality from NCDs by year 2030 and is an extension of the global NCD mortality target. For further details, please refer to chapter 14.

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CARDIOVASCULAR DISEASES

Cardiovascular diseases (CVD) comprise of a group of diseases of the heart and the vascular system. The major conditions are ischaemic heart disease (IHD), hypertension, cerebrovascular disease (stroke) and congenital heart disease. Rheumatic heart disease (RHD) continues to be an important health problem in many developing countries.

Problem statement

WORLD

CVDs are the number one cause of death globally, more people die annually from CVD than any other cause. An estimated 19.20 million people died from CVD in 2021, representing 28.11 per cent of all global deaths. Of these global deaths, an estimated 9.02 million were due to coronary heart disease and 6.97 million were due to stroke *(1)*. At least 82 per cent of the world's deaths from CVDs occur in low and middle-income countries, where people do not have the benefit of integrated primary health care programmes for early detection and treatment of risk factors compared to people in high-income countries. As a result, many cases in these countries are detected late in the course of the disease and die younger from CVDs and other NCDs, often in their most productive years. The poorest people are affected most. At the household level, CVD and other NCDs contribute to poverty due to catastrophic health spending and high out-of-pocket expenditure *(2)*.

The incidence of CVD is greater in urban areas than in rural areas reflecting the acquisition of several risk factors such as tobacco consumption, lack of physical activity, unhealthy diet (today's fast food habits) and obesity. A peculiar cause of concern is the relative early age of CVD deaths in the developing countries. Ironically CVDs are now in decline in the industrialized countries first associated with them. They seem to have crossed the peak of the epidemic by now. The decline is largely a result of the success of primary prevention and to a lesser extent, treatment. The middle and low-income countries are at the mid-point of the emerging epidemic and will face its full impact in the coming years. These countries can be benefitted from the strategy of primary prevention.

INDIA

An estimated 2.78 million people died of CVD in India during 2021, Table 1 shows the break-up of the cases and crude death rate per 100,000 population as reported to WHO.

TABLE 1

Estimated deaths (000) and crude death rate by cause and sex, India (2021) (Population 1,414,207,000)

Disease	Men		Women		Total	
	Number	CDR	Number	CDR	Number	CDR
CVD	1,426.9	195.5	1,358.2	198.5	2,785.4	197.0
Rheumatic Heart Disease	65.5	9.0	102.3	15.0	167.8	11.9
Hypertension	38.1	5.2	111.7	16.3	149.6	10.6
Ischaemic Heart Disease	887.0	121.5	680.1	99.4	1,567.7	110.9
Stroke	360.1	49.3	396.0	57.9	756.2	53.5

Source : *(4, 5)*

Compared with all other countries, India suffers the highest loss in potentially productive years of life, due to deaths from CVD in people aged 35–64 years. The prevalence of CVD is reported to be 2–3 times higher in the urban population as compared to the rural population. In one study, the prevalence of IHD among adults (based on clinical and ECG criteria) was estimated at 96.7 per 1000 population in the urban and 27.1 per 1000 in rural areas *(3)*.

The contribution of risk factors to the CVD have increased massively since last couple of decades. These risk factors are summarized in Table 2 *(6)*.

TABLE 2

Risk factors contributing to CVD, India (2019)

Risk factors	
Total alcohol per capita consumption per year	4.9 litres
Current tobacco use, aged 15+	24%
Mean population salt intake, aged 25+	10 (g/day)
Physical inactivity, adults aged 18+	49%
Physical inactivity, adolescents aged 11–17	74%
Raised blood pressure, aged 30–79 years	27%
Hypertension, aged 30–79	31%
Obesity, adults aged 18+	7%
Obesity, adolescents aged 10–19	3%
Diabetes, adults aged 18+	23%
Mean total cholesterol, adults aged 18+	4.2 mmol/1

Source : *(6)*

Risk factors

The present mortality rates are the consequence of previous exposure to behavioural risk factors such as inappropriate nutrition, insufficient physical activity and increased tobacco consumption. It is called the "lag-time" effect of risk factors for CVD. Overweight, central obesity, high blood pressure, dyslipidaemia, diabetes and low cardio-respiratory fitness are among the biological factors contributing principally to increased risk.

It is now well established fact that a persistently high cholesterol level can almost certainly precipitate a cardiac event such as CHD. Still most people do not have an idea of nutritional requirements and a balanced diet. Unhealthy dietary practices include a high consumption of saturated fats, salt and refined carbohydrates, as well as a low consumption of vegetables and fruits and these tend to cluster together.

Cessation of tobacco use, reduction of salt in the diet, consuming fruits and vegetables, regular physical activity and avoiding harmful use of alcohol have been shown to reduce the risk of cardiovascular disease. In addition, drug treatment of diabetes, hypertension and high blood lipids may be necessary to reduce cardiovascular risk and prevent heart attacks and strokes. Health policies that create conducive environment for making healthy choices affordable and available are essential for motivating people to adopt and sustain healthy behaviour.

There are also a number of underlying determinants of CVDs or "the causes of the causes". These are a reflection of the major forces driving social, economic and cultural change - globalization, urbanization and population ageing. Other determinants of CVDs include poverty, stress and hereditary factors.

Symptoms of heart attack and stroke

Often, there are no symptoms of the underlying disease of the blood vessels. A heart attack or stroke may be the first warning of underlying disease. Symptoms of a heart attack include :

- pain or discomfort in the centre of the chest; and
- pain or discomfort in the arms, the left shoulder, elbows, jaw, or back.

In addition, the person may experience difficulty in breathing or shortness of breath; feeling sick or vomiting; feeling light-headed or faint; breaking into a cold sweat; and becoming pale. Women are more likely to have shortness of breath, nausea, vomiting, and back or jaw pain.

The most common symptom of a stroke is sudden weakness of the face, arm, or leg, most often on one side of the body. Other symptoms include sudden onset of:

1. numbness of the face, arm, or leg, especially on one side of the body;
2. confusion, difficulty in speaking or understanding speech;
3. difficulty in seeing with one or both eyes;
4. difficulty in walking, dizziness, loss of balance or coordination;
5. severe headache with no known cause; and
6. fainting or unconsciousness.

People experiencing these symptoms should seek medical care immediately.

Symptoms of rheumatic heart disease include: shortness of breath, fatigue, irregular heart beats, chest pain and

fainting. Symptoms of rheumatic fever include: fever, pain and swelling of the joints, nausea, stomach cramps and vomiting.

Interventions to reduce cardiovascular disease burden (3)

PRIMARY PREVENTION

The cost effective interventions that are feasible to be implemented include population-wide interventions and individual level interventions, which are recommended to be used in combination to reduce the CVDs.

The example of population- wide intervention are:

- comprehensive tobacco control policies;
- taxation to reduce the intake of foods that are high in fat, sugar and salt;
- building walking and cycle paths to increase physical activity;
- strategies to reduce harmful use of alcohol; and
- providing healthy school meals to children.

At the individual level, for prevention of first heart attacks and strokes, individual health-care interventions need to be targeted to those at high total cardiovascular risk or those with single risk factor level above traditional thresholds, such as hypertension and hypercholesterolemia. The former approach is more cost-effective than the later and has the potential to substantially reduce cardiovascular events. This approach is feasible in primary care in low-resource settings, including by non-physician health workers.

SECONDARY PREVENTION

For secondary prevention of cardiovascular disease in those with established disease, including diabetes, treatment with the following medications are necessary:

- aspirin;
- beta-blockers;
- angiotensin-converting enzyme inhibitors; and
- statins.

The benefits of these interventions are largely independent, but when used together with smoking cessation, nearly 75% of recurrent vascular events may be prevented. Currently there are major gaps in the implementation of these interventions particularly at the primary health care level.

In addition costly surgical operations are sometimes required to treat CVDs. They include:

- coronary artery bypass;
- balloon angioplasty (where a small balloon-like device is threaded through an artery to open the blockage);
- valve repair and replacement; and
- heart transplantation.

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CORONARY HEART DISEASE

Coronary heart disease (syn : ischaemic heart disease) has been defined as "impairment of heart function due to inadequate blood flow to the heart compared to its needs, caused by obstructive changes in the coronary circulation to the heart" *(1)*. It is the cause of 25–30 per cent of deaths in most industrialized countries. The WHO has drawn attention to the fact that CHD is our modern "epidemic", i.e., a disease that affects populations, not an unavoidable attribute of ageing. CHD may manifest itself in many presentations :

a. angina pectoris of effort
b. myocardial infarction
c. irregularities of the heart
d. cardiac failure
e. sudden death.

Myocardial infarction is specific to CHD; angina pectoris and sudden death are not. Rheumatic heart disease and cardiomyopathy are potential sources of diagnostic confusion *(2)*. The natural history of CHD is very variable. Death may occur in the first episode or after a long history of disease.

Measuring the burden of disease

The burden of CHD may be estimated in various ways, each illustrating a different aspect of the picture *(3)*.

(a) Proportional mortality ratio : The simplest measure is the proportional mortality ratio, i.e., the proportion of all deaths currently attributed to it. For example, CHD is held responsible for about 30 per cent of deaths in men and 25 per cent of deaths in women in most western countries.

(b) Loss of life expectancy : CHD cuts short the life expectancy. Calculations have been made *(4)* for the average gain in life expectation that would follow a complete elimination of all cardiovascular deaths if other mortality rates remain unchanged. The benefit would range for men from 3.4 years to 9.4 years, and even greater for women.

(c) CHD incidence rate: This is the sum of fatal and non-fatal attack rates *(5)*. Because of its different manifestations, accurate incidence of CHD rates are difficult to compute. Mortality rates can be used as a crude indicator of incidence.

(d) Age-specific death rates : When analysis is planned to throw light on aetiology, it is essential to study the age-specific rates. Age-specific death rates suggest a true increase in incidence.

(e) Prevalence rate : The prevalence of CHD can be estimated from cross-sectional surveys using ECG for evidence of infarction and history of prolonged chest pain. A useful publication to conduct such surveys is "Cardio-vascular Survey Methods" by Rose and Blackburn *(6)*.

(f) Case fatality rate : This is defined as the proportion of attacks that are fatal within 28 days of onset. The International Society and Federation of Cardiology has suggested that "sudden deaths" be defined to include deaths "occurring instantly or within an estimated 24 hours of the onset of acute symptoms or signs". Data collected in many industrialized countries indicate that 25–28 per cent of patients who suffer a heart attack die suddenly. In about 55 per cent of all cardiac deaths mortality occurs within the first hour *(7)*.

(g) Measurement of risk factor levels : These include measurement of levels of cigarette smoking, blood pressure, alcohol consumption and serum cholesterol in the community *(8)*.

(h) Medical care : Measurement of levels of medical care in the community are also pertinent.

Epidemicity

"Epidemics" of CHD began at different times in different countries. In United States, epidemics began in the early 1920s *(9)*; in Britain in the 1930s *(10)*; in several European countries, still later. And now the developing countries are catching up. Countries where the epidemic began earlier are now showing a decline. For example, in United States, where the epidemic began in early 1920s, a steady decline was evident by 1968, and a 25 per cent fall in mortality (not morbidity) by 1980 *(9)*. Substantial declines in mortality have also occurred in Australia, Canada and New Zealand.

The decline in CHD mortality in US and other countries has been attributed to changes in life-styles and related risk factors (e.g., diet and diet-dependent serum cholesterol, cigarette use and exercise habits) plus better control of hypertension *(11)*.

The reasons for the changing trends in CHD are not precisely known. The WHO has completed a project known as MONICA "(multinational monitoring of trends and determinants in cardiovascular diseases)" to elucidate this issue. Forty-one centres in 26 countries were participating in this project, which was planned to continue for a 10 year period ending in 1994 *(12)*.

When CHD emerged as the modern epidemic, it was the disease of the higher social classes in the most affluent societies. Fifty years later the situation is changing; there is a strong inverse relation between social class and CHD in developed countries *(13)*.

To summarize, in many developed countries, CHD still poses the largest public health problem. But even in those showing a decline, CHD is still the most frequent single cause of death among men under 65 *(13)*.

International variations

With 9.09 million deaths and 13.22 per cent of total deaths, CHD is a worldwide disease. Mortality rates vary widely in different parts of the world *(14)*.

The highest coronary mortality is seen at present in the Western Pacific Region followed by European Region. On the other hand rates in Americas and Eastern Mediterranean countries are much lower.

Coronary heart disease in India

Coronary heart disease is assuming serious dimension in developing countries. There is a considerable increase in prevalence of CHD in urban areas in India during the last decade. Although there is increase in prevalence of CHD in rural areas also, but it is not that steep because life-style changes have affected people in urban areas more than in rural areas.

The pooled estimates from studies carried out in 1990s upto 2002 shows the prevalent rate of CHD in urban areas as 6.4 per cent and 2.5 per cent in rural areas. In urban areas the pooled estimate was 6.1 per cent for males and 6.7 per cent for females. In rural areas the estimate was 2.1 per cent for males and 2.7 per cent for females *(15)*.

According to medical certification of cause of death data, 25.1 per cent of total deaths in urban areas are attributable to diseases of the circulatory system. Therefore, it was assumed that mortality rates due to CHD (which forms an important disease entity and the diseases of circulatory system) in rural areas are expected to be half of CHD specific mortality rates in urban areas.

It is estimated that 15,67,700 people died of CHD during 2021, of which 8,87,000 were men and 6,80,100 women. The crude death rate was 110.9/100,000 population.

Risk factors

The aetiology of CHD is multifactorial. Apart from the obvious ones such as increasing age and male sex, studies have identified several important "risk" factors (i.e., factors that make the occurrence of the disease more probable). Some of the risk factors are modifiable, others immutable (Table 1). Presence of any one of the risk factors places an individual in a high-risk category for developing CHD. The greater the number of risk factors present, the more likely one is to develop CHD. The principal risk factors are discussed below:

TABLE 1

Risk factors for CHD

Not modifiable	Modifiable
Age	Cigarette smoking
Sex	High blood pressure
Family history	Elevated serum cholesterol
Genetic factors	Diabetes
Personality	Obesity
	Sedentary habits
	Stress

1. Smoking

Some people commit suicide by drowning, but many by smoking. A uniquely human habit, smoking has been identified as a major CHD risk factor *(16, 17)* with several possible mechanisms – carbon monoxide induced atherogenesis; nicotine stimulation of adrenergic drive raising both blood pressure and myocardial oxygen demand; lipid metabolism with fall in "protective" high-density lipoproteins, etc.

It has been calculated that in countries where smoking has been a widespread habit, it is responsible for 25 per cent of CHD deaths under 65 years of age in men *(18)*. Cigarettes seem to be particularly important in causing sudden death from CHD especially in men under 50 years of age *(18)*.

The degree of risk of developing CHD is directly related to the number of cigarettes smoked per day *(20)*. Filter cigarettes are probably not protective *(21)*. There is evidence that the influence of smoking is not only independent of, but also synergistic with other risk factors such as hypertension and elevated serum cholesterol (Fig. 1). This means that the effects are more than additive *(18)*.

The risk of death from CHD decreases on cessation of smoking. The risk declines quite substantially within one year of stopping smoking and more gradually thereafter until, after 10–20 years, it is the same as that of non-smokers *(18)*. For those who have had a myocardial infarction, the risk of a fatal recurrence may be reduced by 50 per cent after giving up smoking *(18)*.

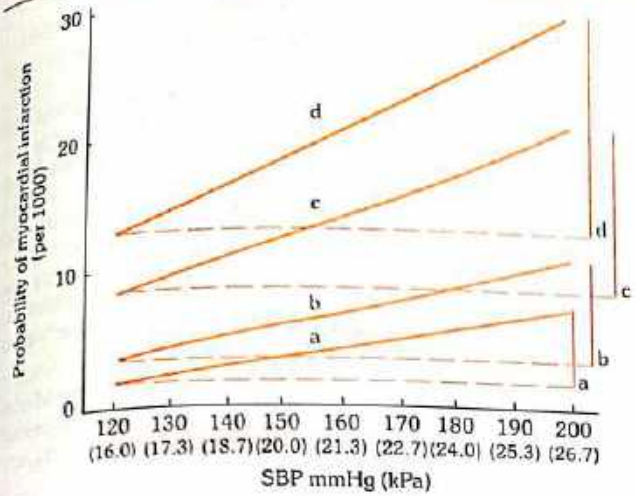

FIG. 1

The importance of risk-factor combinations, illustrated by the six-year risk of myocardial infarction at various levels of SBP and serum cholesterol in smokers and non-smokers

The vertical axis gives the probability of myocardial infarction occuring in the next 6 years per 1000 men with a given SBP.

Curve a : risk in the absence of smoking and elevated serum cholesterol.

Curve b : risk in smokers.

Curve c : risk with elevated serum cholesterol.

Curve d : risk with smoking and elevated serum cholesterol.

The vertical bars a–d show how the increment in the risk of myocardial infarction associated with a given SBP elevation depends on the various "constellations" (combinations) of risk factors. The ratios of the length of the bars provide a measure of the risk due to a particular risk-factor constellation.

Source : *(19)*

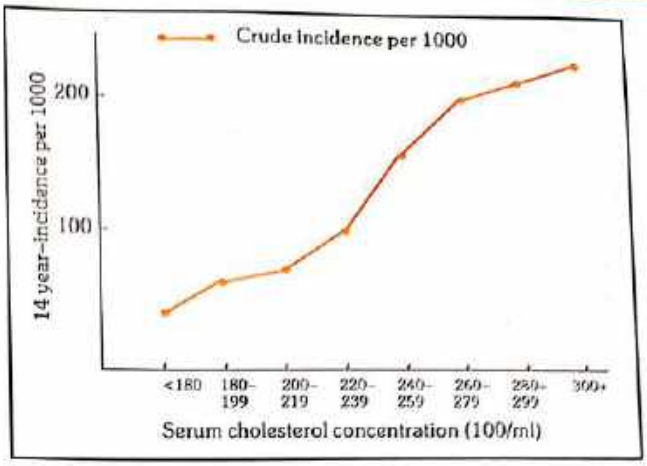

FIG. 2

The risk of CHD and serum cholesterol levels

2. Hypertension

The blood pressure is the single most useful test for identifying individuals at a high risk of developing CHD. Hypertension accelerates the atherosclerotic process, especially if hyperlipidaemia is also present and contributes importantly to CHD. In the past, emphasis was placed on the importance of diastolic blood pressure. Many investigators feel that systolic blood pressure is a better predictor of CHD than is the diastolic. However, both components are significant risk factors. The risk role of "mild" hypertension is generally accepted *(13)*.

3. Serum cholesterol

It is nearly three decades since it became clear that elevation of serum cholesterol was one of the factors which carried an increased risk for the development of myocardial infarction. Today, there is a vast body of evidence showing a triangular relationship between habitual diet, blood cholesterol–lipoprotein levels and CHD, and that these relationships are judged to be causal *(1)*. There is no population, in which CHD is common, that does not also have a relatively high mean level of cholesterol (i.e. greater than 200 mg/dl in adults).

Fig. 2 shows that the risk of CHD rises steadily with the serum cholesterol concentration *(22)*. The 14–years experience of the Seven Countries Study *(23)* showed that serum cholesterol concentration is an important risk factor for the incidence of CHD at levels perhaps 220 mg/dl or more. This supports the notion of a "threshold level" of cholesterol, that is, a certain level beyond which there is an association.

The *strength* of the dietary-fat hypothesis is that observations in the Seven Countries Study (among others) fitted it well – that is, the Japanese had low fat diets, low serum cholesterol and low incidence of CHD while the East Fins were at the other extreme. The weakness of the hypothesis is that studies of individuals have not shown such a relationship. This has been attributed to genetic and dietary intake differences between individuals *(1)*.

When we look at the various types of lipoproteins, it is the level of low-density lipoprotein (LDL) cholesterol that is most directly associated with CHD *(24)*. While very low-density lipoprotein (VLDL) has also been shown to be associated with premature atherosclerosis, it is more strongly associated with peripheral vascular disease (e.g., intermittent claudication) than with CHD. High-density lipoprotein (HDL) cholesterol is protective against the development of CHD – the higher its mean level in a group of individuals, the lower the incidence of infarction in that group *(24)*. HDL should be more than 40 mg/dl.

To further refine CHD risk prediction based on serum lipid levels, a total "cholesterol/HDL ratio" has been developed. A ratio of less than 3.5 has been recommended as a clinical goal for CHD prevention *(25)*.

With newer techniques, high-density and low-density lipoproteins have been further subdivided into sub-fractions. Recent evidence indicates that levels of plasma apolipoprotein–A–I (the major HDL protein) and apolipoprotein–B (the major LDL protein) are better predictors of CHD than HDL cholesterol or LDL cholesterol respectively. Therefore, measurement of apolipoproteins may replace lipoprotein cholesterol determinations in assessing the risk of CHD *(26)*.

4. Other risk factors

(i) Diabetes : The risk of CHD is 2–3 times higher in diabetics than in non-diabetics. CHD is responsible for 30 to 50 per cent of deaths in diabetics over the age of 40 years in industrialized countries *(27)*.

(ii) Genetic factors : A family history of CHD is known to increase the risk of premature death. Genetic factors are probably the most important determinants of a given individual's TC and LDL levels. However, the importance of genetic factors in the majority of cases is largely unknown.

(iii) Physical activity : Sedentary life-style is associated with a greater risk of the development of early CHD. There

is evidence that regular physical exercise increases the concentration of HDL *(28)* and decreases both body weight and blood pressure which are beneficial to cardiovascular health.

(iv) Hormones : The pronounced difference in the mortality rates for CHD between male and female subjects suggests that the underlying factor may have a hormonal basis. It has been hypothesized that hyperestrogenemia may be the common underlying factor that leads both to atherosclerosis and its complications such as CHD, stroke and peripheral vascular disease *(29)*.

(v) Type A personality : Type A behaviour is associated with competitive drive, restlessness, hostility and a sense of urgency or impatience. Type–A individuals are more coronary prone to CHD than the calmer, more philosophical Type B individuals *(30)*.

(vi) Alcohol : High alcohol intake, defined as 75g or more per day is an independent risk factor for CHD, hypertension and all cardiovascular diseases *(13)*. The evidence that moderate alcohol intake leads to a reduction in the risk of CHD is un-substantiated *(31)*.

(vii) Oral contraceptives : Women using oral contraceptives have higher systolic and diastolic blood pressure. The risk of myocardial infarction in women seems to be increased by oral contraceptives, and the risk is compounded by cigarette smoking *(32)*.

(viii) *Miscellaneous* : The possible role of dietary fibre, sucrose and soft water have been debated *(5)*. Dyspnoea on exertion and low vital capacity have also been cited as possible risk factors.

PREVENTION OF CHD

In the 1960s the issue was whether CHD could be prevented or not. Studies were launched, reported and debated. The accumulated evidence led to a broad consensus of expert opinion that CHD is preventable *(13)*. This is best expressed in a report of the WHO Expert Committee on the Prevention of CHD *(1)* which recommended the following strategies :

a. Population strategy
   (i) prevention in whole populations
   (ii) primordial prevention in whole populations
b. High risk strategy
c. Secondary prevention.

a. Population strategy

CHD is primarily a mass disease. The strategy should therefore be based on mass approach focusing mainly on the control of underlying causes (risk factors) in *whole populations*, not merely in individuals. This approach is based on the principle that small changes in risk factor levels in total populations can achieve the biggest reduction in mortality *(33)*. That is, the aim should be to shift the whole risk-factor distribution in the direction of "biological normality" *(1)*. This cannot obviously be done by medical means alone; it requires the mobilization and involvement of the whole community to alter its lifestyle practices that are associated with CHD.

Specific interventions

The population strategy centres round the following key areas :

1. Dietary changes : Dietary modification is the principal preventive strategy in the prevention of CHD. The WHO Expert Committee *(1)* considered the following dietary changes to be appropriate for high incidence populations :

- reduction of fat intake to 20–30 per cent of total energy intake
- consumption of saturated fats must be limited to less than 10 per cent of total energy intake; some of the reduction in saturated fat may be made up by mono and poly-unsaturated fats
- a reduction of dietary cholesterol to below 100 mg per 1000 kcal per day
- an increase in complex carbohydrate consumption (i.e., vegetables, fruits, whole grains and legumes)
- avoidance of alcohol consumption; reduction of salt intake to 5 g daily or less.

2. Smoking : As far as CHD is concerned, present evidence does not support promotion of the so-called "safer cigarette" *(13)*. The goal should be to achieve a smoke-free society, and several countries are progressing towards this goal.

To achieve the goal of a smoke-free society, a comprehensive health programme would be required which includes effective information and education activities, legislative restrictions, fiscal measures and smoking cessation programmes.

3. Blood pressure : It has been estimated that even a small reduction in the average blood pressure of the whole population by a mere 2 or 3 mm Hg would produce a large reduction in the incidence of cardiovascular complications *(34, 35)*. The goal of the population approach to high blood pressure would thus be to reduce mean population blood pressure levels. This involves a multifactorial approach based on a "prudent diet" (reduced salt intake and avoidance of a high alcohol intake), regular physical activity and weight control. The potential benefits and the safety and low cost of this advice would justify its implementation.

4. Physical activity : Regular physical activity should be a part of normal daily life. It is particularly important to encourage children to take up physical activities that they can continue throughout their lives *(1)*.

PRIMORDIAL PREVENTION

A novel approach to primary prevention of CHD is **primordial prevention** *(1)*. It involves preventing the emergence and spread of CHD risk factors and life-styles that have not yet appeared or become endemic. This applies to developing countries in particular. These countries should seek to preserve their traditional eating patterns and life-styles associated with low levels of CHD risk factors.

Since the aetiology of CHD is multifactorial the approach to prevention should be multifactorial aimed at controlling or modifying as many risk factors as possible. The aim should be to change the community as a whole, not the individual subjects living in it *(36)*.

Several well-planned risk factor intervention trials (e.g., The Multiple Risk Factor Intervention Trial (MRFIT) in the US *(37)*, The Stanford Heart Disease Prevention Programme in California *(38)*, and The North Kerelia Project in Finland *(39)* have demonstrated that primary prevention can achieve substantial reduction in the incidence of coronary heart disease. For detailed information, the reader is referred to references no. *37, 38* and *39*.

b. High risk strategy

(i) Identifying risk : High-risk intervention can only start once those at high risk have been identified. By means of simple tests such as blood pressure and serum cholesterol

measurement it is possible to identify individuals at special risk (1). Individuals at special risk also include those who smoke, those with a strong family history of CHD, diabetes and obesity and young women using oral contraceptives.

(ii) Specific advice : Having identified those at high risk, the next step will be to bring them under preventive care and motivate them to take positive action against all the identified risk factors, e.g., an elevated blood pressure should be treated; the patient should be helped to break the smoking habit permanently – nicotine chewing gum can be tried to wean patients from smoking *(40)*; serum cholesterol concentration should be reduced in those in whom it is raised, etc.

Several well planned high-risk intervention studies (e.g., Oslo Heart Study *(41)*, Lipid Research Clinics Study *(42)*, in US have shown that it is feasible to reduce the CHD risk factors.

From a methodological point of view, however, high-risk approach suffers from the disadvantage that the intervention (e.g., treatment) may be effective in reducing the disease in a high-risk group, but it may not reduce the disease to the same extent in the general population which consists of symptomatic, asymptomatic, high-risk, low-risk and healthy people *(43)*. Further, unfortunately, more than half of the CHD cases occur in those who are *not* apparently at special risk, and this is one limitation of the high-risk strategy *(1)*. Nevertheless, recognition and treatment of high-risk cases do make an important contribution to prevention *(1)*.

c. Secondary prevention

Secondary prevention must be seen as a continuation of primary prevention. It forms an important part of an overall strategy. The aim of secondary prevention is to prevent the recurrence and progression of CHD. Secondary prevention is a rapidly expanding field with much research in progress (e.g., drug trials, coronary surgery, use of pace makers).

The principles governing secondary prevention are the same as those already set out in the above sections, e.g., cessation of smoking, control of hypertension and diabetes, healthy nutrition, exercise promotion, etc. The most promising results to date have come from beta-blockers which appear to reduce the risk of CHD mortality in patients who have already suffered at least one infarct in the order of 25 per cent. None of the preventive measures discussed earlier lose their importance even after the first attack. For example, cessation of smoking is the most effective single means of intervention currently available in the management of patients after a heart attack. The risk of fatal infarction or sudden death is reduced by 20–50 per cent. If the patient does not stop smoking, nothing else is worth doing *(44)*.

Despite advances in treatment, the mortality of an acute heart attack is still high among survivors, around 10 per cent in the first year, and 5 per cent yearly thereafter. Delay in reaching hospital is still considerable even in big cities in the West and may be as much as 3.5 hours. About 30 per cent of all deaths occur within 30 minutes of onset. This is one of the reasons why coronary care units have failed to make impact on the total coronary mortality in the community *(45, 46)*.

Each strategy – population strategy, high-risk strategy, secondary prevention – has its advantages and disadvantages, but the population strategy has the greatest potential.

Revascularization procedures for patients with angina pectoris *(47)*

The indications for coronary artery revascularization i.e. coronary artery bypass grafting (CABG) and percutaneous transluminal coronary angioplasty (PTCA) in patients with angina pectoris are often debated. There is general agreement that otherwise healthy patients in the following groups should undergo revascularization. (a) patients with unacceptable symptoms despite medical therapy to its tolerable limits; (b) patients with left main coronary artery stenosis greater than 50 per cent with or without symptoms; (c) patients with three-vessel disease with left ventricular dysfunction (ejection fraction <50 per cent or previous transmural infarction); (d) patients with unstable angina who after symptom control by medical therapy continue to exhibit ischaemia on exercise testing or monitoring; and (e) post-myocardial infarction patients with continuing angina or severe ischaemia on noninvasive testing.

CABG can be accomplished with a very low mortality rate (1–3 per cent) in otherwise healthy patients with preserved cardiac function. However, the mortality rate of this procedure rises to 4–8 per cent in older individuals and in patients who have had a prior CABG. Increasingly, younger individuals with focal lesions of one or more vessels are undergoing coronary angioplasty as the initial revascularization procedure, where coronary artery stenosis can be effectively dilated by inflation of a balloon under high pressure. PTCA is also possible but less successful in bypass graft stenosis.

The incidents of restenosis appears to be reduced with intracoronary stent placement and may be as low as 15–20 per cent. The number of PTCA and stent procedure now exceeds that of CABG operations. Several studies have shown PTCA to be superior to medical therapy for symptom relief but not in preventing infarction or death. In patients with no or only mild symptoms, aggressive lipid-lowering and anti-anginal therapy may be preferable to PTCA.

RISK FACTOR INTERVENTION TRIALS

Since 1951, one of the best known large prospective studies, the **Framingham Study,** has played a major role in establishing the nature of CHD risk factors and their relative importance *(48, 49)*. The major risk factors of CHD are elevated serum cholesterol, smoking, hypertension and sedentary habits. Accordingly, the four main possibilities of intervention in CHD prevention are: reduction of serum cholesterol, the cessation of smoking, control of hypertension and promotion of physical activity.

Risk factor trials can be "single factor" trials or "multi-factor" trials. Both the approaches are complementary and both are needed. Early trials of CHD prevention concentrated on one factor (e.g., dietary cholesterol). Later emphasis swung away from unifactorial to multifactorial approach.

The widely reported intervention trials are : (a) The Stanford Heart Disease Prevention Programme in California, (b) The North Kerelia Project in Finland, (c) The Oslo Study, (d) The Multiple Risk Factor Intervention Trial (MRFIT) in USA, and (e) The Lipid Research Clinics Study. A brief account of these trials is given below. For more details the reader is referred to the references cited in the text.

1. The Stanford–Three–Community Study *(38)*.

To determine whether community health education can reduce the risk of cardiovascular disease, a field experiment was undertaken in 1972 in three northern California towns with populations varying between 12,000 and 15,000. In two of these towns intensive mass education campaigns were conducted against cardiovascular risk factors over a

period of 2 years. The third community served as a control. People from each community were interviewed and examined before the campaign began and one and two years afterwards to assess knowledge and behaviour related to cardiovascular diseases (e.g., diet and smoking) and also to measure physiological indicators of risk (e.g., blood pressure, serum cholesterol, relative weight). In the control community, the risk of cardiovascular disease increased over the two years, but in the intervention communities there was a substantial and sustained decrease in risk. The net difference in estimated total risk between control and intervention samples was 23–28 per cent.

2. The North Kerelia Project *(36, 39)*

North Kerelia is a county in the eastern part of Finland, where CHD is particularly common. Its 185,000 inhabitants work mostly in farming and forestry and live in the countryside.

A multiple risk factor intervention trial was started in 1972. The project had two aims : (a) to reduce the high levels of risk factors for cardiovascular disease (e.g., smoking, blood pressure and serum cholesterol), and (b) to promote the early diagnosis, treatment and rehabilitation of patients with CV disease. A control population was established in a neighbouring county which has similar CV mortality. The main strategy employed was mass community action against risk factors and advice on their avoidance.

Follow-up surveys at 5–years demonstrated a significant reduction in all three major risk factors. By 1979, mortality began to decline by 24 per cent in men and 51 per cent in women in North Kerelia, compared with 12 per cent in men and 26 per cent in women in rest of Finland. A further representative sample (8000) was studied in 1982. It exhibited its effect on CHD deaths – more than twice the reduction achieved in the rest of Finland during the same period. Thus it took 10 years (Rose's 10–years incubation period) to exhibit its effect on CHD deaths.

3. MRFIT *(37)*

The multiple risk factor intervention trial (MRFIT) carried out in USA was aimed at high risk adult males aged 35–57 years. A total of 12,866 men who showed no evidence of CHD either clinically or on ECG were enrolled for the study. Half the group was randomly allocated to an intensive intervention programme, being seen at least every four months to ensure adequate control of risk factors. The other half (control group) received a medical examination once yearly, and no specific advice was given to them about the control of risk factors. The intervention procedures included cessation of smoking, controlling blood pressure and altering diet to reduce hypercholesterolemia.

Over the 7 year follow-up period, IHD mortality was reduced by 22 per cent more in the intervention group but this was not statistically significant. This was because the control group had also changed their habits and lifestyle to a far greater extent than anticipated by the designers of the trial. The trial produced no significant changes at all in mortality or risk factors in as much as the control group was not properly chosen.

4. Oslow diet/smoking Intervention Study *(41)*

This study began in 1973. 16,202 Norwegian men aged 40–49 years were screened for coronary risk factors; of these 1,232 healthy normotensive men at high risk (total serum cholesterol 290–379 mg/dl; smoking) of CHD were selected for a 5 year randomized trial. The aim of the study was to determine whether lowering of serum lipids and cessation of smoking would reduce the incidence of first attack of CHD in males aged 40–50.

The intervention group underwent techniques designed to lower serum cholesterol level through dietary means (e.g., a polyunsaturated fat diet), and to decrease or eliminate smoking. At the end of 5 years, the incidence of myocardial infarction (fatal and nonfatal) was lower by 47 per cent in the intervention group than in the control group.

With this study, primary prevention of CHD entered the practical field of preventive medicine in an impressive manner.

5. Lipid Research Clinics Study *(42)*

This double-blind, randomized clinical trial involved 3,806 asymptomatic "high-risk" American men aged 35–59 years with type II hyperlipoproteinaemia. The trial was designed to test whether reducing serum cholesterol would prevent CHD events.

The men were randomized into two groups, one receiving cholestyramine and the other receiving a placebo. Both the groups were followed for an average of 7.4 years.

The treatment group had an 8.5 per cent and 12.6 per cent greater reduction in total cholesterol and LDL–cholesterol levels respectively than the placebo–treated group. This difference resulted in a 24 per cent reduction in death from definite CHD and a 19 per cent reduction in non-fatal myocardial infarction. The findings of this study have resulted in enthusiasm for the drug treatment of those men with considerably elevated serum cholesterol levels.

Secondary prevention trials

Secondary prevention trials are aimed at preventing a subsequent coronary attack or sudden death. A wide range of clinical trials have been performed with four main groups of drugs – anti-coagulants, lipid-lowering agents (e.g., clofibrate), anti-thrombotic agents (e.g., aspirin) and beta-blockers. The most promising results to date have come from beta blockers.

In general the above studies and similar others show that it is feasible through well-planned intervention programmes to reduce the risk factors in the populations studied. The primary and secondary prevention studies promise at present to be the main contribution of epidemiology to the conquest of chronic diseases.

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HYPERTENSION

Hypertension is a chronic condition of concern due to its role in the causation of coronary heart disease, stroke and other vascular complications. It is the commonest cardiovascular disorder, posing a major public health challenge to population in socio-economic and epidemiological transition. It is one of the major risk factors for cardiovascular mortality, which accounts for 20–50 per cent of all deaths.

Definition of hypertension is difficult and, by necessity arbitrary. Sir George Peckering first fomulated a concept that blood pressure in a population is distributed continuously as a bell-shaped curve with no real separation between normotension and hypertension *(1)*. There is also a direct relation between cardiovascular risk and blood pressure : the higher the blood pressure, the higher the risk of both stroke and coronary events *(1)*. As a consequence, the dividing line between normal and high blood pressure can be defined only in an operational way.

As intervention trials included only adults aged 18 years or older, definition and classification of hypertension refers to adults not taking anti-hypertensive drugs and not actually ill, and based on the average of two or more readings on two or more occasions after initial screening. Table 1 shows the classification of hypertension by blood pressure level.

TABLE 1
Classification of blood pressure measurements

Category	Systolic (mm of Hg)		Diastolic (mm of Hg)
Optimal	< 120	and	< 80
Normal	120–130	and/or	80–84
High normal	130–139	and/or	85–89
Grade 1 Hypertension	140–159	and/or	90–99
Grade 2 Hypertension	160–179	and/or	100–109
Grade 3 Hypertensive crisis	≥180	and/or	> 110
Isolated systolic hypertension	≥140	and	< 90

Source : *(2, 2A)*

When systolic and diastolic blood pressure fall into different categories, the higher category should be selected to classify the individual's blood pressure. *"Isolated systolic hypertension"* is defined as a systolic blood pressure of 140 mm of Hg or more and a diastolic blood pressure of less than 90 mm of Hg.

Organ damage

Although the extent of organ damage often correlates with the level of blood pressure, it is not always the case. In addition the rate of progression of organ damage varies from one individual to another depending on many influences, most of which are incompletely understood. Therefore, blood pressure and organ impairment should be evaluated separately, since markedly high pressures may be seen without organ damage and, conversely, organ damage may be present with only moderate elevation of blood pressure. The presence of signs of organ damage confers an increased cardiovascular risk to any level of blood pressure.

Blood pressure measurement

Despite more than 75 years of experience with the measurement of blood pressure, discussion continues about its reliability and wide variability in individual subjects. Accurate measurements are essential under standardized conditions for valid comparison between persons or groups over time. Three sources of errors have been identified in the recording of blood pressure : *(a) Observer errors* : e.g., hearing acuity, interpretation of Korotkow sounds. *(b) Instrumental errors* : e.g., leaking valve, cuffs that do not encircle the arm. If the cuff is too small and fails to encircle the arm properly then too high a reading will be obtained; and *(c) Subject errors* : e.g., the circumstances of examination. These include the physical environment, the position of the subject, external stimuli such as fear, anxiety, and so on *(3)*.

A few salient points need be mentioned about measuring blood pressure. A WHO Study Group *(4)* recommended the sitting position than the supine position for recording blood pressure. In any clinic a uniform policy should be adopted, using either the right or left arm consistently. The pressure at which the sounds are first heard (phase I) is taken to indicate the systolic pressure. Near the diastolic pressure the sounds first become muffled (phase IV) and then disappear (phase V). Most of the studies have used phase V to measure diastolic blood pressure. The systolic and diastolic pressures

should be measured at least three times over a period of at least 3 minutes and the lowest reading recorded. For reasons of comparability, the data should be recorded everywhere in a uniform way.

Classification

Hypertension is divided into primary (essential) and secondary. Hypertension is classified as "essential" when the causes are generally unknown. Essential hypertension is the most prevalent form of hypertension accounting for 90 per cent of all cases of hypertension. Hypertension is classified as "secondary" when some other disease process or abnormality is involved in its causation. Prominent among these are diseases of kidney (chronic glomerulo-nephritis and chronic pyelonephritis), tumours of the adrenal glands, congenital narrowing of the aorta and toxemias of pregnancy. Altogether, these are estimated to account for about 10 per cent or less of the cases of hypertension.

Magnitude of the problem

Although blood pressure is easily measured, it had taken several decades to realise that arterial hypertension is a frequent, worldwide health disorder *(5)*.

"Rule of halves"

Hypertension is an "iceberg" disease. It became evident in the early 1970s that only about half of the hypertensive subjects in the general population of most developed countries were aware of the condition, only about half of those aware of the problem were being treated, and only about half of those treated were considered adequately treated *(6)*. Fig. 1 illustrates this situation *(7)*. If this was the situation in countries with highly developed medical services, in the developing countries, the proportion treated would be far too less.

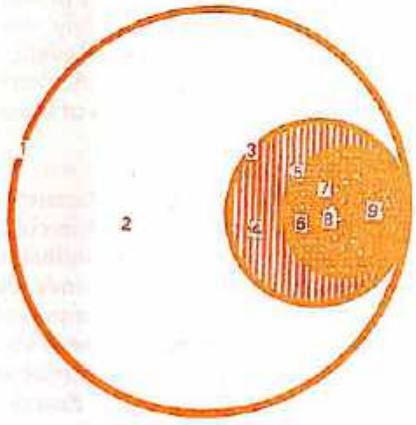

FIG. 1
Hypertension in the community

The areas of the circles shown in Fig. 1 correspond to the actual proportions observed in several population based studies and number-wise represent the following : *(6)*.

1. The whole community
2. Normotensive subjects
3. Hypertensive subjects
4. Undiagnosed hypertension
5. Diagnosed hypertension
6. Diagnosed but untreated
7. Diagnosed and treated
8. Inadequately treated
9. Adequately treated

INCIDENCE : The concept of incidence has limited value in hypertension because of the variability of consecutive readings in individuals, ambiguity of what is "normal" blood pressure and the insidious nature of the condition *(8)*.

The global prevalence of hypertension was estimated to be 1.13 billion killing 10 million people every year. The overall prevalence of hypertension in adults is around 30–40 per cent, with a global age standardized prevalence of 24 and 20 per cent in men and women respectively. This high prevalence of hypertension across the world is irrespective of income status i.e., in lower, middle and higher income countries. Hypertension becomes progressively more common with advancing age, with a prevalence of >60 per cent in people aged >60 years. As populations age, they adopt more sedentary life styles and increase in their body weight. It is estimated that the number of people with hypertension will increase by 15–20 per cent by year 2025 *(2)*. Elevated blood pressure is a leading cause of premature death in 2015, accounting to almost 10 million deaths and over 200 million DALYs. Despite advances in diagnosis and treatment over the past 30 years, the DALYs have increased by 40 per cent since 1990. Systolic blood pressure ≥140 mmHg accounts for most of the mortality and disability burden. The largest number of systolic blood pressure related deaths per year are due to IHD (4.9 million), haemorrhagic stroke (2 million) and ischaemic stroke (1.5 million) *(2)*.

Prevalence in India

In India an individual is classified as having hypertension if that individual has a systolic blood pressure level greater than or equal to 140 mmHg or a diastolic blood pressure level greater than or equal to 90 mmHg or that individual is currently taking antihypertensive medication to lower his/her blood pressure.

Based on blood pressure measurement during the NFHS-5 21 per cent of women age 15 years and over have hypertension, including 12 per cent with mildly elevated blood pressure, 4 per cent with moderately elevated blood pressure, and 2 per cent with severely elevated blood pressure. Forty-four per cent of women have blood pressure within the normal range. Almost two-fifths (39%) of women are pre-hypertensive. One per cent of women are currently taking antihypertensive medicine and have their blood pressure in the normal range.

The prevalence of hypertension is higher among men age 15 years and over than among women age 15 years and over. Twenty four per cent of men age 15 years and over have hypertension, including 16 per cent with mildly elevated blood pressure, 4 per cent with moderately elevate blood pressure, and 2 per cent with severely elevated blood pressure. Thirty per cent of men have normal blood pressure and 49 per cent are pre-hypertensive. About one per cent of men are currently taking antihypertensive medicine and have their blood pressure in the normal range.

Patterns by background characteristics

1. For both women and men, the prevalence of hypertension increases sharply with age. This increase is for all categories of hypertension, including pre-hypertension, for both women and men.
2. The prevalence of hypertension is higher among Sikhs (37% for men and 31% for women), Jains (30% for men

and 25% for women), and Christians (29% for men and 26% for women) than the rest of the religions.

3. There is a consistent and steep increase in the prevalence of hypertension with increases in the body mass index (BMI) for both women and men. Forty percent of obese men and 28 per cent of obese women are hypertensive.

4. The prevalence of hypertension among women is highest (35%) in Sikkim. The prevalence of hypertension among men age 15 and over ranges from 15 per cent in Dadra & Nagar Haveli and Daman & Diu to 42 per cent in Sikkim.

5. For both women and men, the southern states have a higher prevalence of hypertension than the national average.

"Tracking" of blood pressure

If blood pressure levels of individuals were followed up over a period of years from early childhood into adult life, then those individuals whose pressures were initially high in the distribution, would probably continue in the same "track" as adults. In other words, low blood pressure levels tend to remain low, and high levels tend to become higher as individuals grow older (Fig. 3). This phenomenon of persistence of rank order of blood pressure has been described as "tracking" *(9)*. This knowledge can be applied in identifying children and adolescents "at risk" of developing hypertension at a future date.

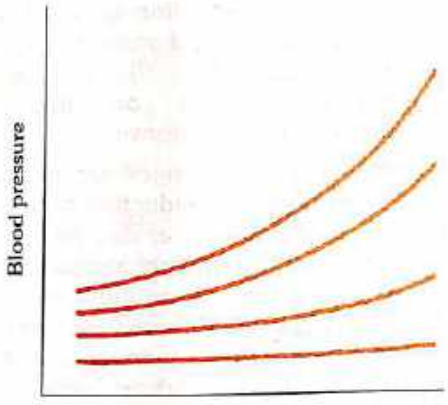

FIG. 3
Tracking of blood pressure

Risk factors for hypertension

Hypertension is not only one of the major risk factors for most forms of cardiovascular disease, but that it is a condition with its own risk factors. A WHO Scientific Group *(5)* has recently reviewed the risk factors for essential hypertension. These may be classified as :

1. Non-modifiable risk factors

(a) AGE : Blood pressure rises with age in both sexes and the rise is greater in those with higher initial blood pressure. Age probably represents an accumulation of environmental influences and the effects of genetically programmed senescence in body systems *(3)*. Some populations have now been identified whose mean blood pressure does not rise with age *(10)*. These communities are for the most part primitive societies with calorie and often salt intakes at subsistence level.

(b) SEX : Early in life there is little evidence of a difference in blood pressure between the sexes. However, at adolescence, men display a higher average level. This difference is most evident in young and middle aged adults. Late in life the difference narrows and the pattern may even be reversed *(1)*. Post-menopausal changes in women may be the contributory factor for this change. Studies are in progress to evaluate whether oestrogen supplementation protects against the late relative rise of blood pressure in women *(1)*.

(c) GENETIC FACTORS : There is considerable evidence that blood pressure levels are determined in part by genetic factors, and that the inheritance is polygenic. The evidence is based on twin and family studies. *Twin studies* have confirmed the importance of genetic factors in hypertension. The blood pressure values of monozygotic twins are usually more strongly correlated than those of zygotic twins. In contrast, no significant correlation has been noted between husbands and wives, and between adopted children and their adoptive parents *(5)*.

Family studies have shown that the children of two normotensive parents have 3 per cent possibility of developing hypertension, whereas this possibility is 45 per cent in children of two hypertensive parents *(11)*. Blood pressure levels among first degree adult relatives have also been noted to be statistically significant *(5)*.

Attempts to find genetic markers that are associated with hypertension have been largely unsuccessful. The detailed mechanism of heredity, i.e., how many genes and loci are involved and their mode of inheritance have not yet been conclusively elucidated.

(d) ETHNICITY : Population studies have consistently revealed higher blood pressure levels in black communities than other ethnic groups *(1)*. Average difference in blood pressure between the two groups vary from slightly less than 5 mm Hg during the second decade of life to nearly 20 mm Hg during the sixth. Black Americans of African origin have been demonstrated to have higher blood pressure levels than whites.

2. Modifiable risk factors

(a) OBESITY : Epidemiological observations have identified obesity as a risk factor for hypertension *(12)*. The greater the weight gain, the greater the risk of high blood pressure. Data also indicate that when people with high blood pressure lose weight, their blood pressure generally decreases. "Central obesity" indicated by an increased waist to hip ratio, has been positively correlated with high blood pressure in several populations.

(b) SALT INTAKE : There is an increasing body of evidence to the effect that a high salt intake (i.e., 7–8 g per day) increases blood pressure proportionately. Low sodium intake has been found to lower the blood pressure *(13)*. For instance, the higher incidence of hypertension is found in Japan where sodium intake is above 400 mmol/day while primitive societies ingesting less than 60 mmol/day have virtually no hypertension *(14)*. It has been postulated that essential hypertensives have a genetic abnormality of the kidney which makes salt excretion difficult except at raised levels of arterial pressure *(5)*.

Besides sodium, there are other mineral elements such as potassium which are determinants of blood pressure.

Potassium antagonizes the biological effects of sodium, and thereby reduces blood pressure. Potassium supplements have been found to lower blood pressure of mild to moderate hypertensives. Other cations such as calcium, cadmium and magnesium have also been suggested as of importance in reducing blood pressure levels.

(c) SATURATED FAT : The evidences suggest that saturated fat raises blood pressure as well as serum cholesterol *(15)*. For further details refer to chapter 11.

(d) DIETARY FIBRE : Several studies indicate that the risk of CHD and hypertension is inversely related to the consumption of dietary fibre. Most fibres reduce plasma total and LDL cholesterol *(1)*.

(e) ALCOHOL : High alcohol intake is associated with an increased risk of high blood pressure. It appears that alcohol consumption raises systolic pressure more than the diastolic. But the finding that blood pressure returns to normal with abstinence suggests that alcohol–induced elevations may not be fixed, and do not necessarily lead to sustained blood pressure elevation *(3)*.

(f) HEART RATE : When groups of normotensive and untreated hypertensive subjects, matched for age and sex, are compared, the heart rate of the hypertensive group is invariably higher. This may reflect a resetting of sympathetic activity at a higher level. The role of heart variability in blood pressure needs further research to elucidate whether the relation is casual or prognostic *(1)*.

(g) PHYSICAL ACTIVITY : Physical activity by reducing body weight may have an indirect effect on blood pressure.

(h) ENVIRONMENTAL STRESS : The term hypertension itself implies a disorder initiated by tension or stress. Since stress is nowhere defined, the hypothesis is untestable *(3)*. However, it is an accepted fact that psychosocial factors operate through mental processes, consciously or unconsciously, to produce hypertension. Virtually all studies on blood pressure and catecholamine levels in young people revealed significantly higher noradrenaline levels in hypertensives than in normotensives. This supports the contention that over-activity of the sympathetic nervous system has an important part to play in the pathogenesis of hypertension *(9)*.

(i) SOCIO-ECONOMIC STATUS : In countries that are in post-transitional stage of economic and epidemiological change, consistently higher levels of blood pressure have been noted in lower socio-economic groups. This inverse relation has been noted with levels of education, income and occupation. However, in societies that are transitional or pre-transitional, a higher prevalence of hypertension have been noted in upper socio-economic groups. This probably represents the initial stage of the epidemic of CVD *(1)*.

(j) OTHER FACTORS : The commonest present cause of secondary hypertension is oral contraception, because of the oestrogen component in combined preparations. Other factors such as noise, vibration, temperature and humidity require further investigation *(5)*.

PREVENTION OF HYPERTENSION

The low prevalence of hypertension in some communities indicates that hypertension is potentially preventable *(16)*.

The WHO has recommended the following approaches in the prevention of hypertension :

1. Primary prevention
   (a) Population strategy
   (b) High-risk strategy
2. Secondary prevention

1. PRIMARY PREVENTION

Although control of hypertension can be successfully achieved by medication (secondary prevention) the ultimate goal in general is primary prevention. Primary prevention has been defined as "all measures to reduce the incidence of disease in a population by reducing the risk of onset" *(17)*. The earlier the prevention starts the more likely it is to be effective.

In connection with primary prevention, terms such as "population strategy" and "high-risk strategy" have become established *(5, 18)*. The WHO has recommended these approaches in the prevention of hypertension. Both the approaches are complementary.

a. POPULATION STRATEGY

The population approach is directed at the whole population, irrespective of individual risk levels. The concept of population approach is based on the fact that even a small reduction in the average blood pressure of a population would produce a large reduction in the incidence of cardiovascular complications such as stroke and CHD *(16)*. The goal of the population approach is to shift the community distribution of blood pressure towards lower levels or "biological normality" *(9)*. This involves a multifactorial approach, based on the following non-pharmacotherapeutic interventions :

(a) NUTRITION : Dietary changes are of paramount importance. These comprise : (i) reduction of salt intake to an average of not more than 5 g per day (ii) moderate fat intake (iii) the avoidance of a high alcohol intake, and (iv) restriction of energy intake appropriate to body needs. (b) WEIGHT REDUCTION : The prevention and correction of over weight/obesity (Body Mass Index greater than 25) is a prudent way of reducing the risk of hypertension and indirectly CHD; it goes with dietary changes. (c) EXERCISE PROMOTION : The evidence that regular physical activity leads to a fall in body weight, blood lipids and blood pressure goes to suggest that regular physical activity should be encouraged as part of the strategy for risk-factor control. (d) BEHAVIOURAL CHANGES : Reduction of stress and smoking, modification of personal life-style, yoga and transcendental meditation could be profitable. (e) HEALTH EDUCATION : The general public require preventive advice on all risk factors and related health behaviour. The whole community must be mobilized and made aware of the possibility of primary prevention, and (f) SELF-CARE : An important element in community–based health programmes is patient participation. The patient is taught self-care, i.e., to take his own blood pressure and keep a log–book of his readings. By doing so, the burden on the official health services would be considerably reduced. Log–books can also be useful for statistical purposes and for the long-term follow-up of cases *(19)*.

Table 2 shows some of the lifestyle modifications to manage hypertension.

TABLE 2
Lifestyle modifications to manage hypertension

Modification	Recommendation Reduction, Range	Approximate systolic BP
Weight reduction	Maintain normal body weight (BMI, 18.5–24.9)	5–20 mm Hg/10 kg weight loss
Adopt DASH eating plan	Consume a diet rich in fruits, vegetables and low-fat dairy products with a reduced content of saturated fat and total fat	8–14 mm Hg
Dietary sodium reduction	Reduce dietary sodium intake to no more than 100 mEq/d (2.4 g sodium or 6 g sodium chloride)	2–8 mm Hg
Physical activity	Engage in regular aerobic physical activity such as brisk walking (at least 30 minutes per day, most days of the week)	4–9 mm Hg
Moderation of alcohol consumption	Limit consumption to no more than two drinks per day (1 oz or 30 ml ethanol eg, 24 oz beer, 10 oz wine, or 3 oz 80- proof whisky) in most men, and no more than one drink per day in women and lighter-weight persons	2–4 mm Hg

For overall cardiovascular risk reduction, stop smoking.
The effects of implementing these modifications are dose and time dependent and could be higher for some individuals.
BMI – body mass index calculated as weight in kilograms divided by the square of height in metres;
DASH – Dietary Approaches to Stop Hypertension.
Source : *(20)*

b. *HIGH-RISK STRATEGY*

This is also part of primary prevention. The aim of this approach is "to prevent the attainment of levels of blood pressure at which the institution of treatment would be considered" *(3)*. This approach is appropriate if the risk factors occur with very low prevalence in the community *(3)*.

Detection of high-risk subjects should be encouraged by the optimum use of clinical methods. Since hypertension tends to cluster in families, the family history of hypertension and "tracking" of blood pressure from childhood may be used to identify individuals at risk.

2. SECONDARY PREVENTION

The goal of secondary prevention is to detect and control high blood pressure in affected individuals. Modern anti-hypertensive drug therapy can effectively reduce high blood pressure and consequently, the excess risk of morbidity and mortality from coronary, cerebrovascular and kidney disease. The control measures comprise:

(i) EARLY CASE DETECTION : Early detection is a major problem. This is because high blood pressure rarely causes symptoms until organ damage has already occurred, and our aim should be to control it before this happens. The only effective method of diagnosis of hypertension is to screen the population. But screening, that is not linked to follow-up and sustained care, is a fruitless exercise. It is emphasized that screening should not be initiated if health resources for treatment and follow-up are not adequate.

In the developed countries, mass screening is not considered essential for the adequate control of blood pressure in the population. In Europe, the large majority of people have at least one contact in every 2 years with the health service. If blood pressure is measured at each such contact, the bulk of the problem of detecting those in need of intervention is solved.

(ii) TREATMENT : In essential hypertension, as in diabetes, we cannot treat the cause, because we do not know what it is. Instead, we try to scale down the high blood pressure to acceptable levels. The aim of treatment should be to obtain a blood pressure below 140/90 mm Hg, and ideally a blood pressure of 120/80 mm Hg. Control of hypertension has been shown to reduce the incidence of stroke and other complications. This is a major reason for identifying and treating asymptomatic hypertension. Care of hypertensives should also involve attention to other risk factors such as smoking and elevated blood cholesterol levels *(16)*.

(iii) PATIENT COMPLIANCE : The treatment of high blood pressure must normally be life-long and this presents problems of patient compliance, which is defined as "the extent to which patient behaviour (in terms of taking medicines, following diets or executing other lifestyle changes) coincides with clinical prescription". The compliance rates can be improved through education directed to patients, families and the community.

Intensive research carried out during the past decade, aiming at control of hypertension at the community level, has already provided valuable results. The studies have shown that control of hypertension in a population is feasible, that it can be carried out through the existing system of health services in different countries, and that the control of blood pressure leads to a reduction of complications of high blood pressure – namely stroke, heart failure and renal failure. In some of the projects the incidence of myocardial infarction was also reduced. As a result of these findings some countries have launched nationwide control programmes in the field of hypertension *(21)*.

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STROKE

The term "stroke" (syn : apoplexy) is applied to acute severe manifestations of cerebrovascular disease. It causes both physical and mental crippling. WHO defined stroke as "rapidly developed clinical signs of focal disturbance of cerebral function; lasting more than 24 hours or leading to death, with no apparent cause other than vascular origin" *(1)*. The 24 hours threshold in the definition excludes transcient ischaemic attacks (TIA) which is defined to last less than 24 hours, and patients with stroke symptoms caused by subdural haemorrhage, tumours, poisoning or trauma are excluded.

The disturbance of cerebral function is caused by three morphological abnormalities, i.e., stenosis, occlusion or rupture of the arteries. Dysfunction of the brain ("neurological deficit") manifests itself by various neurological signs and symptoms that are related to extent and site of the area involved and to the underlying causes. These include coma, hemiplegia, paraplegia, monoplegia, multiple paralysis, speech disturbances, nerve paresis, sensory impairment, etc. Of these hemiplegia constitutes the main somatoneurological disorder in about 90 per cent of patients *(2)*.

Stroke includes a number of syndromes with differing aetiologies, epidemiology, prognosis and treatment. These are listed below :

A. Ischaemic stroke
   a. Lacunar infarct
   b. Carotid circulation obstruction
   c. Vertebro-basilar obstruction
B. Haemorrhagic stroke
   a. Spontaneous intracerebral haemorrhage
   b. Subarachnoid haemorrhage
   c. Intracranial aneurysm
   d. Arteriovenous malformations.

Problem

Stroke is a worldwide health problem. It makes an important contribution to morbidity, mortality and disability in developed as well as developing countries. Although there are substantial differences in frequency from place to place, cerebral thrombosis is usually the most frequent form of stroke encountered in clinical studies, followed by haemorrhage. Subarachnoid haemorrhage and cerebral embolism come next as regards both mortality and morbidity *(2)*. However, stroke from cerebral haemorrhage is more common in Japan than elsewhere *(1)*.

MORBIDITY AND MORTALITY

Cerebrovascular disease remain a leading cause of death from NCDs. In 2021 it was estimated that cerebrovascular disease accounted for 6.97 million deaths worldwide, equivalent to 10.2 per cent of all deaths. Majority of these deaths occurred in people living in developing countries and 10.20 per cent of the subjects were aged less than 70 years *(3)*. Additionally, cerebrovascular disease is the leading cause of disability in adults and each year millions of stroke survivors have to adopt life with restriction in activities of daily living as a consequence of stroke. Many surviving stroke patients will often depend on other people's continuous support to live *(4)*.

In demographically developed countries, the average age at which stroke occurs is around 73 years reflecting the older age structure of these countries. The probability of a first stroke or first TIA is around 1.6 per 1000 and 0.42 per 1000 respectively. In less developed regions, the average age of stroke is less due to the different population age structure, resulting from higher mortality rates.

Stroke patients are at highest risk of death in the first weeks after the event, and between 20–50 per cent die within first month depending on type, severity, age, co-morbidity and effectiveness of treatment of complications. Patients who survive may be left with no disability or with mild, moderate or severe disability. Considerable spontaneous recovery occurs upto about 6 months. However, patients with history of stroke are at high risk of a subsequent event of around 10 per cent in the first year and 5 per cent year thereafter *(4)*.

The proportion of patients achieving independence in self-care by one year after a stroke range from around 60 to 83 per cent. This depends on whether the studies are community-based or hospital-based, which activity is considered in estimating independence, and the methods used to rate ability *(4)*.

There is evidence that mortality from stroke has been declining in many countries for several years. Some of the decline occurred before modern treatment methods became available, indicating that the decline in stroke was associated with social and economic changes.

INDIA

Although the prevalence of stroke appears to be comparatively less in India than in developed countries, it is likely to increase proportionally with the increase in life expectancy. The proportion of stroke in the young population is significantly more in India than in developed countries; some of the more important causes for this are likely to be rheumatic heart disease, ischaemic strokes in peripartum period and arteriopathies as a sequale of CNS infections like bacterial and tubercular meningitis etc. *(5)*.

In India 0.756 million people died of stroke in 2021 of which 0.360 million were men and 0.396 million were women. The crude death rate of stroke was about 53.5 per 100,000 population *(3)*. The studies estimate incidence of stroke in population varies from 116 to 163 per 100,000 population. It is third leading cause of death and tenth cause of DALYs.

RISK FACTORS

Epidemiological studies have indicated that stroke does not occur at random, and there are factors (risk factors) which precede stroke by several years. These are : *(a) Hypertension:* This is considered the main risk factor for cerebral thrombosis as well as cerebral haemorrhage; *(b) Other factors:* Additional factors contributing to risk are cardiac abnormalities (i.e., left ventricular hypertrophy, cardiac dilatation), diabetes, elevated blood lipids, obesity and waist to hip ratio, smoking, alcohol consumption, glucose intolerance, blood clotting and viscosity, oral contraceptives and genetics etc. The importance of these factors is not clearly defined. Although the risk factors for stroke are similar to those for CHD, their relative importance differs *(6)*.

TRANSCIENT ISCHAEMIC ATTACKS (TIA)

One phenomenon that has received increasing attention is the occurrence of TIA in a fair proportion of cases. These are episodes of focal, reversible, neurological deficit of sudden onset and of less than 24 hours duration. They show a tendency to recurrence. They are due to microemboli, and are a warning sign of stroke.

HOST FACTORS

(i) Age : Stroke can occur at any age. Usually incidence rates rise steeply with age. Globally about 47 per cent of all stroke deaths occur in persons over 70 years. In India, about one-fifth of all strokes occur below the age of 40 (called "strokes in the young"). This is attributed to our "young population", and shorter life expectancy.

(ii) Sex : The incidence rates are higher in males than females at all ages.

(iii) Personal history : The WHO Study showed that nearly three-quarters of all registered stroke patients had associated diseases, mostly in the cardiovascular system or of diabetes. This supports the view that in most cases stroke is merely an incident in the slowly progressive course of a generalized vascular disease.

Presenting features

The presenting features of the disease is as follows *(7)* :

A. Presenting features of stroke
- Sudden numbness or weakness in the face, arm, or leg, especially on one side of the body
- Sudden confusion, trouble speaking, or difficulty understanding speech
- Sudden trouble seeing in one or both eyes
- Sudden trouble walking, dizziness, loss of balance, or lack of coordination
- Impairment or loss of consciousness

B. Presenting features of TIA
- Transient weakness, numbness or paralysis of face, arm or leg, typically on one side of the body
- Transient slurred or garbled speech or difficulty understanding others
- Transient blindness in one or both eyes and double vision
- Curtain like appearance in front of eye (Amaurosis fugax)
- Transient dizziness or loss of balance or coordination

Stroke control strategy

The aim of a stroke control programme is to apply at community level effective measures for the prevention of stroke. The first priority goes to control of arterial hypertension which is a major cause of stroke. As transcient ischaemic attacks (TIA) may be one of the earliest manifestations of stroke, their early detection and treatment is important for the prevention of stroke *(2)*. Control of diabetes, elimination of smoking and consumption of alcohol, healthy dietary habits, regular exercise schedule, yoga and avoidance of weight gain, and prevention and management of other risk factors at the population level are new approaches. Treatment for acute stroke is largely the control of complications. Facilities for the long-term follow-up of patients are essential. The education and training of health personnel and of the public form an integral part of the programme. For any such programme, reliable knowledge of the extent of the problem in the community concerned is essential *(2)*.

Management of stroke

It should be recognized that 'stroke' is primarily a clinical diagnosis, and that the diagnosis should be made with special care

i. In the young
ii. If the sensorium is altered in the presence of mild to moderate hemiparesis,
iii. If the history is uncertain, or
iv. If there are other unusual clinical features such as gradual progression over days, unexplained fever or papilledema.

The aim of emergent evaluation is to :

a. Distinguish stroke (a vascular event) from other causes of rapid-onset neurological dysfunction (stroke mimics);
b. Determine its pathology (haemorrhage vs. ischemia);
c. Obtain clues about the most likely aetiology;
d. Predict the likelihood of immediate complications, and
e. Plan appropriate treatment.

Admission to hospital

Most patients with acute stroke should be admitted to a hospital to:

i. Perform urgent CT scan of brain
ii. Detect worsening and perform urgent intervention and management
iii. Evaluate, monitor and control risk factors for haemorrhage and ischemia
iv. Prevent and treat non-neurological complications like aspiration pneumonia
v. Plan rehabilitation
vi. Educate the caregiver

Generally, patients with acute stroke (onset within last 72 hours or altered consciousness due to stroke) should be admitted to hospital for initial care and assessment. The algorithm for stroke patients at primary health centre is shown in Fig. 1.

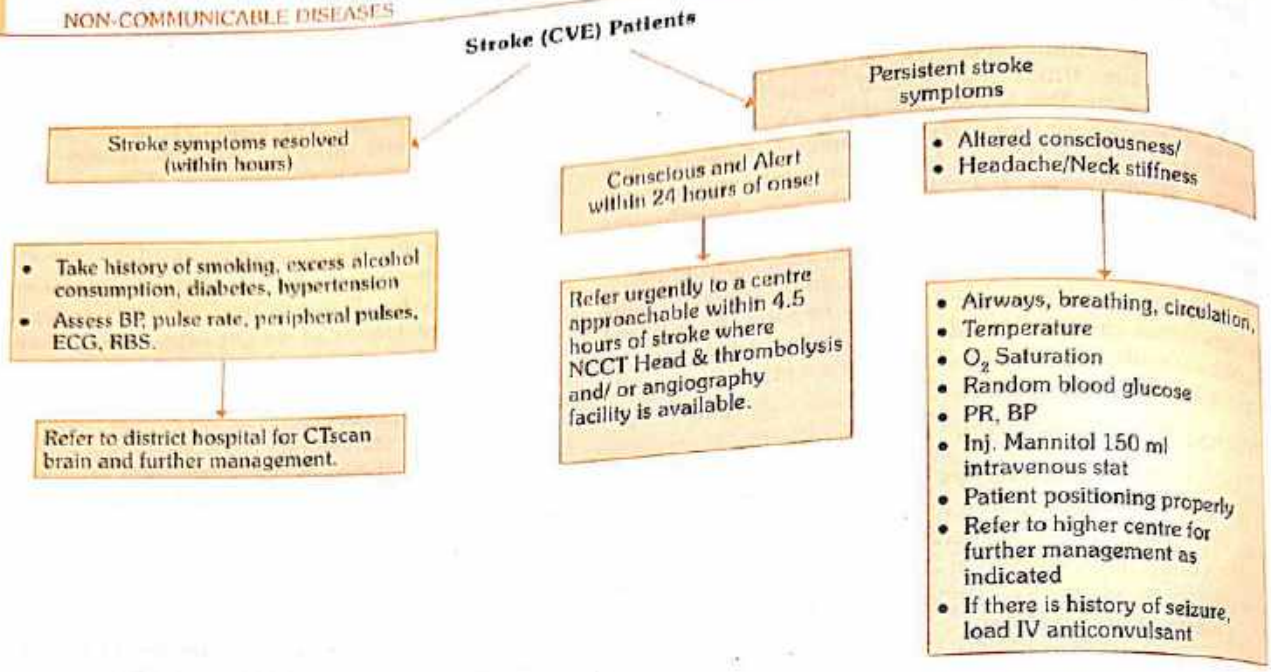

FIG. 1
Algorithm for stroke patients at primary health centre

Source : *(7)*

In summary, control of stroke that was once considered an inevitable accompaniment to ageing is now being approached through primary prevention. It has generated the hope that stroke can be tackled by community health action.

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RHEUMATIC HEART DISEASE

Rheumatic fever (RF) and rheumatic heart disease (RHD) cannot be separated from an epidemiological point of view *(1)*. Rheumatic fever is a febrile disease affecting connective tissues particularly in the heart and joints initiated by infection of the throat by group A β *haemolytic streptococci*. Although RF is not a communicable disease, it results from a communicable disease (streptococcal pharyngitis). Rheumatic fever often leads to RHD which is a crippling disease. The consequences of RHD include : continuing damage to the heart; increasing disabilities; repeated hospitalization, and premature death usually by the age of 35 years or even earlier. RHD is one of the most readily preventable chronic disease.

Problem

WORLD

According to IHME Global Burden of Disease, RHD affected an estimated 55 million people globally in 2021; this represents a 1.7 fold increase in prevalence since 1990. The increase in the absolute numbers of prevalent cases is most likely attributable to population growth and an increase in incidence likely due to increased awareness, increased availability of echocardiography, improved survival in some settings, and to the chronic nature of RHD. The incidence in 2021 globally, was 2.8 million new cases *(2)*.

The prevalence of RHD globally is estimated to peak between the ages of 20 and 29 years, and declines steadily until around 50 years when it then remains relatively stable which may reflect decreasing survival at older ages. While the sex distribution is equal under the age of 15 years, in older age groups prevalence is higher in women across nearly all world regions, the reasons for which are unclear.

In contrast to the increases in prevalence and incidence over the last three decades, mortality from RHD continues to decrease globally in the twenty-first century. According to WHO Global Health Estimates 2021, age-standardized mortality rate decreased by 28%, between 2000 and 2021. In 2021 the age-standardized death rate was 4.5 per 100 000 population equivalent to 360,000 deaths.

The burden of RHD has not been equally distributed across countries and regions. In the twentieth century the incidence of RF and the prevalence of RHD declined substantially in Europe, North America, and in other geographical locations where socioeconomic status rose. Declines in RF incidence and RHD mortality over the past century have been attributed to improved sanitation, housing, living conditions, and access to medical care including antibiotics, as well as potentially to changes in the epidemiology of GAS infections.

The gains in mortality from RHD have also been

unequally distributed globally, however, and many regions including sub-Saharan Africa, the Middle East, Central and South Asia and the South Pacific continue to have endemic RF and RHD. Populations that are affected by RF and RHD have socioeconomic inequalities that make it difficult to prevent RF and to identify and treat RHD. The latter often requires surgery and lifelong treatment, and places significant demands on health systems.

The economic costs of RF and RHD are significant, particularly in countries with a persistently high prevalence of RHD. The most devastating economic effects are on children and adults in their most productive years. The global cost of deaths due to RHD in 2010 was estimated to be US$ 2200 billion *(2)*.

The risk of RF and RHD varies across geographical settings and populations. The categories of risk for RF/RHD based on the 2015 statement of the Revised Jones criteria are as follows *(2)* :

Low risk of RF/RHD :

- Individuals are at low risk for RF/RHD if they come from a setting or population known to experience low rates of RF or RHD.
- Where reliable epidemiological data are available, populations with low risk are considered as having a RF incidence <2 per 100 000 children (5 to 14 years of age) per year, or an all-age prevalence of RHD of ≤100 per 100 000 population per year.

Moderate/high risk of RF/RHD :

- Individuals not clearly from a low-risk setting or population should be considered at moderate/high risk.

Where the risk is moderate to high, RF/RHD can be considered endemic.

INDIA

In India, RHD is prevalent in the range of 5–7 per thousand in 5–15 years age group and there are about 1 million RHD cases in India. RHD constitutes 20–30% of hospital admissions due to CVD in India *(3)*. Streptococcal infections are very common especially in children living in under-privileged conditions, and RF is reported to occur in 1–3 per cent of those infections *(4)*.

During the year 2021, 0.167 million died of rheumatic heart disease, of these 65,500 were men and 102,300 were women. The crude death rate was 11.9 per 100,000 population *(5)*.

Jai Vigyan Mission Mode project on Community Control of RF/RHD in India is being carried out with four main components, viz. to study the epidemiology of streptococcal sore throats, establish registries for RF and RHD, vaccine development for streptococcal infection and conducting advanced studies on pathological aspects of RF and RHD *(4)*.

Epidemiological factors

1. AGENT FACTORS

(a) AGENT : The onset of RF is usually preceded by a streptococcal sore throat. Of the streptococci, it is the group A streptococcus that has been incriminated as the causative agent. It has been suggested that not all strains of group A streptococci lead to RF; it is believed that there might be some strains with "rheumatogenic potential". The serotype that has attracted special emphasis is M type 5 which is frequently associated with RF *(6)*. All group A streptococci are sensitive to penicillin. Unfortunately, the group consists of a great number of immunologically different types with little cross immunity, defying all attempts to produce an effective vaccine. Recently the virus (coxsackie B4) has been suggested as a causative factor and streptococcus acting as a conditioning agent. There are many gaps in our knowledge about the causative agent and underlying pathogenic mechanisms. (b) CARRIERS : Carriers of group A streptococcus are frequent, e.g., convalescent, transcient and chronic carriers. In view of the high carrier rate, their eradication is not even theoretically possible *(7)*.

2. HOST AND ENVIRONMENTAL FACTORS

(a) AGE : RF is typically a disease of childhood and adolescence (5–15 years) although it also occured in adults (20 per cent cases). Mention has already been made about the high incidence of "juvenile mitral stenosis" in India *(7, 8)*. The initial attack of RF occurs at a young age, progresses to valvular lesions faster and is associated with pulmonary arterial hypertension. The cause of the "juvenile" disease in India is not known. (b) SEX : The disease affects both sexes equally but prognosis is worse for females than for males. (c) IMMUNITY : An immunological basis for RF and RHD has been proposed. The most prevalent concept is the toxic–immunological hypothesis. According to this theory, group A streptococcal products have certain toxic products, and components of the streptococcus and of host tissues have an antigenic cross-relationship, leading to immunological processes that result in an attack of RF *(9)*. (d) SOCIO-ECONOMIC STATUS : RF is a social disease linked to poverty, overcrowding, poor housing conditions, inadequate health services, inadequate expertise of health-care providers and a low level of awareness of the disease in the community. It declines sharply when the standard of living is improved, but even in the most affluent countries, there are areas where the disease still exists. (e) HIGH-RISK GROUPS : The school-age children between 5 and 15 years; slum dwellers; and those living in a closed community (e.g., barracks).

Table 1 summarizes the effects of environmental factors on RF and RHD.

Clinical features

(a) FEVER : Fever is present at the onset of acute illness and may be accompanied by profuse sweating. It may last for about 12 weeks or longer and has a tendency to recur. (b) POLYARTHRITIS: This occurs in 90 per cent of cases. Large joints like ankles, knees, elbows and wrists are involved; uncommonly smaller joints of hands and feet may be involved. The pain and swelling come on quickly and also subside spontaneously within 5–7 days. There is no residual damage to the joint. (c) CARDITIS : Occurs in 60–70 per cent of cases. It starts early in the course of RF. Moreover RHD may not be preceded by a clinically apparent attack of RF. All layers of the heart– pericardium, myocardium and the heart valves – are involved. The involvement of heart is manifested by tachycardia, cardiac murmurs, cardiac enlargement, pericarditis and heart failure. The most common ECG finding is the first degree AV block. (d) NODULES : Nodules below the skin tend to

TABLE 1

Direct and indirect results of environmental and health-system determinants on rheumatic fever and rheumatic heart disease

Determinants	Effects	Impact on RF and RHD burden
Socio-economic and environmental factors : (poverty, undernutrition, overcrowding, poor housing).	Rapid spread of group A streptococcal strains.	Higher incidence of acute streptococcal-pharyngitis and suppurative complications. Higher incidence of acute RF. Higher rates of recurrent attacks.
Health-system related factors : – shortage of resources for health care;	Difficulties in accessing health care.	
– inadequate expertise of health-care providers;	Inadequate diagnosis and treatment of streptococcal pharyngitis.	Higher incidence of acute RF and its recurrence.
– Low-level awareness of the disease in the community.	Misdiagnosis or late diagnosis of acute RF.	Patients unaware of the first RF episode. More severe evolution of disease.
	Inadequate secondary prophylaxis and/or non-compliance with secondary prophylaxis.	Untimely initiation or lack of secondary prophylaxis. Higher rates of recurrent attacks with more frequent and severe heart valve involvement, and higher rates of repeated hospital admissions and expensive surgical interventions.

Source : *(10)*

appear 4 weeks after the onset of RF. They are small, painless and non-tender. They last for a variable period of time and then disappear leaving no residual damage. (e) BRAIN INVOLVEMENT: This manifests as abnormal jerky purposeless movements of the arms, legs and the body. It gradually disappears leaving no residual damage. (f) SKIN : Various types of skin rash are known to occur. It is thus obvious that except carditis all other manifestations of RF do not cause permanent damage.

Diagnosis

The 2015 WHO criteria for the diagnosis of RF and RHD are based on revised Jones criteria (Table 2).

TABLE 2

Diagnostic criteria for rheumatic fever modified 2015 Jones criteria

Major criteria	
Low risk population	High risk population
Carditis (clinical or subclinical)	Carditis (clinical or subclinical)
Arthritis - only polyarthritis	Arthritis - monoarthritis or polyarthritis
Chorea	Polyarthralgia
Erythema marginatum	Chorea
Subcutaneous nodules	Erythema marginatum Subcutaneous nodules
Minor criteria	
Low risk population	High risk population
Polyarthralgia	Monoarthralgia
Hyperpyrexia (≥ 38.5°C)	Hyperpyrexia (≥ 38.5°C)
ESR ≥ 60 mm/h and/or CRP ≥ 3.0 mg/dl	ESR ≥ 30 mm/h and/or CRP ≥ 3.0 mg/dl
Prolonged PR interval (after taking into account the differences related to age; if there is no carditis as a major criterion)	Prolonged PR interval (after taking into account the differences related to age; if there is no carditis as a major criterion)

ESR - erythrocyte sedimentation rate; CRP - C-reactive protein

Source : *(2)*

In the revised 2015 Jones criteria, a low, medium and high-risk population was identified. A low risk population is one in which cases of acute RF occur in ≤ 2/100 000 school-age children or rheumatic heart disease is diagnosed in ≤ 1/1000 patients at any age during one year.

The modifications introduced in 2015 in the Jones criteria are as follows :

1. In the major criteria:
   - *Low risk population* : clinical and/or subclinical carditis. AHA recommends that all the patients with suspected RF undergo Doppler echocardiographic examination, even if no clinical signs of carditis are present. In doubtful cases it is recommended that echocardiography is repeated.
   - *Medium and high risk population* : also clinical and/or subclinical carditis and arthritis - monoarthritis or polyarthritis, possibly also with polyarthralgia.
2. In the minor criteria:
   - *Low risk population* : the parameters of inflammation and the level of fever were defined precisely.
   - *Medium and high risk population* : monoarthralgia, also with defined parameters of inflammation and the level of fever.

The diagnosis of RF in the whole population with evidence of antecedent group A β-hemolytic streptococcal infection requires a confirmation of two major criteria or one major and two minor criteria – the first episode of the disease.

Diagnosis of subsequent episodes of the disease requires a confirmation of two major criteria or one major and two minor criteria or three minor criteria.

Echocardiographic examination is currently the main diagnostic tool used for confirmation, diagnosis and monitoring of valvular lesions in the course of RF, especially in cases of subclinical carditis.

Subclinical carditis is one in which physical examination does not confirm any lesions in auscultation over the heart. Only echocardiography (Doppler) reveals mitral or aortic valve pathology.

The echocardiographic criteria developed by AHA in 2012 are as follows *(11)* :

I. Echocardiographic (Doppler) criteria :

- Pathological mitral regurgitation–4 criteria (all must be met) :
  1. Visible at least in 2 projections.
  2. Regurgitation jet length ≥ 2 cm at least in 1 projection.
  3. Regurgitation peak velocity > 3 m/s.
  4. Regurgitation pansystolic.
- Pathological aortic regurgitation–4 criteria (all must be met) :
  1. Visible at least in 2 projections.
  2. Regurgitation jet length ≥ 1 cm at least in 1 projection.
  3. Regurgitation peak velocity > 3 m/s.
  4. Regurgitation pandiastolic.

Prevention

Two preventive approaches are possible :

a. PRIMARY PREVENTION

The aim of primary prevention is to prevent the first attack of RF, by identifying all patients with streptococcal throat infection and treating them with penicillin. While this approach is theoretically simple, in practice, it is difficult to achieve and may not be feasible in many developing countries *(12)*. In order to prevent a single case of RHD, several thousand cases of streptococcal throat infection must be identified and treated. Many infections are inapparent or if apparent are not brought to the attention of the health services; even if they are reported, quick and reliable laboratory services are needed to confirm the diagnosis.

A viable approach is to concentrate on "high-risk" groups such as school-age children. They should be kept under surveillance for streptococcal pharyngitis. Ideally a sore throat should be swabbed and cultured. If streptococci are present, the child should be put on penicillin. Since facilities for throat swab culture are not easily available, it is justified to treat a sore throat with penicillin even without having the culture. For this purpose, a single intramuscular injection of 1.2 million units of benzathine benzyl penicillin for adults and 600,000 units for children is adequate, or oral penicillin (Penicillin V or Penicillin G) should be given for 10 days. This is the least expensive method of giving penicillin for eradication of streptococci from the throat. For patients with allergy to penicillin, first generation cephalosporins i.e., cefodroxil or cefalexin is used. The other drugs used – erythromycin, clarithromycin and azithromycin *(11)*. The MCH and school health services should be utilized for this purpose.

In short, the impossible logistics of primary prevention coupled with enormous financial constraints force us to concentrate on secondary prevention *(8)*.

b. SECONDARY PREVENTION

Secondary prevention (i.e., the prevention of recurrences of RF) is a more practicable approach, especially in developing countries. It consists in identifying those who have had RF and giving them one intramuscular injection of benzathine benzyl penicillin (1.2 million units in adults and 600,000 units in children) at intervals of 3 weeks *(10)*. This must be continued for at least 5 years or until the child reaches 21 years whichever is later. For patients with carditis (mild mitral regurgitation or healed carditis) the treatment should continue for 10 years after the last attack, or at least until 40 years of age, which ever is longer. More severe valvular disease or post-valve surgery cases need life-long treatment *(11)*. This prevents streptococcal sore throat and therefore recurrence of RF and RHD.

However, the crucial problem is one of patient compliance as penicillin prophylaxis is a long-term affair. Studies have shown that secondary prevention is feasible, inexpensive and cost-effective, when implemented through primary health care systems *(11)*.

c. NON-MEDICAL MEASURES

Non-medical measures for the prevention/control of RF are related to improving living conditions, and breaking the poverty–disease–poverty cycle. Improvements in socio-economic conditions (particularly better housing) will in the long term reduce the incidence of RF.

Objective evaluation of available data indicates that penicillin alone will not lead to effective control. Predictions suggest that many of the countries which suffer severe economic constraints will not be likely to be able to raise their standards of living in the foreseeable future to significantly alter the incidence of this disease *(7)*.

d. EVALUATION

In the evaluation of the programme, the prevalence of RHD in school children from periodic surveys of random samples is probably the best indicator. It is suggested that surveys should be carried out on samples of schools (not individuals) in the 6–14 years age group at 5–year intervals. The recommended sample size is 20,000 to 30,000 children depending upon the expected prevalence *(12)*.

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CANCER

Cancer may be regarded as a group of diseases characterized by an (i) abnormal growth of cells (ii) ability to invade adjacent tissues and even distant organs, and (iii) the eventual death of the affected patient if the tumour has progressed beyond that stage when it can be successfully removed. Cancer can occur at any site or tissue of the body and may involve any type of cells.

The major categories of cancer are : *(a) Carcinomas*, which arise from epithelial cells lining the internal surfaces of the various organs (e.g. mouth, oesophagus, intestines, uterus) and from the skin epithelium; *(b) Sarcomas*, which arise from mesodermal cells constituting the various connective tissues (e.g. fibrous tissue, fat and bone); and *(c) Lymphomas, myeloma* and *leukaemias* arising from the cells of bone marrow and immune systems.

The term "primary tumour" is used to denote cancer in the organ of origin, while "secondary tumour" denotes cancer that has spread to regional lymph nodes and distant organs. When cancer cells multiply and reach a critical size, the cancer is clinically evident as a lump or ulcer localized to the organ of origin in early stages. As the disease advances, symptoms and signs of invasion and distant metastases become clinically evident *(1)*.

Problem statement

WORLD

In the year 2022, the global burden of cancer rose to an estimated 19.976 million new cases with 9.743 million deaths. The most common cancer diagnosed were cancer lung followed by cancer breast, colorectum, prostate and stomach. The most common cause of death due to cancer was colorectum cancer, liver cancer, breast cancer and cancer stomach. The summary statistics for the year 2022 is as follows *(2)* :

	Males	Females	Both sexes
Population	3,972,735,747	3,912,335,034	7,885,070,781
Incidence			
Number of new cancer cases	10,311,610	9,664,889	19,976,499
Age-standardized incidence rate (World)	212.6	186.3	196.9
Risk of developing cancer before the age of 75 years (cum. risk %)	21.8	18.5	20.0
Top 3 leading cancers (ranked by cases)	Lung Prostate Colorectum	Breast Lung Colorectum	Lung Breast Colorectum
Mortality			
Number of cancer deaths	5,430,284	4,313,548	9,743,832
Age-standardized mortality rate (World)	109.8	76.9	91.7
Risk of dying from cancer before the age of 75 years (cum. risk %)	11.4	8.0	9.6
Top 3 leading cancers (ranked by deaths)	Lung Liver Colorectum	Breast Liver Colorectum	Lung Colorectum Liver
5-year prevalent cases	25,747,272	27,756,915	53,504,187

Source : *(2)*

The age standardized incidence rate of top 10 cancers by sex, and age standardized incidence and mortality rate of top 10 cancers worldwide are as shown in Fig. 1 and 2.

As a consequence of growing and ageing populations, as well as changes in the prevalence and distribution of main risk factors for cancer, several of which are associated with socio-economic development, developing countries are disproportionately affected by the increasing numbers of cancers.

For both sexes combined, one-half of all cases and 56.1 per cent of cancer deaths are estimated to occur in Asia in 2022, where 59.5 per cent of the global population resides. Europe accounts for 22.4 per cent of the total cancer cases and 20.4 per cent of the cancer deaths, although it represents 9.7 per cent of the global population, followed by the Americas' 13.4 per cent of incidence and 7.2 per cent of mortality worldwide. In contrast to other regions, the share of cancer deaths in Asia (56.1 per cent) and Africa (7.8 per cent) are higher than the share of incidence (49.3 per cent and 5.9 per cent, respectively) because of the different distribution of cancer types and higher case fatality rates in these regions *(2)*.

The "Westernization" trends : As low human-development index (HDI) countries become more developed through rapid societal and economic changes, they are likely to become "westernized". As such, the pattern of cancer incidence is likely to follow that seen in high HDI settings, with likely decline in cancer incidence rate of cervix uteri and stomach, and increasing incidence rates of breast, prostate and colorectal cancers. This westernization effect is a result of reduction in infection-related cancers and increase in cancers associated with reproductive, dietary and hormonal risk factors *(3)*.

For any disease, the relationship of incidence to mortality is an indication of prognosis. Similar incidence and mortality rates being indicative of an essentially fatal condition. Thus, lung cancer accounts for most deaths from cancer in the world (1.81 million) annually, since it is most invariably associated with poor prognosis. On the other hand, appropriate intervention is often effective in avoiding fatal outcome following diagnosis of breast cancer. Hence this particular cancer, which rank second in terms of incidence, is not among the top three causes of death from cancer,

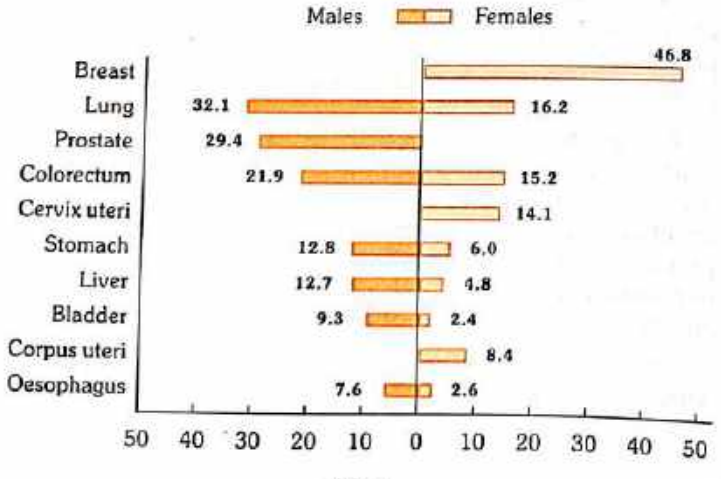

FIG. 1
Age standardized incidence rates by sex, top 10 cancers (World)

Source : *(2)*

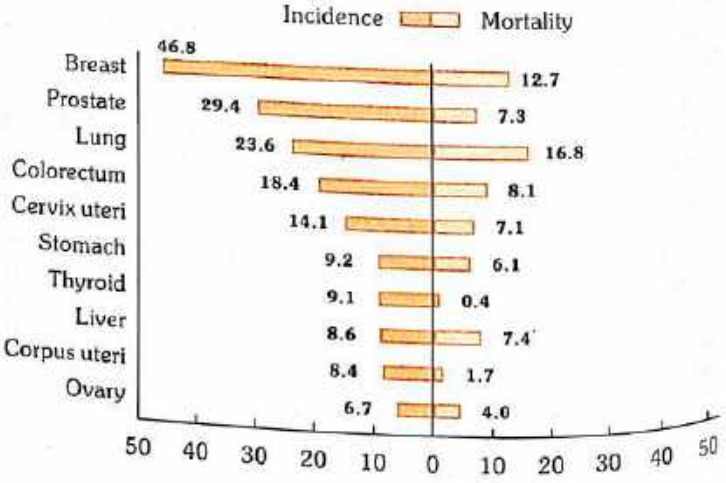

FIG. 2
Age standardized incidence and mortality rates, top 10 cancers (World)

Source : *(2)*

which are respectively cancers of the lung, colorectum and liver.

The most conspicuous feature of the distribution of cancers between the sexes is the male predominance of lung cancer. Prostate, colorectum, stomach and liver cancer are also much more common in males. Cancer of breast, lung, colorectum and cervix uteri are common in females *(2)*. For the most part, differences in distribution between the sexes are attributable to differences in exposure to causative agents rather than to variation in the susceptibility. For other tumour types, including cancers of pancreas and colorectum, there is little difference in the sex distribution. Generally speaking, the relationship of incidence to mortality is not affected by sex. Thus for example, the prognosis following diagnosis of liver or pancreatic cancer is dismal for both males and females. Many other tumour types are more responsive to therapy, so that cancers of breast, prostate and uterine cervix are the cause of death in only a minority of patients diagnosed *(4)*.

The burden of cancer is distributed unequally between developed and developing countries, with particular cancer types exhibiting different patterns of distribution.

INDIA

In India, the National Cancer Registry Programme of the ICMR provides data on incidence, mortality and distribution of cancer from 28 population-based registries and 5 hospital based registries.

In India, in the year 2022, the number of prevalent cases (5 years) is about 3,258,518, the number of new cases 1,413,318 and the number of deaths 916,827. The summary statistical situation for the year 2022 in the country is as follows :

Statistics at a glance, 2022

	Males	Females	Both sexes
Population	730,746,615	675,885,166	1,406,631,781
Number of new cancer cases	691,178	722,138	1,413,316
Age-standardized incidence rate	97.1	100.8	98.5
Risk of developing cancer before the age of 75 years (cum. risk %)	10.6	10.7	10.6
Top 3 leading cancers (ranked by cases)	Lip, oral cavity Lung Oesophagus	Breast Cervix uteri Ovary	Breast Lip, oral cavity Cervix uteri
Number of cancer deaths	470,055	446,772	916,827
Age-standardized mortality rate	66.5	62.6	64.4
Risk of dying from cancer before the age of 75 years (cum. risk %)	7.5	7.0	7.2
Top 3 leading cancers (ranked by cases)	Lip, oral cavity Lung Oesophagus	Breast Cervix uteri Ovary	Breast Lip, oral cavity Cervix uteri
5-year prevalent cases	1,470,047	1,788,471	3,258,518

Source : *(5)*

The age standardized incidence rate of top 10 cancers by sex, and age standardized mortality rate and incidence rate per lakh population in India is as shown in Fig. 3 and 4 *(5)*.

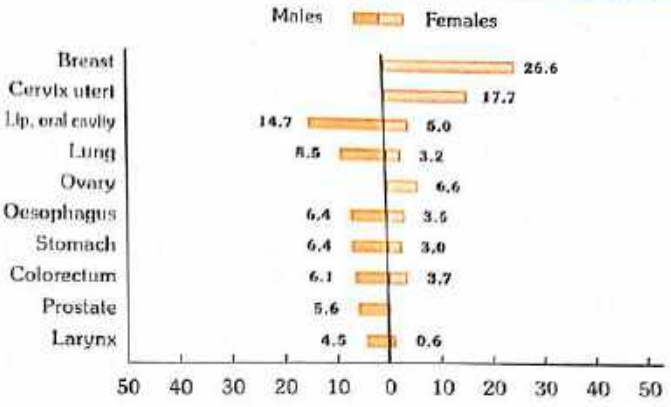

FIG. 3
Age standardized incidence rates by sex, top 10 cancers in India (2022)

Source : *(5)*

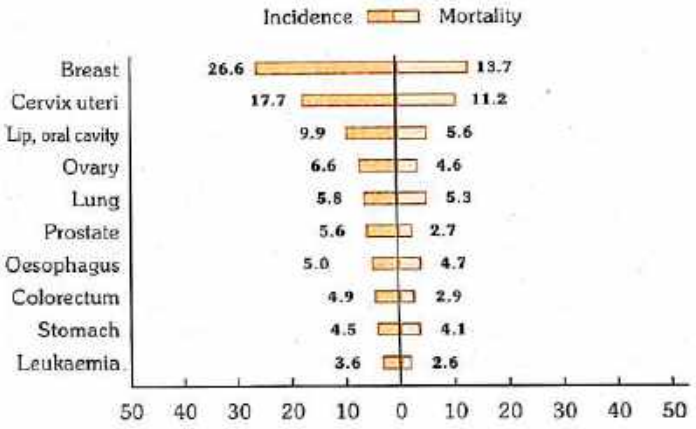

FIG. 4
Age standardized incidence and mortality rates, top 10 cancers in India (2022)

Source : *(5)*

The five most frequent cancers in men were cancer lip and oral cavity, lung, oesophagus, colorectum and stomach, and in women, cancer breast, cervix uteri, ovary, lip and oral cavity and colorectum. Cancer in males were mostly tobacco related. In women, cervical cancer is closely associated with poor genital hygiene, early consummation of marriage, multiple pregnancies, and contact with multiple sexual partners. It is also reported that breast cancer is proportionately on the increase in a few metropolitan areas of India. This appears to be related to late marriage, birth of the first child at a late age, fewer children, and shorter periods of breast-feeding, which are increasingly common practice among the educated urban women *(7)*.

Facilities for screening and proper management of cancer patients are grossly limited in India. More than two-thirds of cancer patients are already in an advanced and incurable stage at the time of diagnosis. Appropriate strategies are being developed, including creating public awareness about cancer, tobacco control and application of self or assisted screening technique for oral, cervical, and breast cancers.

Time trends

Few decades ago, cancer was the sixth leading cause of death in industrialized countries; today, it is the second leading cause of death. There are a number of reasons for this

increase, the three main ones being a longer life expectancy, more accurate diagnosis and the rise in cigarette smoking, especially among males. The overall rates do not reflect the different trends according to the type of cancer. For example, there has been a large increase in lung cancer incidence and the stomach cancer has shown a declining trend in most developed countries for reasons not understood.

Cancer patterns

There are wide variations in the distribution of cancer throughout the world. That cancer of the stomach is very common in Japan, and has a low incidence in United States. The cervical cancer is high in Columbia and has a low incidence in Japan. In the South-East Asia Region of WHO, the great majority are cancers of the oral cavity and uterine cervix. These and other international variations in the pattern of cancer are attributed to multiple factors such as environmental factors, food habits, lifestyle, genetic factors or even inadequacy in detection and reporting of cases.

Hospital data clearly indicates that the two organ sites most commonly involved are: (i) the uterine cervix in women, and (ii) the oropharynx in both sexes. These two sites represent approximately 50 per cent of all cancer cases. Both these cancers are predominantly environment related and have a strong socio-cultural relationship. It is also important to note that these two kinds of cancer are easily accessible for physical examination and amenable to early diagnosis by knowledge already available i.e., good clinical examination and exfoliative cytology. The cure rate for these neoplasma is also very high if they are treated surgically at stages I and II. But unfortunately, in most cases, the patients present themselves to a medical facility when the disease is far advanced and is not amenable to treatment. This is the crux of the problem.

Causes of cancer

As with other chronic diseases, cancer has a multifactorial aetiology.

1. ENVIRONMENTAL FACTORS

Environmental factors are generally held responsible for 80 to 90 per cent of all human cancers. The major environmental factors identified so far include : *(a) TOBACCO :* Tobacco in various forms of its usage (e.g., smoking, chewing) is the major environmental cause of cancers of the lung, larynx, mouth, pharynx, oesophagus, bladder, pancreas and probably kidney. It has been estimated that, in the world as a whole, cigarette smoking is now responsible for more than one million premature deaths each year *(8). (b) ALCOHOL :* Excessive intake of alcoholic beverages is associated with oesophageal and liver cancer. Some recent studies have suggested that beer consumption may be associated with rectal cancer *(9)*. It is estimated that alcohol contributed to about 3 per cent of all cancer deaths *(10). (c) DIETARY FACTORS :* Dietary factors are also related to cancer. Smoked fish is related to stomach cancer, dietary fibre to intestinal cancer, beef consumption to bowel cancer and a high fat diet to breast cancer. A variety of other dietary factors such as food additives and contaminants have fallen under suspicion as causative agents. (Refer to chapter 12 for further details.) *(d) OCCUPATIONAL EXPOSURES :* These include exposure to benzene, arsenic, cadmium, chromium, vinyl chloride, asbestos, polycyclic hydrocarbons, etc. Many others remain to be identified. The risk of occupational exposure is considerably increased if the individuals also smoke cigarettes. Occupational exposures are usually reported to account for 1 to 5 per cent of all human cancers *(11). (e) VIRUSES :* An intensive search for a viral origin of human cancers revealed that hepatitis B and C virus is causally related to hepatocellular carcinoma. The relative risk of Kaposi's sarcoma occurring in patients with HIV infection is so high that it was the first manifestation of the AIDS epidemic to be recognized. Non–Hodgkin's lymphoma, a cancer of the lymph nodes and spleen is a late complication of AIDS. The Epstein-Barr virus (EBV) is associated with 2 human malignancies, viz. Burkitt's lymphoma and nasopharyngeal carcinoma. *Cytomegalovirus* (CMV) is a suspected oncogenic agent and classical Kaposi's sarcoma is associated with a higher prevalence of antibodies to CMV. *Human papilloma virus* (HPV) is a chief suspect in cancer cervix. Hodgkin's disease is also believed to be of viral origin. The human T–cell leukaemia virus is associated with adult T–cell leukaemia/lymphoma in the United States and southern parts of Japan *(4, 12). (f) PARASITES :* Parasitic infections may also increase the risk of cancer, as for example, schistosomiasis in Middle East producing carcinoma of the bladder. *(g) CUSTOMS, HABITS AND LIFESTYLES :* To the above causes must be added customs, habits and lifestyles of people which may be associated with an increased risk for certain cancers. The familiar examples are the demonstrated association between smoking and lung cancer, tobacco and betel chewing and oral cancer, etc *(13). (h) OTHERS :* There are numerous other environmental factors such as sunlight, radiation, air and water pollution, medications (e.g., oestrogen) and pesticides which are related to cancer.

2. GENETIC FACTORS

Genetic influences have long been suspected. For example, retinoblastoma occurs in children of the same parent. Mongols are more likely to develop cancer (leukaemia) than normal children. However, genetic factors are less conspicuous and more difficult to identify. There is probably a complex interrelationship between hereditary susceptibility and environmental carcinogenic stimuli in the causation of a number of cancers.

Cancer control

Cancer control consists of a series of measures based on present medical knowledge in the fields of prevention, detection, diagnosis, treatment, after care and rehabilitation, aimed at reducing significantly the number of new cases, increasing the number of cures and reducing the invalidism due to cancer.

The basic approach to the control of cancer is through primary and secondary prevention. It is estimated that at least one-third of all cancers are preventable *(14)*.

1. PRIMARY PREVENTION

Cancer prevention until recently was mainly concerned with the early diagnosis of the disease (secondary prevention), preferably at a precancerous stage. Advancing knowledge has increased our understanding of causative factors of some cancers and it is now possible to control these factors in the general population as well as in particular occupational groups. They include the following :

(a) CONTROL OF TOBACCO AND ALCOHOL CONSUMPTION : Primary prevention offers the greatest hope for reducing the number of tobacco–induced and

alcohol related cancer deaths. It has been estimated that control of tobacco smoking alone would reduce the total burden of cancer by over a million cancers each year *(15)*. *(b) PERSONAL HYGIENE:* Improvements in personal hygiene may lead to declines in the incidence of certain types of cancer, e.g., cancer cervix. *(c) RADIATION:* Special efforts should be made to reduce the amount of radiation (including medical radiation) received by each individual to a minimum without reducing the benefits. *(d) OCCUPATIONAL EXPOSURES* : The occupational aspects of cancer are frequently neglected. Measures to protect workers from exposure to industrial carcinogens should be enforced in industries. *(e) IMMUNIZATION* : In the case of primary liver cancer, immunization against hepatitis B virus and for prevention of cancer cervix immunization against HPV presents an exciting prospect. *(f) FOODS, DRUGS AND COSMETICS:* These should be tested for carcinogens. *(g) AIR POLLUTION* : Control of air pollution is another preventive measure. *(h) TREATMENT OF PRECANCEROUS LESIONS* : Early detection and prompt treatment of precancerous lesions such as cervical tears, intestinal polyposis, warts, chronic gastritis, chronic cervicitis, and adenomata is one of the cornerstones of cancer prevention. *(i) LEGISLATION* : Legislation has also a role in primary prevention. For example, legislation to control known environmental carcinogens (e.g., tobacco, alcohol, air pollution). *(j) CANCER EDUCATION* : An important area of primary prevention is cancer education. It should be directed at "high-risk" groups. The aim of cancer education is to motivate people to seek early diagnosis and early treatment. Cancer organizations in many countries remind the public of the early warning signs ("danger signals") of cancer. These are :

a. a lump or hard area in the breast
b. a change in a wart or mole
c. a persistent change in digestive and bowel habits
d. a persistent cough or hoarseness
e. excessive loss of blood at the monthly period or loss of blood outside the usual dates
f. blood loss from any natural orifice
g. a swelling or sore that does not get better
h. unexplained loss of weight.

There is no doubt that the possibilities for primary prevention are many. Since primary prevention is directed at large population groups (e.g., high risk groups, school children, occupational groups, youth clubs), the cost can be high and programmes difficult to conduct. Primary prevention, although a hopeful approach, is still in its early stages. Major risk factors have been identified for a small number of cancers only and far more research is needed in that direction.

2. SECONDARY PREVENTION

Secondary prevention comprises the following measures :

i) CANCER REGISTRATION

Cancer registration is a *sine qua non* for any cancer control programme. It provides a base for assessing the magnitude of the problem and for planning the necessary services. Cancer registries are basically of two types : hospital-based and population based. *(a) HOSPITAL-BASED REGISTRIES:* The hospital-based registry includes all patients treated by a particular institution, whether in-patients or out-patients. Registries should collect the uniform minimum set of data recommended in the "WHO Handbook for Standardized Cancer Registers" *(16)*. If there is a long-term follow-up of patients, hospital-based registries can be of considerable value in the evaluation of diagnostic and treatment programmes. Since hospital population will always be a selected population, the use of these registries for epidemiological purposes is thus limited. *(b) POPULATION-BASED REGISTRIES* : A right step is to set up a "hospital–based cancer registry" and extend the same to a "population-based cancer registry". The aim is to cover the complete cancer situation in a given geographic area. The optimum size of base population for a population based cancer registry is in the range of 2–7 million *(17)*. The data from such registries alone can provide the incidence rate of cancer and serve as a useful tool for initiating epidemiological enquiries into causes of cancer, surveillance of time trends, and planning and evaluation of operational activities in all main areas of cancer control.

ii) EARLY DETECTION OF CASES

Cancer screening is the main weapon for early detection of cancer at a pre-invasive *(in situ)* or pre-malignant stage. Effective screening programmes have been developed for cervical cancer, breast cancer and oral cancer. Like primary prevention, early diagnosis has to be conducted on a large scale; however, it may be possible to increase the efficiency of screening programmes by focussing on high-risk groups. Clearly, there is no point in detecting cancer at an early stage unless facilities for treatment and after-care are available. Early detection programmes will require mobilization of all available resources and development of a cancer infrastructure starting at the level of primary health care, ending with complex cancer centres or institutions at the state or national levels.

iii) TREATMENT

Treatment facilities should be available to all cancer patients. Certain forms of cancer are amenable to surgical removal, while some others respond favourably to radiation or chemotherapy or both. Since most of the known methods of treatment have complementary effect on the ultimate outcome of the patient, multi-modality approach to cancer control has become a standard practice in cancer centres all over the world. In the developed countries today, cancer treatment is geared to high technology. For those who are beyond the curable stage, the goal must be to provide pain relief. A largely neglected problem in cancer care is the management of pain. The WHO has developed guidelines on relief of cancer pain *(18)*. "Freedom from cancer pain" is now considered a right of cancer patients.

CANCER SCREENING

In the light of present knowledge, early detection and prompt treatment of early cancer and precancerous conditions provide the best possible protection against cancer for the individual and the community. Now a good deal of attention is being paid to screening for early detection of cancer. This approach, that is, cancer screening may be defined as the "search for unrecognized malignancy by means of rapidly applied tests".

Cancer screening is possible because : (a) in many instances, malignant disease is preceded for a period of months or years by a premalignant lesion, removal of which prevents subsequent development of cancer; (b) most

cancers begin as localized lesions and if found at this stage a high rate of cure is obtainable; and (c) as much as 75 per cent of all cancers occur in body sites that are accessible.

METHODS OF CANCER SCREENING

(a) Mass screening by comprehensive cancer detection examination: A rapid clinical examination, and examination of one or more body sites by the physician is one of the important approaches for screening for cancer. *(b) Mass screening at single sites :* This comprises examination of single sites such as uterine cervix, breast or lung. *(c) Selective screening :* This refers to examination of those people thought to be at special risk, for example, parous women of lower socio-economic strata upwards of 30 years of age for detection of cancer cervix, chronic smokers for lung cancer, etc.

1. Screening for cancer cervix

Screening for cervical cancer has become an accepted clinical practice. The prolonged early phase of cancer in situ can be detected by the Pap smear. Current policy suggests that all women should have a Pap test (cervical smear) at the age of 30 years, and then every 3 years thereafter. A periodic pelvic examination is also recommended. Organized population based screening programmes have reduced the incidence and mortality from cervical cancer in many developed countries.

However, screening for cancer cervix using Pap smear requires excessive resources in terms of laboratories, equipments and trained personnels. This has led to search for an alternative screening method that can be more cost-effective. Visual inspection based screening tests such as visual inspection with 5 per cent acetic acid (VIA), VIA with magnification (VIAM), and visual inspection post application of Lugol's iodine (VILI) are some of the alternative screening tests, which have been studied for their effectiveness in India. Sensitivity of VIA tends to be similar to cytology based screening. It is easy to carry out and easy to train appropriate health workers *(20)*.

The strategy is to screen women using visual inspection after application of freshly prepared 5 per cent acetic acid solution (5 ml of glacial acetic acid mixed with 95 ml distilled water). Detection of well-defined opaque acetowhite lesions close to the squamo-columnar junction, well defined circum-orificial acetowhite lesion or dense acetowhitening of ulceroproliferative growth on the cervix constiute a positive VIA or VIAM. The test is followed by a single visit approach for further investigation and management at district hospital. The management at district hospital is planned in such a way that the treatment based on colposcopy is offered in the same visit. Pap smear and biopsy are the investigations that are done to ensure that there are cytological and histopathological back-up for the interventions *(20)*.

With its updated guidelines, WHO now encourages countries to use HPV tests for cervical screening, including HPV DNA and HPV mRNA tests. HPV-DNA testing detects high-risk strains of HPV, which cause almost all cervical cancers; and HPV mRNA detects HPV infections leading to cellular transformation. Unlike tests that rely on visual inspection, HPV-testing is an objective test. It has been shown to be simpler, prevents more pre-cancers and cancer, and saves more lives. It is also more cost-effective than visual inspection techniques or cytology (commonly known as 'pap smears'). Screening should start from 30 years of age in the general population of women, with regular screening with a validated HPV test every 5 to 10 years, and from 25 years of age for women living with HIV. Women living with HIV also need to be screened more frequently, every 3 to 5 years. Screening must be linked to treatment and management of positive screening tests. HPV positive women may be treated without diagnostic verification in limited resourced settings. A test to triage the HPV positive women (e.g. VIA) is essential for treating HIV positive women *(19)*.

Intensive information, education and communication activities are required to sensitize the community about the significance of the disease and its early detection through screening.

2. Screening for breast cancer

There is evidence that screening for breast cancer has a favourable effect on mortality from breast cancer. The basic techniques for early detection of breast cancer are : (a) breast self-examination (BSE) by the patient (b) palpation by a physician (c) thermography, and (d) mammography.

All women should be encouraged to perform breast self-examination. Breast cancers are more frequently found by women themselves than by a physician during a routine examination. Although the effectiveness of BSE has not been adequately quantified, it is a useful adjuvant to early case detection. In many countries, BSE will probably be the only feasible approach to wide population coverage for a long time to come. *Palpation* is unreliable for large fatty breasts. *Thermography* has the advantage that the patient is not exposed to radiation. Unfortunately, it is not a sensitive tool. *Mammography* is most sensitive and specific in detecting small tumours that are sometimes missed on palpation. The use of mammography has three potential drawbacks: (i) exposure to radiation. This may amount to a dose of 500 milliroentgen compared to a 30–40 milliroentgen dose received in chest X-ray. Therefore, there has been concern about exposure to radiation from repeated mammographies and the risk of breast cancer developing as a result (ii) mammography requires technical equipment of a high standard and radiologists with very considerable experience – these two factors limit its more widespread use for mass screening purposes, and (iii) biopsy from a suspicious lesion may end up in a false-positive in as many as 5–10 cases for each case of cancer detected.

Although recent evidence points to the superiority of mammography over clinical examination in terms of sensitivity and specificity *(21)*, medical opinion is against routine mammography on the very young. Women under 35 years of age should not have X-rays unless they are symptomatic or a family history of early onset of breast cancer *(22)*.

3. Screening for lung cancer

At present there are only two techniques for screening for lung cancer, viz. chest radiograph and sputum cytology. Mass radiography has been suggested for early diagnosis at six monthly intervals, but the evidence in support of this is not convincing. So it is not recommended. It is doubtful whether the disease satisfies the criteria of suitability for screening (see chapter 4).

EPIDEMIOLOGY OF SELECTED CANCERS

1. Oral cancer

Oral cancer is one of the ten most common cancers in the world. Its high frequency in Central and South East Asian

countries (e.g., India, Bangladesh, Sri Lanka, Thailand, Indonesia, Pakistan) has been well documented. It is estimated that during the year 2022, about 3,89,896 persons were having oral cancer. About 1,88,438 persons (1.8 per cent of all cancers) died of oral cancer worldwide.

Oral cancer is a major problem in India. It is estimated that in 2022 it caused 8.7 deaths per 100,000 population (total 79,979 deaths). The age standardized incidence rate was 14.7 per 100,000 population in men and 5.0 per 100,000 population in women *(5)*.

EPIDEMIOLOGICAL FEATURES

(a) Tobacco : Approximately 90 per cent of oral cancers in South East Asia are linked to tobacco chewing and tobacco smoking. During 1966–1977, a large epidemiological survey was carried out in different parts of the country. In this 10–year follow-up study of 30,000 individuals in the three districts of Ernakulam (Kerala), Srikakulam (Andhra), and Bhavnagar (Gujarat), the results indicated that (i) oral cancer and precancerous lesions occurred almost solely among those who smoked or chewed tobacco, and (ii) oral cancer was almost always preceded by some type of precancerous lesion *(23, 24)*. The case about tobacco is further strengthened by the findings that the cancer almost always occurred on the side of the mouth where the tobacco quid was kept *(25)*, and the risk was 36 times higher than for non–chewers if the quid was kept in the mouth during sleep *(26)*.

(b) Alcohol : Data indicates that oral cancer can also be caused by high concentrations of alcohol, and that alcohol appears to have a synergistic effect in tobacco users *(25)*.

(c) Pre-cancerous stage : The natural history of oral cancer shows that often a precancerous stage precedes the development of cancer. The pre-cancerous lesions (leukoplakia, erythroplakia) can be detected for upto 15 years prior to their change to an invasive carcinoma *(24)*. Intervention at this stage may result in regression of the lesion.

(d) High-risk groups : These include tobacco chewers and smokers, bidi smokers, people using tobacco in other forms such as betel quid; people who sleep with the tobacco quid in the mouth *(27)*.

(e) Cultural patterns : In studying the tobacco habits in developing countries, indigenous forms of smoking, as well as chewing, which are characteristic of certain regions have to be taken into account *(8)*. Tobacco is smoked in the form of manufactured cigarettes. The indigenous forms of smoking are : *bidi, chutta* (cigar), *chilum, hookah* (hubble–bubble). Tobacco in powdered form is inhaled as snuff.

The most common form of tobacco chewing in India is the betel quid which usually consists of the betel leaf, arecanut, lime and tobacco. It is common for the poorer people to rub with the thumb flakes of sun-dried tobacco and slaked lime in the palm of their left hand until the desired mixture is obtained. The mixture *(khaini)* is then put into the mouth in small amounts and at frequent intervals during the day and slowly sucked and swallowed after dilution with saliva.

Cancer of the oral cavity is also very prevalent in Central Asian districts of USSR, where people chew "nass" or "nasswar" – a mixture of tobacco, ashes, lime and cotton-seed oil.

Another type of cancer common in the eastern coastal regions of Andhra Pradesh state in India is the epidermoid carcinoma of the hard palate. It is associated with the habit of reverse smoking of cigar *(chutta)*, i.e., smoking with the burning end inside the mouth *(28)*.

PREVENTION

a. PRIMARY PREVENTION

Oral cancer is amenable to primary prevention. If the tobacco habits are eliminated from the community, a great deal of reduction in the incidence of oral cancer can be achieved. This requires intensive public education and motivation for changing lifestyles supported by legislative measures like banning or restricting the sale of tobacco.

b. SECONDARY PREVENTION

Oral cancers are easily accessible for inspection allowing early detection. If detected early, possibly at the precancerous stage, they can be treated or cured. The precancerous lesions can be detected for up to 15 years, prior to their change to an invasive carcinoma. Leukoplakia can be cured by cessation of tobacco use. The main treatment modalities that offer hope are surgery and radiotherapy *(29)*. In developing countries over 50 per cent of oral cancers are detected only after they have reached an advanced stage *(14)*.

The primary health care workers (village health guides, and multi-purpose workers) are in a strategic position to detect oral cancers at an early stage during home visits. They can prove to be a vital link and a key instrument in the control of oral cancer in developing countries *(30)*.

2. Cancer of the cervix

Cervical cancer is the fourth most frequent cancer in women with an estimated 6,60,000 new cases in 2022 representing 7.1 per cent of all female cancers *(2)*. During the year about 3,50,000 women died of cervical cancer, which comes to 3.6 per cent of all deaths due to cancer in women *(2)*. Approximately 94 per cent of deaths from cervical cancer occurred in low and middle income countries. Wide variations in incidence and mortality from the disease exist between countries. Cases and deaths have declined markedly in the last 40 years in most industrialized countries, partly owing to a reduction in risk factors, but mainly as a result of extensive screening programmes. More limited improvements have been observed in developing countries, where persistently high rates tend to be the rule *(1)*.

In India, cancer cervix constitutes 9.0 per cent of all cancer incidence among women. The age standardized incidence rate is about 17.7 per 100,000 population. The estimated deaths were 79,979 in 2022 *(5)*.

NATURAL HISTORY

(a) The disease: Cancer cervix seems to follow a progressive course from epithelial dysplasia to carcinoma *in situ* to invasive carcinoma (Fig. 5). There is good evidence that carcinoma *in situ* persists for a long time, more than 8 years on an average *(31)*. The proportion of cases progressing to invasive carcinoma from preinvasive stage is not known – it may average 15 to 20 years or longer. The duration of the preinvasive stage is also not known. There is evidence that some *in situ* cases will spontaneously regress without treatment. Once the invasive stage is reached, the disease spreads by direct extension into the lymph nodes and pelvic organs.

Normal epithelium ↔ Dysplasia ↔ Cancer *in situ* → Invasive cancer

FIG. 5
Hypothetical model of the natural history of cancer cervix

When a woman presents symptoms of suspicion for cervical cancer, she must be referred to an appropriate facility for further evaluation, diagnosis and treatment. The symptoms of early-stage cervical cancer may include : (a) irregular blood spotting or light bleeding between periods in women of reproductive age; (b) postmenopausal spotting or bleeding; (c) bleeding after sexual intercourse; and (d) increased vaginal discharge, sometimes foul smelling.

As cervical cancer advances, more severe symptoms may appear including : (a) persistent back, leg or pelvic pain; (b) weight loss, fatigue, loss of appetite; (c) foul-smell discharge and vaginal discomfort; and (d) swelling of a leg or both lower extremities.

Other severe symptoms may arise at advanced stages depending on which organs the cancer has spread to.

(b) Causative agent : There is evidence pointing to Human papilloma virus (HPV) – sexually transmitted – as the cause of cervical cancer *(32)*. This virus was once supposed to produce only vegetant warts. More than 90 per cent of the infected population eventually clear the infection. But now virus is acknowledged as responsible for a much wider clinical and subclinical lesions. The virus is found in more than 95% of the cancers. Current evidence suggests that the virus is a necessary cause of the disease. It takes 15–20 years for cervical cancer to develop in women with normal immune system. It can take only 5–10 years in women with weakened immune system, such as those with untreated HIV infection *(33)*.

RISK FACTORS

(a) AGE : Cancer cervix affects relatively young women with incidence increasing rapidly from the age of 25 to 45, then levelling off, and finally falling again. *(b) GENITAL WARTS :* Past and/or present occurrence of clinical genital warts has been found to be an important risk factor *(33)*. *(c) MARITAL STATUS :* Cases are less likely to be single, more likely to be widowed, divorced or separated and having multiple sexual partners. The fact that cancer of the cervix is very common in prostitutes and practically unknown among virgins suggests that the disease could be linked with sexual intercourse. *(d) EARLY MARRIAGE:* Early marriage, early coitus, early childbearing and repeated childbirth have been associated with increasing risk. *(e) ORAL CONTRACEPTIVE PILLS :* There is renewed concern about the possible relationship between pill use and the development of invasive cervical cancer *(34)*. A recent WHO study finds an increased risk with increased duration of pill use and with the use of oral contraceptives high in oestrogen *(35)*. *(f) SOCIO-ECONOMIC CLASS :* Cancer cervix is more common in the lower socio-economic groups reflecting probably poor genital hygiene *(g)* Women living with HIV are 6 times more likely to develop cancer cervix.

PREVENTION AND CONTROL

The Global strategy towards eliminating cervical cancer as a public health problem, adopted by the World Health Assembly in 2020, recommends a comprehensive approach to cervical cancer prevention and control. The recommended actions include interventions across the life course *(19)*.

Primary prevention	Secondary prevention	Tertiary prevention
Girls 9–14 years • HPV vaccination	From 30 years of age for women from the general population and 25 years of age for women living with HIV	All women as needed
Girls and boys should also be offered, as appropriate • Health information and warnings about tobacco use • Sex education tailored to age and culture • Condom promotion and provision for those engaged in sexual activity • Male circumcision	• Screening with a high-performance test equivalent or better than HPV test • Followed by immediate treatment or as quickly as possible after an HPV molecular positive test.	Treatment of invasive cancer at any age • Surgery • Radiotherapy • Chemotherapy • Palliative care

Cervical cancer prevention should encompass a multidisciplinary, including components from community education, social mobilization, vaccination, stopping smoking, using condom, voluntary male circumcision, screening, treatment and palliative care.

HPV vaccination

HPV vaccines work best if administered prior to exposure to HPV. Therefore, to prevent cervical cancer WHO recommends vaccinating girls aged 9 to 14 years, when most have not started sexual activity. Some countries have started to vaccinate boys as the vaccination prevents HPV related cancers in males as well HPV vaccination does not replace cervical cancer screening. In countries where HPV vaccine is introduced, population-based screening programmes are still needed to identify and treat cervical pre-cancer and cancer to reduce cervical cancer incidence and deaths.

3. Breast cancer

Female breast cancer is now the second leading cause of global cancer incidence in 2022, with an estimated 2.29 million new cases, representing 11.5 per cent of all cancer cases. It is the fifth leading cause of cancer mortality worldwide, with 6,70,000 deaths. Among women, breast cancer accounts for 1 in 4 cancer cases and for 1 in 6 cancer deaths, ranking first for incidence in the vast majority of countries.

Global estimates reveal striking inequities in the breast cancer burden according to human development. For instance, in countries with a very high Human Development Index (HDI), 1 in 12 women will be diagnosed with breast cancer in their lifetime and 1 in 71 women die of it. In contrast, in countries with a low HDI; while only 1 in 27 women is diagnosed with breast cancer in their lifetime, 1 in 48 women will die from it *(36)*.

In India, breast cancer is the top most cancer with about 192,020 (13.6 per cent) new cases diagnosed in 2022. The incidence rate is about 26.6 per 100,000 population.

In India, breast cancer was estimated to cause 13.7 deaths per 100,000 population in the year 2022. The survival rate decreased by 2.7 times for breast cancer, in case of detection at stage IV as against stage I. A total of 192,020 women died of cancer breast in 2022 in India *(5)*.

THE DISEASE (37)

Breast cancer most commonly presents as a painless lump or thickening in the breast. It is important that women finding an abnormal lump in the breast consult a health practitioner without a delay of more than 1–2 months even when there is no pain associated with it. Seeking medical attention at the first sign of a potential symptom allows for more successful treatment.

Generally, symptoms of breast cancer include:

- a breast lump or thickening;
- alteration in size, shape or appearance of a breast;
- dimpling, redness, pitting or other alteration in the skin;
- change in nipple appearance or alteration in the skin surrounding the nipple (areola); and/or
- abnormal nipple discharge.

There are many reasons for lumps to develop in the breast, most of which are not cancer. As many as 90% of breast masses are not cancerous. Non-cancerous breast abnormalities include benign masses like fibroadenomas and cysts as well as infections.

Breast cancer can present in a wide variety of ways, which is why a complete medical examination is important. Women with persistent abnormalities (generally lasting more than one month) should undergo tests including imaging of the breast and in some cases tissue biopsy to determine if a mass is malignant or benign.

Advanced cancers can erode through the skin to cause ulceration but are not necessarily painful. Women with breast wounds that do not heal should have a biopsy performed.

Breast cancers may spread to other areas of the body and trigger other symptoms. Often, the most common first detectable site of spread is to the lymph nodes under the arm although it is possible to have cancer-bearing lymph nodes that cannot be felt.

Over time, cancerous cells may spread to other organs including the lungs, liver, brain and bones. Once they reach these sites, new cancer-related symptoms such as bone pain or headaches may appear.

RISK FACTORS

The established risk factors of breast cancer include the following:

(a) AGE : Breast cancer is uncommon below the age of 35, the incidence increasing rapidly between the ages of 35 and 50. A slight bimodal trend in the age distribution has been observed *(38)* with a dip in incidence at the time of menopause. A secondary rise in frequency often occurs after the age of 65. Women who developed their first breast cancer under the age of 40, had three times the risk of developing a second breast cancer than did those who developed their first cancer after the age of 40 *(39)*. Indeed the aetiologies of pre-menopausal and post-menopausal breast cancer appears to be different *(40)*.

Breast cancer is not only infrequent in Indian women, but also it occurs in them a decade earlier than in Western women – the mean age of occurrence is about 42 in India, as compared to 53 in the white women.

(b) FAMILY HISTORY : The risk is high in those with a positive family history of breast cancer, especially if a mother or sister developed breast cancer when premenopausal.

(c) PARITY : MacMahon, *et al. (41)* in their international case–control study found that the risk of breast cancer is directly related to the age at which women bear the first child. An early first, full-term pregnancy seems to have a protective effect. Those whose first pregnancy is delayed to their late thirties are at a higher risk than multiparous women. Unmarried women tend to have more breast tumours than married single women, and nulliparous women had the same risk.

(d) AGE AT MENARCHE AND MENOPAUSE : Early menarche and late menopause are established risk factors *(42)*. The risk is reduced for those with a surgically induced menopause. Forty or more years of menstruation doubles the risk of breast cancer as compared with 30 years *(43)*.

(e) HORMONAL FACTORS : The association of breast cancer with early menarche and late menopause suggests that ovary appears to play a crucial role in the development of breast cancer. Evidence suggests that both elevated oestrogen as well as progesterone are important factors in increasing breast cancer risk *(44)*. In short, hormones appear to hold the key to the understanding of breast cancer.

(f) PRIOR BREAST BIOPSY : Prior breast biopsy for benign breast disease is associated with an increased risk of breast cancer.

(g) DIET : Current aetiological hypotheses suggest that cancer of the breast is linked with a high fat diet and obesity. It is not known how dietary fat influences breast cancer risk at a cellular level *(44)*.

(h) SOCIO-ECONOMIC STATUS : Breast cancer is common in higher socio-economic groups. This is explained by the risk factor of higher age at first birth.

(i) OTHERS : *(i) Radiation* : An increased incidence of breast cancer has been observed in women exposed to radiation. *(ii) Oral contraceptives* : Oral contraceptive appears to have little overall effect on breast cancer, although prolonged use of oral pills before the first pregnancy or before the age of 25 may increase the risk in younger women *(45)*.

PREVENTION

Behavioural choices and related interventions that reduce the risk of breast cancer include *(37)* :

- prolonged breastfeeding;
- regular physical activity;
- weight control;
- avoidance of harmful use of alcohol;
- avoidance of exposure to tobacco smoke;
- avoidance of prolonged use of hormones; and
- avoidance of excessive radiation exposure.

Unfortunately, even if all of the potentially modifiable risk factors could be controlled, this would only reduce the risk of developing breast cancer by at most 30 per cent.

Female gender is the strongest breast cancer risk factor. Approximately 0.5–1 per cent of breast cancers occur in men. The treatment of breast cancer in men follows the same principles of management as for women.

In the past, all breast cancers were treated surgically by mastectomy (complete removal of the breast). When cancers are large, mastectomy may still be required. Today, the majority of breast cancers can be treated with a smaller procedure called a "lumpectomy" or partial mastectomy, in

which only the tumor is removed from the breast. In these cases, radiation therapy to the breast is generally required to minimize the chances of recurrence in the breast.

Lymph nodes are removed at the time of cancer surgery for invasive cancers. Complete removal of the lymph node bed under the arm (complete axillary dissection) in the past was thought to be necessary to prevent the spread of cancer. A smaller lymph node procedure called "sentinel node biopsy" is now preferred as it has fewer complications. It uses dye and/or a radioactive tracer to find the first few lymph nodes to which cancer could spread from the breast.

Medical treatments for breast cancer, which may be given before ("neoadjuvant") or after ("adjuvant") surgery, is based on the biological subtyping of the cancer. Cancers that express the estrogen receptor (ER) and/or progesterone receptor (PR) are likely to respond to endocrine (hormone) therapies such as tamoxifen or aromatase inhibitors. These medicines are taken orally for 5–10 years, and reduce the chance of recurrence of these "hormone-positive" cancers by nearly half. Endocrine therapies can cause symptoms of menopause but are generally well tolerated.

Cancers that do not express ER or PR are "hormone receptor negative" and need to be treated with chemotherapy unless the cancer is very small. The chemotherapy regimens available today are very effective in reducing the chances of cancer spread or recurrence and are generally given as outpatient therapy. Chemotherapy for breast cancer generally does not require hospital admission in the absence of complications.

Breast cancers may independently overexpress a molecule called the HER2/neu oncogene. These "HER2 positive" cancers are amenable to treatment with targeted biological agents such as trastuzumab. These biological agents are very effective but also very expensive, because they are antibodies rather than chemicals. When targeted biological therapies are given, they are combined with chemotherapy to make them effective at killing cancer cells.

Radiotherapy also plays a very important role in treating breast cancer. With early stage breast cancer, radiation can prevent a woman having to undergo a mastectomy. With later stage cancer, radiotherapy can reduce cancer recurrence risk even when a mastectomy has been performed. For advanced stage of breast cancer, in some circumstances, radiation therapy may reduce the likelihood of dying of the disease.

The effectiveness of breast cancer therapies depends on the full course of treatment. Partial treatment is less likely to lead to a positive outcome.

The strategies for improving breast cancer outcomes depend on fundamental health system strengthening to deliver the treatments that are already known to work. For example, having reliable referral pathways from primary care facilities to district hospitals to dedicated cancer centres.

GLOBAL BREAST CANCER INITIATIVE *(37)*

The objective of the WHO Global Breast Cancer Initiative (GBCI) is to reduce global breast cancer mortality by 2.5 per cent per year, thereby averting 2.5 million breast cancer deaths globally between 2020 and 2040. Reducing global breast cancer mortality by 2.5 per cent per year would avert 25% of breast cancer deaths by 2030 and 40 per cent by 2040 among women under 70 years of age. The three pillars toward achieving these objectives are: health promotion for early detection; timely diagnosis; and comprehensive breast cancer management.

4. Lung cancer

MAGNITUDE OF THE PROBLEM

Lung cancer has been known in industrial workers from the late 19th century. It came into prominence as a public health problem in the Western world in 1930s – at first in men, and later (in 1960s) among women *(46)*, and has followed the increasing adoption of cigarette smoking first by men and later by women. According to WHO reports, between 1960 and 1980, the death rate due to lung cancer increased by 76 per cent in men and by 135 per cent in women *(47, 27)*. In countries where cigarette smoking has only recently begun to be widely adopted, lung cancer deaths still remain low, but it may be expected that they will rise soon. In others, such as Poland, where the use of cigarettes began earlier, the rise is already occurring. The total burden of lung cancer in any country is directly related to the amount and duration of cigarette smoking.

With an estimated 2.48 million new cancer cases and 1.81 million deaths, lung cancer is the top most commonly diagnosed cancer and the leading cause of cancer deaths in 2022, representing approximately one in 10 (12.4 per cent) cancers diagnosed and one in 5 (18.7 per cent) deaths. Lung cancer is the leading cause of cancer morbidity and mortality in men, whereas, in women, it ranks second for incidence, after breast cancer, and second for mortality, after breast cancer. Incidence and mortality rates are roughly 2 times higher in men than in women, although the male-to-female ratio varies widely across regions, ranging from 1.2 in Northern America to 5.6 in Northern Africa. Lung cancer incidence and mortality rates are 3 to 4 times higher in transitioned countries than in transitioning countries; this pattern may well change as the tobacco epidemic evolves given that 80% of smokers aged ≥15 years resided in low-income and middle-income countries *(48)*.

In India, the age standardized incidence rate for the year 2022 was : total 5.8 per 100,000 population; for men 8.5 per 100,000 population and women 3.2 per 100,000 population. The estimated deaths were 75,031. The rate was 5.3 per 100,000 population *(5)*.

EPIDEMIOLOGICAL FEATURES

a. AGE AND SEX

About a third of all lung cancer deaths occur below the age of 65. In many industrialized countries, the incidence of lung cancer is at present increasing more in females than in males *(49)*.

b. RISK FACTORS

(i) Smoking : Tobacco smoking was first suggested as a cause of lung cancer in the 1920s. Subsequent studies proved the causal relationship between cigarette smoking and lung cancer. Two studies in India showed that the lung cancer risk for cigarette smokers is 8.6 times the risk for non-smokers *(50, 51)*. The risk is strongly related to the number of cigarettes smoked, the age of starting to smoke and smoking habits, such as inhalation and the number of puffs and the nicotine, the tar content and the length of cigarettes. Those who are highly exposed to "passive smoking" (somebody else's smoke) are at an increased risk of developing lung cancer. It has been calculated that in

countries where smoking has been a widespread habit, it is responsible for 90 per cent of lung cancer deaths *(52)*. The strongest evidence that cigarette smoking is responsible for lung cancer is the incidence reduction that occurs after cessation of smoking. This has been convincingly demonstrated in a 20 year prospective study on male British doctors *(53)*.

The most noxious components of tobacco smoke are tar, carbon monoxide and nicotine. The carcinogenic role of tar is well established. Nicotine and carbon monoxide, particularly, contribute to increased risk of cardiovascular diseases through enhancement of blood coagulation in the vessels, interference with myocardial oxygen delivery, and reduction of the threshold for ventricular fibrillation *(8)*.

A study in India has shown that there is no difference between the tar and nicotine delivery of the filter and non-filter cigarettes smoked in India, so that a filter gives no protection to Indian smokers. The "king-size" filter cigarettes deliver more tar and nicotine than ordinary cigarettes. Bidi smoking appears to carry a higher lung cancer risk than cigarette smoking owing to the higher concentration of carcinogenic hydrocarbons in the smoke *(8)*.

(ii) Other factors : Besides cigarette smoking, there are other factors which are implicated in the aetiology of lung cancer. These include air pollution, radioactivity, and occupational exposure to asbestos, arsenic and its compounds, chromates, particles containing polycyclic aromatic hydrocarbons and certain nickel–bearing dusts. A number of studies have shown an interaction between smoking and asbestos exposure.

PREVENTION

1. PRIMARY PREVENTION

In lung cancer control, primary prevention is of greatest importance. The most promising approach is to control the "smoking epidemic", because 80 to 90 per cent of all cases of lung cancer in developed countries are due to smoking of cigarettes. Methods of controlling the smoking epidemic have been described by the WHO expert committees in their reports. Broadly these methods include :

a. Public information and education
b. Legislative and restrictive measures
c. Smoking cessation activities
d. National and international coordination

a. Public information and education

The need of the hour is to create public awareness about the hazards of smoking through mass media. The target population should be the entire population with greater emphasis laid on young people and school children. Nothing less than a national anti-smoking campaign will be needed to change human behaviour or life styles associated with smoking. Curtailment of smoking must be an essential part of national health policy.

b. Legislative and restrictive measures

Legislation and restrictive measures have been suggested in the following areas : control of sales promotion; health warnings on cigarette packets and advertisements; product description showing yield of harmful substances; imposition of upper limits for harmful substances in smoking materials; taxation; sales restrictions; restriction on smoking in public places; restriction on smoking in places of work, etc.

The Government of India have provided legislative support to the anti-smoking campaign. "The Cigarettes (Regulation of production, supply and distribution) Act of 1975" which came into force from 1 April 1976, requires all manufacturers or persons trading in cigarettes to display prominently the statutory warning "Cigarette Smoking is Injurious to Health" on all cartons or packets of cigarettes that are put on sale. Most of the State Governments in India have promulgated laws prohibiting smoking in closed areas, e.g., cinemas, buses, educational institutions, and hospitals. Again in the year 2003, a comprehensive tobacco control legislation titled "The Cigarettes And Other Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, Supply and Distribution) Act 2003 was passed by the Govt of India. Refer to chapter 7 "National cancer control programme" for the details.

c. Smoking cessation activities

Research continues on different methods of smoking cessation. In all countries well over 90 per cent of those who give up smoking do so of their own volition, i.e., without use of any specific therapy. The basic role of most treatments for smoking cessation would be to relieve the smoker of "abstinence symptoms" (e.g., sleeplessness, craving for smoking, dizziness, constipation, etc). The report of the WHO expert committee on smoking control contains information on specific smoking cessation methods such as smoking cessation clinics, nicotine substitutes, hypnosis, etc.

d. National and International coordination

Since smoking is a worldwide epidemic, it requires coordinated political and non-political approaches at local, national and international levels to contain the smoking epidemic.

2. SECONDARY PREVENTION

This rests on early detection of cases and their treatment. At present, there are only two procedures capable of detecting presymptomatic, early-stage lung cancer. These are the chest X-ray and sputum cytology. But screening for early–stage lung cancer is less attractive, more expensive and appears to have less potential for reducing mortality than primary prevention. Therefore, mass screening for lung cancer is not recommended as a routine public health policy *(49)*.

Efforts to find effective treatment for lung cancer have met with only limited success. For untreated patients, the median survival is 2 to 3 months, compared to 10–14 months for patients receiving combined chemotherapy. In view of these limitations, primary prevention merits greater attention. An important part of treatment is relief of pain so that each dying patient has the right to spend his last days as pain-free as possible.

5. Stomach cancer

Stomach cancer remains an important cancer worldwide and is responsible for over 0.968 million new cases in 2022 and an estimated 660,175 deaths, equating to 6.8 per cent of all cancer deaths, making it the fifth most frequently diagnosed cancer, and fifth leading cause of cancer deaths. The rates are 2-fold higher in men than women.

Although they are often reported as a single entity, gastric cancer can generally be classified into 2 topographical

categories. Rates of noncardia gastric cancer (arising from distal regions) have steadily declined over the last 50 years in most populations. Cancers of the gastric cardia (arising in the area adjoining the oesophageal-gastric junction) have epidemiological characteristics more similar to those of oesophageal adenocarcinoma and important risk factors include obesity and gastroesophageal reflux disease. The incidence of these cancers are increasing particularly in high-income countries *(48)*.

In India the age-standardized incidence rate for stomach cancer in 2022 was 6.1 per 100,000 population in men, and 3.0 per 100,000 population in women. The crude mortality rate was 4.1 per 100,000 population. As a total, 57,727 people died of cancer stomach in 2022 *(5)*.

The constant decline of stomach cancer in industrialized countries is linked to improved food preservation practices; better nutrition more rich in vitamins from fresh vegetables and fruits; and less consumption of preserved, cured and salted foods. Infection with the bacterium *Helicobacter pylori* contributes to the risk, probably by interacting with the other factors.

Symptoms are non-specific, which explains why most of the cases are diagnosed when the disease is at an advanced stage. Patients may complain of weight loss, fatigue or gastric discomfort. Diagnosis is performed by barium X-rays and with biopsy.

This cancer is treated by surgical removal of the tumour, with or without adjuvant chemotherapy.

Stomach cancer cases have a generally poor survival prognosis, averaging no more than 20% survival after five years. If the tumour is localized to the stomach, about 60% of patients survive five years or more. However, only about 18% of all cases are diagnosed at this early stage. Screening by photofluoroscopy has been widespread in Japan since the late 1960s and mortality rates are declining. It is unclear whether this trend can be attributed to mass screening alone.

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DIABETES MELLITUS

The term diabetes describes a group of metabolic disorders characterized and identified by the presence of hyperglycaemia in the absence of treatment. The heterogeneous aetio-pathology includes defects in insulin secretion, insulin action, or both, and disturbances of carbohydrate, fat and protein metabolism. The long-term specific effects of diabetes include retinopathy, nephropathy and neuropathy, among other complications. People with diabetes are also at increased risk of other diseases including heart, peripheral arterial and cerebrovascular disease, obesity, cataracts, erectile dysfunction, and non-alcoholic fatty liver disease. They are also at increased risk of some infectious diseases, such as tuberculosis *(1)*.

Classification of diabetes (2019)

Ideally a single classification system for diabetes would facilitate three primary purposes: clinical care, aetio-pathology and epidemiology. With this in mind, the Expert group considered it best to define a classification system that prioritizes clinical care and helps health professionals choose appropriate treatment, and whether or not to start treatment with insulin, particularly at the time of diagnosis. The WHO classification of diabetes is as shown in Table 1 *(2)*.

TABLE 1

Types of diabetes

Type of diabetes	Brief description	Change from previous classification
Type 1 diabetes	β-cell destruction (mostly immune-mediated) and absolute insulin deficiency; onset most common in childhood and early adulthood	Type 1 sub-classes removed
Type 2 diabetes	Most common type, various degrees of β-cell dysfunction and insulin resistance; commonly associated with overweight and obesity	Type 2 sub-classes removed
Hybrid forms of diabetes		New type of diabetes
Slowly evolving, immune-mediated diabetes of adults	Similar to slowly evolving type 1 in adults but more often has features of the metabolic syndrome, a single GAD autoantibody and retains greater β-cell function	Nomenclature changed - previously referred to as latent autoimmune diabetes of adults (LADA)
Ketosis-prone type 2 diabetes	Presents with ketosis and insulin deficiency but later does not require insulin; common episodes of ketosis, not immune-mediated	No change
Other specific types		
Monogenic diabetes - Monogenic defects of β-cell function - Monogenic defects in insulin action	Caused by specific gene mutations, has several clinical manifestations requiring different treatment, some occurring in the neonatal period, others by early adulthood Caused by specific gene mutations; has features of severe insulin resistance without obesity; diabetes develops when β-cells do not compensate for insulin resistance	Updated nomenclature for specific genetic defects
Diseases of the exocrine pancreas	Various conditions that affect the pancreas can result in hyperglycaemia (trauma, tumor, inflammation, etc.)	No change
Endocrine disorders	Occurs in diseases with excess secretion of hormones that are insulin antagonists	No change
Drug- or chemical-induced	Some medicines and chemicals impair insulin secretion or action, some can destroy β-cells	No change
Infection-related diabetes	Some viruses have been associated with direct ß-cell destruction	No change
Uncommon specific forms of immune-mediated diabetes	Associated with rare immune-mediated diseases	No change
Other genetic syndromes sometimes associated with diabetes	Many genetic disorders and chromosomal abnormalities increase the risk of diabetes	No change
Unclassified diabetes	Used to describe diabetes that does not clearly fit into other categories. This category should be used temporarily when there is not a clear diagnostic category especially close to the time of diagnosis	New types of diabetes
Hyperglycaemia first detected during pregnancy		
Diabetes mellitus in pregnancy	Type 1 or type 2 diabetes first diagnosed during pregnancy	No change
Gestational diabetes mellitus	Hyperglycaemia below diagnostic thresholds for diabetes in pregnancy	Defined by 2013 diagnostic criteria

Diagnostic criteria for diabetes : fasting plasma glucose ≥7.0 mmol/L or 2-hour post-load plasma glucose ≥11.1 mmol/L or Hba1c ≥48 mmol/mol

Diagnostic criteria for gestational diabetes : fasting plasma glucose 5.1–6.9 mmol/L or 1-hour post-load plasma glucose ≥10.0 mmol/L or 2-hour post-load plasma glucose 8.5–11.0 mmol/L

Source : *(2)*

Type 1 diabetes (Insulin-dependent diabetes mellitus) is the most severe form of the disease. Its onset is typically abrupt and is usually seen in individuals less than 30 years of age. It is lethal unless promptly diagnosed and treated. This form of diabetes is immune-mediated in over 90 per cent of cases and idiopathic in less than 10 per cent cases. The rate of destruction of pancreatic β cell is quite variable. Rapid in some individuals and slow in others. Type 1 diabetes is usually associated with ketosis in its untreated state. It occurs mostly in children, the incidence is highest among 10–14 year old group, but occasionally occur in adults. It is catabolic disorder in which circulating insulin is virtually absent, plasma glucagon is elevated, and the pancreatic β cells fail to respond to all insulinogenic stimuli. Exogenous insulin is therefore required to reverse the catabolic state, prevent ketosis, reduce the hyperglucagonaemia, and reduce blood glucose *(3)*.

Type 2 diabetes is much more common than type 1 diabetes. It is often discovered by chance. It is typically gradual in onset and occurs mainly in the middle-aged and elderly, frequently mild, slow to ketosis and is compatible with long survival if given adequate treatment. Its clinical picture is usually complicated by the presence of other disease processes.

Gestational diabetes is hyperglycaemia with blood glucose values above normal but below those diagnostic of diabetes, occurring during pregnancy. Women with gastational diabetes are at an increased risk of complications during pregnancy and at delivery. They and their children are also at increased risk of type 2 diabetes in the future.

Impaired glucose tolerance (IGT) describes a state intermediate– "at-risk" group – between diabetes mellitus and normality. It can only be defined by the oral glucose tolerance test (see Table 3).

Insulin resistance syndrome (Syndrome X)

In obese patients with type 2 diabetes, the association of hyperglycaemia, hyperinsulinaemia, dyslipidaemia and hypertension, which leads to coronary artery disease and stroke, may result from a genetic defect producing insulin resistance, with the latter being exaggerated by obesity. It has been proposed that insulin resistance predisposes to hyperglycaemia, which results in hyperinsulinaemia (which may or may not be of sufficient magnitude to correct the hyperglycaemia) and this excessive insulin level then contributes to high levels of triglycerides and increased sodium retention by renal tubules, thus inducing hypertension. High levels of insulin can stimulate endothelial proliferation to initiate atherosclerosis *(3)*.

Problem statement

WORLD

Diabetes is an "iceberg" disease. Although increase in both the prevalence and incidence of type 2 diabetes have occurred gloablly, they have been especially dramatic in societies in economic transition, in newly industrialized countries and in developing countries. During year 2014, the number of cases of diabetes worlwide is estimated to be around 422 million, of these more than 90 per cent are type 2 diabetes. In 2019, an estimated 1.5 million people died from consequences of high blood sugar *(4)*. More than 80 per cent diabetes deaths occur in low and middle income countries.

The apparent prevalence of hyperglycaemia depends on the diagnostic criteria used in epidemiological surveys. The global prevalence of diabetes in 2014 was estimated to be 8.5% in adults aged 18+ years *(4)*. The prevalence of diabetes was highest in the Eastern Mediterranean Region and the Region of the Americas (11% for both sexes) and lowest in the WHO European and Western Pacific Regions (9% for both sexes). The magnitude of diabetes and other abnormalities of glucose tolerance are considerably higher than the above estimates if the categories of 'impaired fasting' and 'impaired glucose tolerance' are also included. The estimated prevalence of diabetes was relatively consistent across the income groupings of countries. Low-income countries showed the lowest prevalence (8% for both sexes), and the upper-middle-income countries showed the highest (10% for both sexes) *(5)*.

Unfavourable modification of lifestyle and dietary habits that are associated with urbanization are believed to be the most important factors for the development of diabetes. The prevalence of diabetes is approximately twice in urban areas than in rural population.

A bulk of evidence from studies on migrants indicates that the ethnic, presumably genetic, vulnerability of Asians manifests into diabetes when subjected to unfavourable life-styles. Population-based surveys completed recently in Bangladesh, India and Indonesia have shown considerable increase in the prevalence rate of the disease in both urban and rural dwellers when compared to results obtained earlier.

Diabetic patients, if undiagnosed or inadequately treated, develop multiple chronic complications leading to irreversible disability and death. Coronary heart disease and stroke are more common in diabetics than in the general population. Microvascular complications like diabetic renal disease and diabetic retinopathy and neuropathy are serious health problems resulting in deterioration of the quality of life and premature death. In fact, diabetes is listed among the five most important determinants of the cardiovascular disease epidemic in Asia. Lower limb amputation are at least 10 times more common in diabetic than in non-diabetic individuals in developed countries, more than half of all non-traumatic lower limb amputations are due to diabetes *(5)*. Metabolic disorders in pregnant diabetic women as well as those caused by gestational diabetes (diabetes diagnosed for the first time during pregnancy) pose a high health risk, to both the mother and foetus.

Unfortunately, there is still inadequate awareness about the real dimension of the problem among the general public. There is also a lack of awareness about the existing interventions for preventing diabetes and the management of complications. Inadequacies in primary health care systems, which are not designed to cope with the additional challenges posed by the chronic non-communicable diseases, result in poor detection of cases, suboptimal treatment and insufficient follow-up leading to unnecessary disabilities and severe complications, often resulting in early death.

The age-adjusted mortality rates among the people with diabetes are 1.5 to 2.5 times higher than in the general population *(6)*. In Caucassian population, much of the excess mortality is attributable to cardiovascular disease, especially coronary heart disease; amongst Asian and American Indian population, renal disease is a major contributor *(6)*; whereas in some developing societies, infections are an important cause of death. It is conceivable that the decline in mortality due to coronary heart disease which has occurred in many affluent countries may be halted or even reversed if rates of type 2 diabetes continue to rise. This may occur if the coronary risk factors associated with diabetes increase to the extent that the risk they mediate outweighs the benefit accrued from improvements in conventional cardiovascular risk factors, and the improved care of patients with established cardiovascular disease *(6)*.

In addition to non-insulin dependent diabetes, which is rather silent, chronic, often unidentified killer mostly among the adult population, the insulin dependent form of the disease (type 1) makes an even more dramatic appearance in affected children. They develop symptoms of ketoacidosis and often die, since the majority do not have access to adequate medical care, and since insulin is not available or too expensive. It is estimated that the prevalence of type 1 diabetes in Asia is relatively low, accounting for about 9.7 per cent of all diabetes mellitus cases in the Region. The insulin dependent diabetes registry at Chennai (India) reported an incidence of 10.5 per 100,000 children in the age group of 10–12 years *(7)*.

INDIA

The population in India has an increased susceptibility to diabetes mellitus. This propensity was demonstrated by multiple surveys of migrant Indians residing in Fiji, Singapore, South Africa, U.K. and USA. The rates of diabetes in migrants from the Indian subcontinent have consistently shown to exceed those of the local population.

India is home to 77 million diabetics, second only to China in the world. The Govt. of India and diabetic retinopathy survey 2019 found 11.8 per cent prevalence of diabetes in India. Males showed prevalence of 12 per cent and females 11.7 per cent. There is no sex difference. Nearly 40 per cent of known diabetics were diagnosed 1 to 4 years back, while 5.3 per cent of known diabetics reported

diagnosis within one-year *(8)*. Majority of cases are of type 2 diabetes. In the year 2016, about 2 per cent deaths were attributable to diabetes. In the age group 30–69 years, 75,900 males and 51,700 females died of diabetes and in the age group 75 and above, about 46,800 males and 45,600 females died of diabetes *(9)*. The prevalence was higher in urban areas ranging between 10.9 to 14.2 per cent. In rural areas it was 3.0 to 7.8 per cent in population aged 20 years and above.

National programme for prevention and control of non-communicable diseases are operational in India and it includes diabetes and diabetes registry. For details please refer to chapter 7.

Natural history

Epidemiological determinants

1. AGENT

The underlying cause of diabetes is insulin deficiency which is absolute in type 1 diabetes and partial in type 2 diabetes. This may be due to a wide variety of mechanisms: (a) pancreatic disorders – inflammatory, neoplastic and other disorders such as cystic fibrosis, (b) defects in the formation of insulin, e.g., synthesis of an abnormal, biologically less active insulin molecule; (c) destruction of beta cells, e.g., viral infections and chemical agents, (d) decreased insulin sensitivity, due to decreased numbers of adipocyte and monocyte insulin receptors. (e) genetic defects, e.g., mutation of insulin gene; and (f) auto–immunity. Evidence is accumulating that the insulin response to glucose is genetically controlled. The overall effect of these mechanisms is reduced utilization of glucose which leads to hyperglycaemia accompanied by glycosuria.

2. HOST FACTORS

(a) AGE : Although diabetes may occur at any age, surveys indicate that prevalence rises steeply with age. Type 2 diabetes usually comes to light in the middle years of life and thereafter begins to rise in frequency. Malnutrition related diabetes affects large number of young people. The prognosis is worse in younger diabetics who tend to develop complications earlier than older diabetics. *(b) SEX* : In some countries (e.g., UK) the overall male–female ratio is about equal *(10)*. In south-east Asia, an excess of male diabetics has been observed, but this is open to question. *(c) GENETIC FACTORS:* The genetic nature of diabetes is undisputed. Twin studies showed that in identical twins who developed type 2 diabetes, concordance was approximately 90 per cent *(11)*, thus demonstrating a strong genetic component. In type 1 diabetes, the concordance was only about 50 per cent indicating that type 1 diabetes is not totally a genetic entity. *(d) GENETIC MARKERS* : Type 1 diabetes is associated with HLA–B8 and B15, and more powerfully with HLA–DR3 and DR4. The highest risk of type 1 diabetes is carried by individuals with both DR3 and DR4. On the other hand type 2 diabetes is not HLA–associated *(11)*. *(e) IMMUNE MECHANISMS* : There is some evidence of both cell–mediated and of humoral activity against islet cells. Some people appear to have defective immunological mechanisms, and under the influence of some environmental "trigger", attack their own insulin producing cells. *(f) OBESITY* : Obesity particularly central adiposity has long been accepted as a risk factor for type 2 diabetes and the risk is related to both the duration and degree of obesity. The association has been repeatedly demonstrated in longitudinal studies in different populations, with a striking gradient of risk apparent with increasing level of BMI, adult weight gain, waist circumference or waist to hip ratio. Indeed waist circumference or waist to hip ratio (reflecting abdominal or visceral adiposity) are more powerful determinants of subsequent risk of type 2 diabetes than BMI *(6)*. Central obesity is also an important determinant of insulin resistance, the underlying abnormality in most cases of type 2 diabetes. In some instances obesity reduces the number of insulin receptors on target cells. Voluntary weight loss improves insulin sensitivity and in several randomized controlled trials has shown to reduce the risk of progression from impaired glucose tolerence to type 2 diabetes *(12, 13)*. However, many obese subjects are not diabetic. Thus obesity by itself is inadequate to account for all, or even most, cases of type 2 diabetes; physical inactivity and/or deficiencies of specific nutrients may also be involved *(11)*. Obesity appears to play no role in type 1 diabetes pathogenesis *(14)*. *(g) MATERNAL DIABETES* : Offsprings of diabetic pregnancies including gestational diabetes are often large and heavy at birth, tend to develop obesity in childhood and are at high risk of developing type 2 diabetes at an early age. Those born to mothers after they have developed diabetes have a three-fold higher risk of developing diabetes than those born before. Maternal diabetes associated with intrauterine growth retardation and low birth weight, when associated with rapid growth catch-up later on, appears to increase the risk of subsequent diabetes in the child *(6)*.

3. ENVIRONMENTAL RISK FACTORS

Susceptibility to diabetes appears to be unmasked by a number of environmental factors acting on genetically susceptible individuals. They include : *(a) SEDENTARY LIFESTYLE* : Sedentary life style appears to be an important risk factor for the development of type 2 diabetes. Lack of exercise may alter the interaction between insulin and its receptors and subsequently lead to type 2 diabetes *(11)*. *(b) DIET* : A high saturated fat intake has been associated with a higher risk of impaired glucose tolerance, and higher fasting glucose and insulin levels *(6)*. Higher proportions of saturated fatty acids in serum lipid or muscle phospholipid have been associated with higher fasting insulin, lower insulin sensitivity and a higher risk of type 2 diabetes. Higher unsaturated fatty acids from vegetable sources and polyunsaturated fatty acids have been associated with reduced risk of type 2 diabetes and lower fasting and 2–hour glucose concentrations. Higher proportions of long-chain polyunsaturated fatty acids in skeletal muscle phospholipids have been associated with increased insulin sensitivity *(6)*. In human intervention studies, replacement of saturated by unsaturated fatty acids leads to improved glucose tolerence and enhanced insulin sensitivity. However, long chain polyunsaturated fatty acids do not appear to confer additional benefit over monounsaturated fatty acids. When total fat intake is high (greater than 37 per cent of total energy), altering the quality of dietary fat appears to have little effect *(15)*. *(c) DIETARY FIBRE* : In many controlled experimental studies, high intakes of dietary fibre have been shown to result in reduced blood glucose and insulin levels in people with type 2 diabetes and impaired glucose tolerance *(16)*. Moreover an increased intake of wholegrain cereals, vegetables and fruits (all rich in NSP) was a feature of diets in randomized controlled trials. Thus the evidence for a potential protective effect of dietary fibre appears strong. A minimum daily intake of 20 grams of dietary fibre is recommended *(6)*. Table 2 shows a summary of lifestyle

TABLE 2

Summary of strength of evidence on lifestyle factors and risk of developing type 2 diabetes

Evidence	Decreased risk	Increased risk
Convincing	Voluntary weight loss in overweight and obese people Physical activity	Overweight and obesity Abdominal obesity Physical inactivity Maternal diabetes[a]
Probable	NSP[1]	Saturated fats Intrauterine growth retardation
Possible	η-3 fatty acids Low glycaemic index foods Exclusive breast-feeding[b]	Total fat intake Trans-fatty acids
Insufficient	Vitamin E Chromium Magnesium Moderate alcohol	Excess alcohol

1 NSP = Non-starch Polysaccharides.
a Includes gestational diabetes.
b As a global public health recommendation, infants should be exclusively breast-fed for the first six months of life to achieve optimal growth, development and health.

Source : *(6)*

and dietary factors associated with diabetes. *(d) MALNUTRITION :* Malnutrition (PEM) in early infancy and childhood may result in partial failure of β–cell function. Damage to beta cells may well explain the associated impaired carbohydrate tolerance in kwashiorkor *(11). (e) ALCOHOL :* Excessive intake of alcohol can increase the risk of diabetes by damaging the pancreas and liver and by promoting obesity *(11). (f) VIRAL INFECTIONS:* Among the viruses that have been implicated are rubella, mumps, and human coxsackie virus B4. Viral infections may trigger in immunogenetically susceptible people a sequence of events resulting in β–cell destruction. *(g) CHEMICAL AGENTS :* A number of chemical agents are known to be toxic to beta cells, e.g., alloxan, streptozotocin, the rodenticide VALCOR, etc *(17).* A high intake of cyanide producing foods (e.g., cassava and certain beans) may also have toxic effects on β–cells. *(h) STRESS :* Surgery, trauma, and stress of situations, internal or external, may "bring out" the disease. *(i) OTHER FACTORS :* High and low rates of diabetes have been linked to a number of social factors such as occupation, marital status, religion, economic status, education, urbanization and changes in life style which are elements of what is broadly known as **social class.** One of the most important epidemiological features of diabetes is that it is now common in the lower social classes whereas 50 years ago, the gradient was the reverse. One reason could be rapid changes in lifestyle in lower classes.

SCREENING FOR DIABETES

In the past, the commonest approach to diabetes screening was a preliminary, semi–quantitative test for glucose in a urine sample, followed by an oral glucose tolerance test for those found to have glycosuria. The underlying assumption is that early detection and effective control of hyperglycaemia in asymptomatic diabetics reduces morbidity.

1. Urine examination

Urine test for glucose, 2 hours after a meal, is commonly used in medical practice for detecting cases of diabetes. All those with glycosuria are considered diabetic unless otherwise proved by a standard oral glucose tolerance test. Most studies now confirm that although glucose is found in urine in the most severe cases of diabetes, it is often absent in milder forms of the disease, and such cases are likely to be missed by urine test. This is known as lack of "sensitivity". To be more precise, the sensitivity of the test (i.e., proportion of people with disease who have a positive test) varies between 10–50 per cent. The lack of sensitivity means that many diabetics would have been missed if this had been the only test. That is, the test yields too many "false-negatives". Further, glycosuria may be found in perfectly normal people; this gives rise to "false-positives". Since the specificity of the test is over 90 per cent, the yield of false-positives is not very high. For these reasons, urine testing is not considered an appropriate tool for case-finding or epidemiological surveys of the population *(11).*

2. Blood sugar testing

Because of the inadequacies of urine examination, "standard oral glucose test" remains the cornerstone of diagnosis of diabetes. Mass screening programmes have used glucose measurements of fasting, postprandial or random blood sample. The measurement of glucose levels in random blood samples is considered unsatisfactory for epidemiological use; at the most, it can give only a crude estimate of the frequency of diabetes in a population *(11).* The fasting value alone is considered less reliable since true fasting cannot be assured and spurious diagnosis of diabetes may more readily occur. Therefore, for epidemiological purposes, the 2–hour value after 75 g oral glucose may be used either alone or with the fasting value *(11).* Automated biochemistry has now made it possible to screen thousands of samples for glucose estimation. The criteria for the diagnosis of diabetes, proposed by WHO, are given in Table 3.

TABLE 3

The WHO recommendations for the diagnostic criteria for diabetes (2019)

Measurement	Diagnostic cut-off value
Fasting venous or capillary* plasma glucose	≥7.0 mmol/L (126 mg/dL)
2-hour post-load venous plasma glucose	≥11.1 mol/L (200 mg/dL)
2-hour post-load capillary** plasma glucose	≥12.2 mmol/L (220 mg/dL)
Random plasma glucose	≥11.1 mmol/L (200 mg/dL)
HbA1c***	6.5% (48 mmol/mol)

* Overnight fast of 8–14 hours.
** If laboratory measurement is not available, point of care ("finger stick") devices can be used (they report glucose values in capillary plasma).
*** Plasma glucose is preferred in people with symptoms who are suspected of having type 1 diabetes.

Source : *(1)*

Target population

Screening of the whole population for diabetes is not considered a rewarding exercise *(18, 19)*. However, screening of "high-risk" groups is considered more appropriate. These groups are: (i) those in the age group 40 and over; (ii) those with a family history of diabetes; (iii) the obese; (iv) women who have had a baby weighing more than 4.5 kg (or 3.5 kg in constitutionally small populations); (v) women who show excess weight gain during pregnancy; and (vi) patients with premature atherosclerosis.

PREVENTION AND CARE

1. Primary prevention

Two strategies for primary prevention have been suggested: (a) population strategy, and (b) high-risk strategy *(11)*.

a. POPULATION STRATEGY

The scope for primary prevention of type 1 diabetes is limited on the basis of current knowledge and is probably not appropriate *(11)*. However, the development of prevention programmes for type 2 diabetes based on elimination of environmental risk factors is possible. There is pressing need for **primordial prevention** – that is, prevention of the emergence of risk factors in countries in which they have not yet appeared. The preventive measures comprise maintenance of normal body weight through adoption of healthy nutritional habits and physical exercise. The nutritional habits include an adequate protein intake, a high intake of dietary fibre and avoidance of sweet foods. Elimination of other less well defined factors such as protein deficiency and food toxins may be considered in some populations. These measures should be fully integrated into other community–based programmes for the prevention of non-communicable diseases (e.g., coronary heart disease).

b. HIGH-RISK STRATEGY

There is no special high-risk strategy for type 1 diabetes. At present, there is no practical justification for genetic counselling as a method of prevention *(11)*.

Since NIDDM appears to be linked with sedentary life–style, over-nutrition and obesity, correction of these may reduce the risk of diabetes and its complications. Since alcohol can indirectly increase the risk of diabetes, it should be avoided. Subjects at risk should avoid diabetogenic drugs like oral contraceptives. It is wise to reduce factors that promote atherosclerosis, e.g., smoking, high blood pressure, elevated cholesterol and high triglyceride levels. These programmes may most effectively be directed at target population groups.

2. Secondary prevention

When diabetes is detected, it must be adequately treated. The aims of treatment are : (a) to maintain blood glucose levels as close within the normal limits as is practicable (see Table 3), and (b) to maintain ideal body weight. Treatment is based on (a) diet alone – small balanced meals more frequently, (b) diet and oral antidiabetic drugs, or (c) diet and insulin. Good control of blood glucose protects against the development of complications. Please see in chapter 10 "Nutrition and health" under title "Nutritional factors in selected diseases" for details.

Proper management of the diabetic is most important to prevent complications. Routine checking of blood sugar, of urine for proteins and ketones, of blood pressure, visual acuity and weight should be done periodically. The feet should be examined for any defective blood circulation (Doppler ultrasound probes are advised), loss of sensation and the health of the skin. Primary health care is of great importance to diabetic patients since most care is obtained at this level.

Glycosylated haemoglobin : There should be an estimation of glycated (glycosylated) haemoglobin at half–yearly intervals. This test provides a long-term index of glucose control. This test is based on the following rationale: glucose in the blood is complexed to a certain fraction of haemoglobin to an extent proportional to the blood glucose concentration. The percentage of such glycosylated haemoglobin reflects the mean blood glucose levels during the red cell life-time (i.e., about the previous 2–3 months) *(20)*.

Self-care : A crucial element in secondary prevention is self care. That is, the diabetic should take a major responsibility for his own care with medical guidance – e.g., adherence to diet and drug regimens, examination of his own urine and where possible blood glucose monitoring; self administration of insulin, abstinence from alcohol, maintenance of optimum weight, attending periodic check–ups, recognition of symptoms associated with glycosuria and hypoglycaemia, etc.

Table 4 shows some of the individual interventions in diabetes with evidence of efficacy.

Home blood glucose monitoring : Assessment of control has been greatly aided by the recent facility of immediate, reasonably accurate, capillary blood glucose measurements either by one of the many meters now available or the direct reading Haemoglucotest strips *(21)*.

The patient should carry an identification card showing his name, address, telephone number (if any) and the details of treatment he is receiving. In short, he must have a working knowledge of diabetes. All these mean education of patients and their families to optimize the effectiveness of primary health care services.

TABLE 4

Individual interventions in diabetes with evidence of efficacy

Interventions with evidence of efficacy	Benefit
Lifestyle interventions for preventing type 2 diabetes in people of high risk	Reduction of 35–58% in incidence
Metformin for preventing type 2 diabetes for people at high risk	Reduction of 25–31% in incidence
Glycaemic control in people with HbA1c greater than 9%	Reduction of 30% in microvascular disease per 1 percent drop in HbA1c
Blood pressure control in people whose pressure is higher than 130/80 mmHg	Reduction of 35% in macrovascular and microvascular disease per 10 mmHg drop in blood pressure
Annual eye examinations	Reduction of 60 to 70% in serious vision loss
Foot care in people with high risk of ulcers	Reduction of 50 to 60% in serious foot disease
Angiotensin converting enzyme inhibitor use in all people with diabetes	Reduction of 42% in nephropathy; 22% drop in cardiovascular disease

Source : *(5)*

3. Tertiary prevention

Diabetes is major cause of disability through its complications, e.g., blindness, kidney failure, coronary thrombosis, gangrene of the lower extremities, etc. The main objective at the tertiary level is to organize specialized clinics (Diabetic clinics) and units capable of providing diagnostic and management skills of a high order. There is a great need to establish such clinics in large towns and cities *(22)*. The tertiary level should also be involved in basic, clinical and epidemiological research. It has also been recommended that local and national registries for diabetics should be established *(11)*.

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OBESITY

Obesity may be defined as an abnormal growth of the adipose tissue due to an enlargement of fat cell size (hypertrophic obesity) or an increase in fat cell number (hyperplastic obesity) or a combination of both *(1)*. Obesity is often expressed in terms of body mass index (BMI) (see Table 1). Overweight is usually due to obesity but can arise from other causes such as abnormal muscle development or fluid retention *(2)*.

However, obese individuals differ not only in the amount of excess fat that they store, but also in the regional distribution of the fat within the body. The distribution of fat induced by the weight gain affects the risk associated with obesity, and the kind of disease that results. It is useful therefore, to be able to distinguish between those at

TABLE 1

Adult weights and heights corresponding to recommended cut-off values for body mass index

	BMI							
	16.0	17.0	18.5	20.0	22.0	25.0	30.0	40.0
Height (cm)	Thinness					Overweight		
	Body weight (kg)							
140	31.4	33.3	36.2	39.2	43.1	49.0	58.8	78.4
142	32.3	34.3	37.3	40.3	44.4	50.4	60.5	80.7
144	33.2	35.3	38.4	41.5	45.6	51.8	62.2	82.9
146	34.1	36.2	39.4	42.6	46.9	53.3	63.9	85.3
148	35.0	37.2	40.5	43.8	48.2	54.8	65.7	87.6
150	36.0	38.2	41.6	45.0	49.5	56.3	67.5	90.0
152	37.0	39.3	42.7	46.2	50.8	57.8	69.3	92.4
154	37.9	40.3	43.9	47.4	52.2	59.3	71.1	94.9
156	38.9	41.4	45.0	48.7	53.5	60.8	73.0	97.3
158.	39.9	42.4	46.2	49.9	54.9	62.4	74.9	99.9
160	41.0	43.5	47.4	51.2	56.3	64.0	76.8	102.4
162	42.0	44.6	48.3	52.5	57.7	65.6	78.7	105.0
164	43.0	45.7	49.8	53.8	59.2	67.2	80.7	107.6
166	44.1	46.8	51.0	55.1	60.6	68.9	82.7	110.2
168	45.2	48.0	52.2	56.4	62.1	70.6	84.7	112.9
170	46.2	49.1	53.5	57.8	63.6	72.3	86.7	115.6
172	47.3	50.3	54.7	59.2	65.1	74.0	88.8	118.3
174	48.4	51.5	56.0	60.6	66.6	75.7	90.8	121.1
176	49.6	52.7	57.3	62.0	68.1	77.4	92.9	123.9
178	50.7	53.9	58.6	63.4	69.7	79.2	95.0	126.7
180	51.9	55.1	59.9	64.8	71.3	81.0	97.2	129.6
182	53.0	56.3	61.3	66.2	72.9	82.8	99.4	132.5
184	54.2	57.6	62.6	67.7	74.5	84.6	101.6	135.4
186	55.5	58.8	64.0	69.2	76.1	86.5	103.8	138.4
188	56.6	60.1	65.4	70.7	77.8	88.4	106.0	141.4
190	57.8	61.4	66.8	72.2	79.4	90.3	108.3	144.4

For easy reference and calculation of BMI values corresponding to recommended cut-offs, first find the height of the individual in the left hand column. The weights given in the row for that height correspond to various recommended cut-off values for adult BMI. Weight for two normal BMI values are also included.

Source : *(5)*

increased risk as a result of "abdominal fat distribution" or "android obesity" from those with the less serious "gynoid" fat distribution, in which fat is more evenly and peripherally distributed around the body.

Prevalence

Obesity is perhaps the most prevalent form of malnutrition. As a chronic disease, prevalent in both developed and developing countries, and affecting children as well as adults, it is now so common that it is replacing the more traditional public health concerns including undernutrition. It is one of the most significant contributors to ill health. For industrialized countries, it has been suggested that such increase in body weight have been caused primarily by reduced levels of physical activity, rather than by changes in food intake or by other factors. It is extremely difficult to assess the size of the problem and compare the prevalence rates in different countries as no exact figures are available and also because the definitions of obesity are not standardized.

Overweight and obesity are the fifth leading risk of global deaths. Worldwide, obesity has more than doubled since

1980. In 2022, more than 2.5 billion adults, 18 years and older, were overweight. Of these over 650 million men and women were obese *(3)*.

In 2022, more than 37 million children under 5 years of age were overweight or obese. Once considered a high-income country problem, overweight and obesity are now rising in low-and middle-income countries, particularly in urban settings *(3)*. Close to 30 million overweight children are living in developing and 10 million in developed countries *(3)*. Childhood obesity is associated with a higher chance of obesity, premature death and disability in adulthood. In addition, it is associated with future risk of increased breathing difficulties, increased risk of fractures, hypertension, early markers of cardiovascular disease, insulin resistance and psychological effects.

At least 3.4 million adults die each year as a result of being overweight or obese. In addition, 44 per cent of the diabetes burden, 23 per cent of ischaemic heart disease burden and between 7 to 41 per cent of certain cancer burdens are attributable to overweight and obesity *(3)*. Overweight and obesity are linked to more deaths worldwide than underweight.

INDIA

The National Family Health Survey-5 (2019–2021) calculated Body Mass Index (BMI) of men and women (aged 15–49 years) interviewed to know the trend of nutritional status of the population. The trend of obesity and overweight persons are as follows :

(a) 19 per cent of women age 15–49 are thin, 24 per cent are overweight or obese, and 57 per cent are in the normal range. The patterns by background characteristics are *(4)* :

- The proportion of thin women decreases with age, from 40 per cent for women age 15–19 to 9 per cent for women age 40–49, whereas the proportion of overweight or obese women increases steadily, from 5 per cent of women age 15–49 to 37 per cent of women age 40–49.
- The proportion of thin women is higher in rural areas (21%) than in urban areas (13%) and the reverse is observed for the prevalence of overweight or obesity (33% in urban areas and 20% in rural areas).
- There is a steady decrease in the proportion of thin women as household wealth increases (from 28% in the lowest wealth quintile to 10% in the highest wealth quintile), which is accompanied by a steady increase in the proportion of overweight or obese women (from 10% in the lowest wealth quintile to 39% in the highest wealth quintile).
- The highest proportion of thin women is observed in Jharkhand and Bihar (26% each), followed by Gujarat and Dadra & Nagar Haveli and Daman & Diu (25% each). The highest proportion of overweight or obese women is found in Puducherry (46%), Chandigarh (44%), Delhi, Tamil Nadu, and Punjab (41% each), and Kerala and Andaman & Nicobar Islands (38% each).

(b) 16 per cent of men age 15–49 are thin, 23 per cent are overweight and obese, and 61 per cent have BMI in normal range. The patterns by background characteristics are *(4)* :

- The patterns of nutritional status by background characteristics among men are similar to those among women.
- The proportion of thin men decreases with age, from 41 per cent of men age 15–19 to 8 per cent of men age 40–49, whereas the proportion of overweight or obese men increases from 7 per cent of men age 15–19 to 32 per cent of men age 40–49.
- The proportion of thin men is higher in rural areas (18%) than in urban areas (13%), whereas 30 per cent of men are overweight or obese in urban areas, compared with 19 per cent in rural areas.
- There is steady decrease in the proportion of thin men with increasing household wealth (from 24% in the lowest wealth quintile to 9% in the highest wealth quintile), and a steady increase in the proportion of overweight or obese men (from 10% in the lowest wealth quintile to 37% in the highest wealth quintile).
- The proportion of thin men is highest in Bihar (22%), followed by Madhya Pradesh and Gujarat (21% each). The highest proportion of overweight or obese men is observed in Andaman & Nicobar Island (45%), followed by Puducherry (43%) and Lakshadweep (41%).

As obesity is a key risk factor in natural history of other chronic and non-communicable diseases, the typical time sequence of emergence of chronic diseases following the increased prevalence of obesity is important in public health planning. The first adverse effects of obesity to emerge in population in transition are hypertension, hyperlipidaemia and glucose intolerence, while coronary heart disease and the long-term complications of diabetes, such as renal failure begin to emerge several years (or decades) later *(6)*. It is matter of time before same mortality rates for such diseases will be seen in developing countries as those prevailing 30 years ago in industrialized countries *(7)*.

Epidemiological determinants

The aetiology of obesity is complex, and is one of multiple causation :

(a) AGE : Obesity can occur at any age, and generally increases with age. Infants with excessive weight gain have an increased incidence of obesity in later life *(8)*. About one-third of obese adults have been so since childhood *(1)*. It has been well established that most adipose cells are formed early in life and the obese infant lays down more of these cells (hyperplastic obesity) than the normal infant. Hyperplastic obesity in adults is extremely difficult to treat with conventional methods.

(b) SEX : Women generally have higher rate of obesity than men, although men may have higher rates of overweight. In the Framingham, USA study, men were found to gain most weight between the ages of 29 and 35 years, while women gain most between 45 and 49 years of age *(9)*, i.e. at menopausal age. It has been claimed that woman's BMI increases with successive pregnancies. The recent evidence suggested that this increase is likely to be, on an average, about 1 kg per pregnancy. On the other hand in many developing countries, consecutive pregnancies at short intervals are often associated with weight loss rather than weight gain *(7)*.

(c) GENETIC FACTORS : There is a genetic component in the aetiology of obesity. Twin studies have shown a close

correlation between the weights of identical twins even when they are reared in dissimilar environments *(10)*. The profile of fat distribution is also characterized by a significant heritability level of the order of about 50 per cent of the total human variation. Recent studies have shown that the amount of abdominal fat was influenced by a genetic component accounting for 50–60 per cent of the individual differences *(7)*.

(d) PHYSICAL INACTIVITY : There is convincing evidence that regular physical activity is protective against unhealthy weight gain. Where as sedentary lifestyle particularly sedentary occupation and inactive recreation such as watching television promote it, physical activity and physical fitness are important modifiers of mortality and morbildity related to overweight and obesity *(11)*. In some individuals a major reduction in activity without the compensatory decrease in habitual energy intake may be the major cause of increased obesity, e.g. in athletes when they retire and in young people who sustain injuries etc. Physical inactivity may cause obesity, which in turn restricts activity. This is a vicious circle. It is the reduced energy output that is probably more important in the aetiology of obesity than used to be thought *(10)*.

(e) SOCIO-ECONOMIC STATUS : The relationship of obesity to social class has been studied in some detail. There is a clear direct relationship between socio-economic status and obesity. Within some affluent countries, however, obesity has been found to be more prevalent in the lower socio-economic groups.

(f) EATING HABITS : Eating habits (e.g., eating in between meals, preference to sweets, refined foods and fats) are established very early in life. The composition of the diet, the periodicity with which it is eaten and the amount of energy derived from it are all relevant to the aetiology of obesity. A diet containing more energy than needed may lead to prolonged post-prandial hyperlipidaemia and to deposition of triglycerides in the adipose tissue resulting in obesity *(12)*. Nowadays television and print media is playing an important role in producing obesity by heavy advertisement of fast food outlets of energy-dense, micronutrient poor food and beverages (usually classified under the "eat least" category in diet guidelines) of multinational corporations, which influence the daily eating habits. The consumer demand by itself may be influenced by advertising, marketing, culture, fashion and convenience *(7)*. It has been calculated that a child whose energy requirement is 2000 kcal/day and who consumes 100 kcal/day extra will gain about 5 kg a year *(9)*. The accumulation of one kilo of fat corresponds to 7,700 kcal of energy *(14)*.

(g) PSYCHOSOCIAL FACTORS : Psychosocial factors (e.g., emotional disturbances) are deeply involved in the aetiology of obesity. Overeating may be a symptom of depression, anxiety, frustration and loneliness in childhood as it is in adult life. Excessively obese individuals are usually withdrawn, self-conscious, lonely and secret eaters. An insight into the circumstances in which the obesity has developed is essential for planning the most suitable management.

(h) FAMILIAL TENDENCY : Obesity frequently runs in families (obese parents frequently having obese children), but this is not necessarily explained solely by the influence of genes.

(i) ENDOCRINE FACTORS : These may be involved in occasional cases, e.g., Cushing's syndrome, growth hormone deficiency.

(j) ALCOHOL : A recent review of studies concluded that the relationship between alcohol consumption and adiposity was generally positive for men and negative for women *(6)*.

(k) EDUCATION : In most affluent societies, there is an inverse relationship between educational level and prevalence of overweight *(5)*.

(l) SMOKING : Reports that the use of tobacco lowers body weight began to appear more than 100 years ago, but detailed studies have been reported only during the past 10 years or so. In most populations, smokers weigh somewhat less than ex-smokers; individuals who have never smoked fall somewhat between the two.

(m) ETHNICITY : Ethnic groups in many industrialized countries appear to be especially susceptible to the development of obesity and its complications. Evidence suggests that this may be due to a genetic predisposition to obesity that only become apparent when such groups are exposed to a more affluent lifestyle *(7)*.

(n) DRUGS : Use of certain drugs, e.g., cortico-steroids, contraceptives, insulin, β-adrenergic blockers, etc. can promote weight gain *(7)*.

Use of BMI to classify obesity

Body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in metres (kg/m^2).

For example, an adult who weighs 70 kg and whose height is 1.75 m will have a BMI of 22.9 :

$$BMI = 70\ (kg)/1.75^2\ (m^2) = 22.9$$

The classification of overweight and obesity, according to BMI, is shown in Table 2. Obesity is classified as a BMI ≥ 30.0. The classification shown is in agreement with that recommended by WHO *(11)*, but includes an additional subdivision at BMI 35.0–39.9 in recognition of the fact that management options for dealing with obesity differ above a BMI of 35. The WHO classification is based primarily on the association between BMI and mortality.

TABLE 2

Classification of adults according to BMI

Classification	BMI	Risk of comorbidities
Underweight	< 18.50	Low (but risk of other clinical problems increased)
Normal range	18.50-24.99	Average
Overweight :	≥ 25.00	
Pre-obese	25.00-29.99	Increased
Obese class I	30.00-34.99	Moderate
Obese class II	35.00-39.99	Severe
Obese class III	≥ 40.00	Very severe

Source : *(11)*

These BMI values are age-independent and the same for both sexes. The table shows a simplistic relationship between BMI and the risk of comorbidity, which can be affected by a range of factors, including the nature of the diet, ethnic group and activity level. The risks associated

with increasing BMI are continuous and graded and begin at a BMI above 25.

Although it can generally be assumed that individuals with a BMI of 30 or above have an excess fat mass in their body, BMI does not distinguish between weight associated with muscle and weight associated with fat. As a result, the relationship between BMI and body fat content varies according to body build and proportion, and it has been shown repeatedly that a given BMI may not correspond to the same degree of fatness across populations. Polynesians, for example, tend to have a lower fat percentage than Caucasian Australians at an identical BMI. In addition, the percentage of body fat mass increases with age up to 60–65 years in both sexes, and is higher in women than in men of equivalent BMI. In cross-sectional comparisons, therefore, BMI values should be interpreted with caution if estimates of body fat are required.

INTRA-ABDOMINAL (CENTRAL) FAT ACCUMULATION AND INCREASED RISK

Compared with subcutaneous adipose tissue, intra-abdominal adipose tissue has more cells per unit mass, higher blood flow, more glucocorticoid (cortisol) receptors, probably more androgen (testosterone) receptors, and greater catecholamine-induced lipolysis. These differences make intra-abdominal adipose tissue more susceptible to both normal stimulation and changes in lipid accumulation and metabolism. Furthermore, intra-abdominal adipocytes are located upstream from liver in the portal circulation. This means that there is a marked increase in the flux of nonesterified fatty acid to the liver *via* the portal blood in patients with abdominal obesity.

There is good evidence that abdominal obesity is important in the development of insulin resistance, and in the metabolic syndrome (hyperinsulinaemia, dyslipidaemia, glucose intolerance, and hypertension) that link obesity with CHD *(7)*. Premenopausal women have quantitatively more lipoprotein lipase (LPL) and higher LPL activity in the gluteal and femoral subcutaneous regions, which contain fat cells larger than those in men, but these differences disappear after menopause *(7)*.

Assessment of obesity

Before we consider assessment of obesity, it will be useful to first look at body composition as under;

a. the active mass (muscle, liver, heart etc.)
b. the fatty mass (fat)
c. the extracellular fluid (blood, lymph, etc.)
d. the connective tissue (skin, bones, connective tissue)

Structurally speaking, the state of obesity is characterized by an increase in the fatty mass at the expense of the other parts of the body. The water content of the body is never increased in case of obesity.

Although obesity can easily be identified at first sight, a precise assessment requires measurements and reference standards. The most widely used criteria are :

1. BODY WEIGHT

Body weight, though not an accurate measure of excess fat, is a widely used index. In epidemiological studies it is conventional to accept + 2 SD (standard deviations) from the median weight for height as a cut-off point for overweight and + 3 SD for obesity.

For adults, some people calculate various other indicators such as *(9)* :

(1) *Body mass index* (Quetelet's index)

$$= \frac{\text{Weight (kg)}}{\text{Height}^2\text{(m)}}$$

(2) *Ponderal Index*

Ponderal means estimated or ascertained by weight. The ponderal index is an improved version of body mass index.

PI = Weight / height^3
PI (adult) = Weight (kg) / height (m)^3
PI (child) = Weight (g) × 100 /length (cm)^3

Ponderal index normal range is as follows :

Ponderal value	Interpretation for adults
8–11	under weight
11–15	normal
15–17	over weight or pre obese
>17	obese
2.2–3.0	**Interpretation for newborn**

Source : *(9A)*

(3) *Brocca index*

= Height (cm) *minus* 100

For example, if a person's height is 160 cm, his ideal weight is (160–100) = 60 kg

(4) *Corpulence index*

$$= \frac{\text{Actual weight}}{\text{Desirable weight}}$$

This should not exceed 1.2

The body mass index (BMI) and the Brocca index are widely used. A FAO/WHO/UNU Report gives the much needed reference tables for body mass index (see Table 1) which can be used internationally as reference standards for assessing the prevalence of obesity in a community.

2. SKINFOLD THICKNESS

A large proportion of total body fat is located just under the skin. Since it is most accessible, the method most used is the measurement of skinfold thickness. It is a rapid and "non–invasive" method for assessing body fat. Several varieties of callipers (e.g., Harpenden skin callipers) are available for the purpose. The measurement may be taken at all the four sites – mid-triceps, biceps, subscapular and suprailiac regions. The sum of the measurements should be less than 40 mm in boys and 50 mm in girls *(14)*. Unfortunately standards for subcutaneous fat do not exist for comparison. Further, in extreme obesity, measurements may be impossible. The main drawback of skinfold measurements is their poor repeatability.

3. WAIST CIRCUMFERENCE AND WAIST : HIP RATIO (WHR)

Waist circumference is measured at the mid point between the lower border of the rib cage and the iliac crest. It is a convenient and simple measurement that is unrelated to height, correlates closely with BMI and WHR and is an approximate index of intra-abdominal fat mass and total body fat. Changes in waist circumference reflect changes in risk factors for cardiovascular disease and other forms of

chronic diseases. There is an increased risk of metabolic complications for men with a waist circumference ≥ 102 cm, and women with a waist circumference ≥ 88 cm *(11)*.

According to WHO guidelines, it has become accepted that a high WHR (> 0.9 in men and > 0.85 in women) indicates abdominal fat accumulation *(4)*.

4. OTHERS

In addition to the above, three well-established and more accurate measurements are used for the estimation of body fat. They are measurement of total body water, of total body potassium and of body density. The techniques involved are relatively complex and cannot be used for routine clinical purposes or for epidemiological studies *(7)*. The introduction of measuring fat cells has opened up a new field in obesity research.

Hazards of obesity

Obesity is a health hazard and a detriment to well-being which is reflected in the increased morbidity and mortality: (a) INCREASED MORBIDITY : Obesity is a positive risk factor in the development of hypertension, diabetes, gall bladder disease and coronary heart disease and certain types of cancers, especially the hormonally related and large bowel cancers. There are in addition, several associated diseases, which, although not usually fatal, cause a great deal of morbidity in the community, e.g., varicose veins, abdominal hernia, osteoarthritis of the knees, hips and lumbar spine, flat feet and psychological stresses particularly during adolescence. Obese persons are exposed to increased risk from surgery. Obesity may lead to lowered fertility. Table 3 shows the relative risk of health problems associated with obesity. (b) INCREASED MORTALITY : The Framingham Heart Study in United States showed a dramatic increase in sudden death among men more than 20 per cent overweight as compared with those with normal weight. The increased mortality is brought about mainly by the increased incidence of hypertension and coronary heart disease. There is also an excess number of deaths from renal diseases. Obesity lowers life expectancy. More information is needed about the relationship between different degrees of obesity and morbidity and mortality. Please see in chapter 11 under heading "Nutritional factors in selected diseases" for dietary factors of obesity.

TABLE 3

Relative risk of health problems associated with obesity[a]

Greatly increased	Moderately increased	Slightly increased
Type 2 diabetes	CHD	Cancer (breast cancer in postmenopausal women, endometrial cancer, colon cancer)
Gall bladder disease	Hypertension	Reproductive hormone abnormalities
Dyslipidaemia	Osteoarthritis (knees)	Polycystic ovary syndrome
Insulin resistance	Hyperuricaemia and gout	Impaired fertility
Breathlessness		Low back pain due to obesity
Sleep apnea		Increased risk of anaesthesia complications
		Fetal defects associated with maternal obesity

[a] All relative risk values are approximate.

Source : *(7)*

Prevention and control

Weight control is widely defined as approaches to maintaining weight within the 'healthy' (i.e. 'normal' or 'acceptable') range of body mass index of 18.5 to 24.9 kg/m^2 throughout adulthood (WHO Expert Committee, 1995). It should also include prevention of weight gain of more than 5 kg in all people. In those who are already overweight, a reduction of 5–10 per cent of body weight is recommended as an initial goal *(6)*.

Prevention of obesity should begin in early childhood. Obesity is harder to treat in adults than it is in children. The control of obesity centres around weight reduction. This can be achieved by dietary changes, increased physical activity and a combination of both. (a) DIETARY CHANGES: The following dietary principles apply both to prevention and treatment : the proportion of energy-dense foods such as simple carbohydrates and fats should be reduced; the fibre content in the diet should be increased through the consumption of common un-refined foods; adequate levels of essential nutrients in the low energy diets (most conventional diets for weight reduction are based on 1000 kcal daily model for an adult) should be ensured, and reducing diets should be as close as possible to existing nutritional patterns *(15)*. The most basic consideration is that the food energy intake should not be greater than what is necessary for energy expenditure. It requires modification of the patient's behaviour and strong motivation to lose weight and maintain ideal weight. Unfortunately, most attempts to reduce weight in obese persons by dietary advice remain unsuccessful. (b) INCREASED PHYSICAL ACTIVITY: This is an important part of weight reducing programme. Regular physical exercise is the key to an increased energy expenditure. (c) OTHERS: Appetite suppressing drugs have been tried in the control of obesity. They are generally inadequate to produce massive weight loss in severely obese patients. Surgical treatment (e.g., gastric bypass, gastroplasty, jaw-wiring, to eliminate the eating of solid food have all been tried with limited success *(16)*. In short, one should not expect quick or even tangible results in all cases from obesity prevention programmes. Health education has an important role to play in teaching the people how to reduce overweight and prevent obesity. A fruitful approach will be to identify those children who are at risk of becoming obese and find way of preventing it.

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VISUAL IMPAIRMENT AND BLINDNESS

A compilation published by WHO in 1966 *(1)* lists 65 definitions of blindness. As might be expected the definitions differed widely. Terms such as total blindness, economic blindness, and social blindness were in vogue. The 25th World Health Assembly in 1972 noted the complexity of the problem and considered the need for a generally accepted definition of blindness and visual impairment for national and international comparability. Taking into consideration existing definitions, the WHO proposed a uniform criterion and defined blindness as "visual acuity of less than 3/60 (Snellen) or its equivalent" *(2)*.

The International Classification of Disease 11 (2018) classifies vision impairment into two groups, distance and near presenting vision impairment.

Distance vision impairment:

Mild	–	Presenting visual acuity worse than 6/12
Moderate	–	Presenting visual acuity worse than 6/18
Severe	–	Presenting visual acuity worse than 6/60
Blindness	–	Presenting visual acuity worse than 3/60

Near vision impairment :

Presenting near vision acuity worse than N6 or M0.8 at 40 cm with existing correction.

A person's experience of vision impairment varies depending upon many different factors. This includes, for example, the availability of prevention and treatment interventions, access to vision rehabilitation (including assistive products such as glasses or white canes), and whether the person experiences problems with inaccessible buildings, transport information etc. *(3)*.

The problem

WORLD

Globally, 2.2 billion people have a near or distance visual impairment. In at least 1 billion people impairment could have been prevented or has yet to be addressed. This 1 billion people includes those with moderate or severe distance vision impairment or blindness due to unaddressed refractive error (88.4 million), cataract (94 million), glaucoma (7.7 million), corneal opacities (4.2 million), diabetic retinopathy (3.2 million), and trachoma (2 million), as well as near vision impairment caused by unaddressed presbyopia (826 million) *(4)*.

About 80 per cent of blindness is avoidable (treatable or potentially preventable). However, a large proportion of those affected remain blind for want of access to affordable eye care. Blindness leads not only to reduced economic and social status but may also result in premature death. The major causes of moderate to severe vision impairment are as follows *(5)* :

1. Uncorrected refractive errors, 53 per cent;
2. Un-operated cataract, 25 per cent;
3. Age-related macular degeneration, 4 per cent;
4. Glaucoma, 2 per cent; and
5. Diabetic retinopathy 1 per cent.

The major causes of blindness are *(5)*.

1. Un-operated cataract 35 per cent;
2. Un-corrected refractive error 21 per cent; and
3. Glaucoma 8 per cent.

About 82 per cent of all people who are visually impaired are aged 50 years and older, while this age group comprises about 20 per cent of the world's population. With an increasing elderly population in many countries, more people will be at risk of age-related visual impairment. An estimated 19 million children are visually impaired. Of these, 12 million children are visually impaired due to refractory errors, a condition that could be easily diagnosed and corrected. 1.4 million are irreversibly blind for the rest of their lives *(5)*.

The most frequent causes of blindness in developed countries are accidents, glaucoma, diabetes, vascular diseases (hypertension), cataract and degeneration of ocular tissues especially of the retina, and hereditary conditions.

In South–East Asia Region, cataract is the single most common cause of blindness being responsible for 50–80 per cent of all blindness. Uncorrected refractive errors are being increasingly recognized as a cause of blindness and low vision. Vitamin A deficiency, which has been responsible for most childhood blindness in the Region is gradually declining. The emerging causes of blindness include glaucoma, age-related macular degeneration, diabetic retinopathy, corneal ulcer and ocular trauma *(6)*.

Among the leading causes of childhood blindness in the region are xerophthalmia, congenital cataract, congenital glaucoma and optic atrophy due to meningitis, retinopathy of prematurity, and uncorrected refractive errors. Xerophthalmia is largely under control with vitamin A distribution in immunization programmes.

There are an estimated 3–4 million persons blind, due to corneal opacity. With declining incidence of trachoma and xerophthalmia, the consequences of ocular trauma and corneal ulceration are emerging as important causes. According to an estimate, 6.5 million people are affected with, and 1.3 million eyes become blind due to corneal ulcer every year in the region *(6)*. Trachoma remains an important cause in pockets in some countries although its importance as a cause of blindness has declined over the years *(7)*.

Overall, visual impairment worldwide has decreased since the early 1990s. This decrease is principally the result of a reduction of visual impairment from infectious diseases through public health action, overall socio-economic development, increased availability of eye care services and awareness of the general population about solution to the problems related to vision impairment (surgery, refraction devices, etc.). However, it is estimated that the number of people with vision impairment could triple due to population growth and ageing *(5)*.

INDIA

India has changed its over four-decade-old definition of blindness, bringing it in line with the WHO criteria. According to the new definition, a person who is unable to count fingers from a distance of three meters would be considered blind as against the earlier stipulation of six

meters, which was adopted in 1976. The notification in this regard has been issued by the Union Health Ministry.

According to this definition, the population of blind people in India will reduce from 1.20 crore (as per National Blindness Survey 2007 data) to 80 Lacs *(8)*.

The nomenclature of the programme is also changed from "National Programme for Control of Blindness" to "National Programme for Control of Blindness and visual impairment" *(8)*.

The prevalence of blindness according to rapid national survey on blindness 2006–2007 was 1.0 per cent. In the current survey (2015–2019) the projected prevalence rate is 0.36 per cent *(10)*.

The National Survey on Blindness 2015–19 conducted in the country recognized the main causes responsible for visual impairment and blindness. As shown in Table 1, the principal cause of blindness in India today is cataract, responsible for about 66.2 per cent of all cases. Cataract occurs more frequently with advancing age. Senile cataract occurs a decade earlier in India relative to Europe and America. Uncorrected refractive error are responsible for about 0.1 per cent of blindness; overall prevalence of glaucoma was about 5.5 per cent; posterior segment pathology accounts for about 5.9 per cent cases *(10)*. In a camp based study, glaucoma prevalence was found to be about 3.07 per cent with a slight female preponderance (males 2.9 per cent and females 3.19 per cent). Primary open angle glaucoma was more common (about 1.7 per cent) than primary angle closure glaucoma (0.73 per cent) *(9)*. In the others group, injuries as a cause of blindness accounts for 1.2 per cent *(11)*. There is evidence that injuries are on the increase due to increase in cottage industry (e.g. carpentry, black smithy, stone crushing, chiselling and hammering and chopping wood), and rapid industrialization in the country. The other causes in this group includes congenital disorder, uveitis, retina detachment, tumours, diabetes, hypertension, diseases of the nervous system, leprosy, etc.

TABLE 1
Causes of blindness in India
(2015–19 National survey on blindness)

Refractive error	0.1 per cent
Aphakia uncorrected	1.7 per cent
Cataract untreated	66.2 per cent
Cataract surgical complications	7.2 per cent
Trachomatous corneal opacity	0.8 per cent
Non-trachomatous corneal opacity	7.4 per cent
Phthisis	2.8 per cent
Glaucoma	5.5 per cent
Diabetic retinopathy	1.2 per cent
ARMD	0.7 per cent
Other posterior segment disease	5.9 per cent
All other globe/CNS abnormalities	0.5 per cent

Source : *(10)*

Retinopathy of prematurity (ROP) is emerging as an important cause of childhood blindness. With the advent of hyperbaric oxygen and opening of large number of private and governmnet NICUs, the survival of the premature babies (born before 30 weeks of gestation and 1500 grams of weight at birth) has improved considerably. These babies are at risk of developing ROP and there is dire necessity to create awareness not only in public but also amongst opthalmologists and paediatricians to detect and treat ROP in time.

Epidemiological determinants

(a) AGE : About 30 per cent of the blind in India are said to lose their eyesight before they reach the age of 20 years, and many under the age of 5 years. Refractive error, trachoma, conjunctivitis and malnutrition (vitamin A deficiency) are important causes of blindness among children and the younger age groups; cataract, refractive error, glaucoma and diabetes are causes of blindness in middle age; accidents and injuries can occur in all age groups, but more importantly in the age group 20 to 40 years. (b) SEX : A higher prevalence of blindness is reported in females than in males in India. This has been attributed to a higher prevalence of trachoma, conjunctivitis and cataract among females than in males *(12)*. (c) MALNUTRITION : Malnutrition as a cause of blindness was hardly recognized a few years ago. It is closely related not only with low vitamin A intake, but also with infectious diseases of childhood especially measles and diarrhoea (which precipitate malnutrition). In many cases protein energy malnutrition (PEM) is also associated with blindness. Severe blinding corneal destruction due to vitamin A deficiency (e.g., keratomalacia) is largely limited to the first 4–6 years of life and is especially frequent among those 6 months to 3 years of life. (d) OCCUPATION : It has long been recognized that people working in factories, workshops and cottage industries are prone to eye injuries because of exposure to dust, airborne particles, flying objects, gases, fumes, radiation (usually welding flash), electrical flash, etc. Many workers including doctors are known to have developed premature cataracts while exposed to X-rays, ultraviolet rays or heat waves. (e) SOCIAL CLASS : There is a close relationship between the incidence of blindness and socio-economic status. Surveys indicate that blindness is twice more prevalent in the poorer classes than in the well-to-do *(12)*. (f) SOCIAL FACTORS: Many people lose their eyesight because of meddlesome ophthalmology by quacks. The basic social factors are ignorance, poverty, low standard of personal and community hygiene, and inadequate health care services.

Changing concepts in eye health care

Recent years have witnessed a change from acute intervention (cure) typical of clinical ophthalmology to comprehensive eye-health care which includes the following concepts :

1. *Primary eye care*

One of the most significant developments in the field of eye health care over the last few years has been the concept of *primary eye care*, that is, the inclusion of an eye-care component in primary health care system. The idea of primary eye care, as one of the main ingredients of a primary health care approach to blindness, has rapidly gained acceptance the world over. It is today recognized as a model for eye care at the community level. The promotion and protection of eye health, together with on-the-spot treatment for the commonest eye diseases, are its cornerstones. The final objective of primary eye care is to increase the coverage and quality of eye health care through primary health care approach and thereby improve the utilization of existing resources.

2. *Epidemiological approach*

The epidemiological approach which involves studies at the population level has been recognized. It focuses, among other things, on the measurement of the incidence, prevalence of diseases and their risk factors. The local epidemiological situation will determine the action needed.

3. Team concept

In many developing countries, there is only one eye specialist for more than a million people. Increasingly, therefore, health care leans on the use of auxiliary health personnel to fill many gaps. In India this gap is filled by village health workers, ophthalmic assistants, multi-purpose workers, and voluntary agencies.

4. Establishment of national programmes

Another important development in connection with the prevention of blindness has been the establishment of national programmes. Many of these programmes were first started by voluntary agencies concerned with blindness prevention (e.g., eye camps) and some of them focused on a single disease, such as trachoma. The increasing recognition of the primary health care approach to blindness resulted in comprehensive national programmes for the prevention of blindness *(13)* from all causes.

Prevention of blindness

The concept of **avoidable blindness** (i.e., preventable or curable blindness) has gained increasing recognition during recent years. A great many of the causes of blindness lend themselves to prevention and/or control – whether by improving nutrition, by treating cases of infectious diseases, or by controlling the organisms which cause infection, or by improving safety conditions – particularly on the roads, at work or in the home *(14)*.

The components for action in national programmes for the prevention of blindness comprise the following :

1. INITIAL ASSESSMENT

The first step is to assess the magnitude, geographic distribution and causes of blindness within the country or region by prevalence surveys. This knowledge is essential for setting priorities and development of appropriate intervention programmes.

2. METHODS OF INTERVENTION *(15)*

(a) Primary eye care

A wide range of eye conditions (e.g., acute conjunctivitis, ophthalmia neonatorum, trachoma, superficial foreign bodies, xerophthalmia) can be treated/prevented at the grass-root level by locally trained primary health workers (e.g., village health guides, multi-purpose workers) who are the first to make contact with the community. For this purpose, they are provided with essential drugs such as topical tetracycline, vitamin A capsules, eye bandages, shields, etc. They are also trained to refer difficult cases (e.g., corneal ulcer, penetrating foreign bodies, painful eye conditions and infections which do not respond to treatment) to the nearest PHC or district hospital. Their activities also involve promotion of personal hygiene, sanitation, good dietary habits and safety in general. Currently, there is one village health guide for 1000 population and 2 multipurpose workers for 5000 population in India.

In short, primary eye care is based firmly in primary health care which is ".....essential health care.....made universally accessible to individuals and families in the community through their full participation and at a cost that the community and country can afford ...." (Article VI of the Declaration of Alma Ata, 1978).

(b) Secondary care

Secondary care involves definitive management of common blinding conditions such as cataract, trichiasis, entropion, ocular trauma, glaucoma, etc. This care is provided in PHCs and district hospitals where eye departments or eye clinics are established. The secondary care may involve the use of mobile eye clinics. For instance, cataract accounts for over 62 per cent of blindness in India. The eye camp approach to make cataract surgery available has been highly successful, and has received wide popular support. Apart from cataract operations, these camps undertake general health surveys for the early detection of visual defects as well as education of the masses. For mobile services to be effective, there must be good community participation in the programme. Adequate follow-up and evaluation must also be provided. The "mobile units", though valuable, lack permanence and are being utilized as part of a comprehensive strategy for eye care. The great advantage of this strategy is, it is problem-specific and makes the best use of local resources and provides inexpensive eye care to the population at the peripheral level *(16)*.

(c) Tertiary care

These services are usually established in the national or regional capitals and are often associated with Medical Colleges and Institutes of Medicine. They provide sophisticated eye care such as retinal detachment surgery, corneal grafting and other complex forms of management not available in secondary centres. The majority of States in India has passed the Corneal Grafting Acts which have helped the establishment of Eye Banks. Other measures of rehabilitation comprise education of the blind in special schools and utilization of their services in gainful employment. The central government has established National Institute for the Blind in Dehradun (U.P.) to work out new approaches and strategies for solving the problems of the blind.

(d) Specific programmes

(i) *Trachoma control* : Endemic trachoma and associated infections are a major cause of preventable blindness in many developing countries. Early diagnosis and treatment will cure trachoma. National programmes have been mounted against trachoma in many countries. Mass campaigns with topical tetracycline and the improvement of socio-economic conditions have markedly reduced the severity of trachoma and associated bacterial conjunctival infections. The Trachoma Control Programme launched in India in 1963 was merged with the National Programme for the Control of Blindness in 1976.

(ii) *School eye health services* : This is another useful approach to the eye health problems in the community. School children who form a sizable segment of the community can be screened and treated for defects such as refraction errors, squint, amblyopia, trachoma, etc. Health education is an important component of school health service. Students should be taught to practise the principles of good posture, proper lighting, avoidance of glare, proper distance and angle between the books and the eyes. Use of suitably readable type style in textbooks should be encouraged.

(iii) *Vitamin A prophylaxis* : Under the vitamin A distribution scheme in India, 200,000 IU of vitamin A are given orally at 6–monthly intervals between the ages 1–6 years. To be able to control xerophthalmia, the whole family should be kept under surveillance for one year and children for 5 years *(17)*.

(iv) *Occupational eye health services:* This is to prevent/ treat eye hazards in industries. Education on the prevention of occupational eye hazards and the use of protective devices in some occupations (like welding) is essential. The key to the prevention of accidents in factories is to improve the safety features of machines, to have proper illumination of the working area, to select workers with the requisite alertness and good vision, and to encourage the use of protective devices *(15)*.

3. LONG-TERM MEASURES

Long-term measures also have a part to play in controlling eye infections. Broadly these measures are aimed at improving the quality of life and modifying or attacking the factors responsible for the persistence of eye health problems, e.g., poor sanitation, lack of adequate safe water supplies, little intake of foods rich in vitamin A, lack of personal hygiene, etc. Health education is an important long-term measure in order to create community awareness of the problem; to motivate the community, to accept total eye health care programmes, and to secure community participation.

4. EVALUATION

Evaluation should be an integral part of intervention programmes to measure the extent to which ocular diseases and blindness have been alleviated, assess the manner and degree to which programme activities have been carried out, and determine the nature of other changes that may have been produced *(18)*.

National and International agencies

The National Association for the Blind (NAB), a voluntary organization which came into existence in 1952 has been active in the field of providing welfare services to the blind throughout India. The Royal Commonwealth Society for the Blind has been working in the field since 1950. In 1974, by invitation of WHO, the organizations concerned with blindness and with its prevention came together to build a new agency, the "International Agency for Prevention of Blindness". The Agency's primary task is to prevent blindness. There is a growing movement for direct technical cooperation among the developing countries. Neighbouring countries may provide training, exchange workers, share plans, and, in a variety of ways enrich and stimulate their programmes *(18)*.

National Programme for the Control of Blindness and Visual Impairment

See chapter 7 for details.

Vision 2020 : The Right to Sight

Vision 2020 : The Right to Sight, a global initiative to eliminate avoidable blindness was launched by WHO on 18th Feb. 1999. One significant way in which this initiative differs from previous ones is that the concept centres around Rights issues. Recognition of sight as a fundamental human right by all countries can be an important catalyst of initiatives for the prevention and control of blindness. The objective of Vision 2020 is to assist member countries in developing sustainable systems which will enable them to eliminate avoidable blindness from major causes, i.e. cataract, xerophthalmia and other causes of childhood blindness, refractive error and low vision, trachoma and other causes of corneal blindness by the year 2020 *(10, 6)*.

Global eye health action plan 2014–2019 (19)

The global eye health action plan 2014–2019 aims to reduce avoidable visual impairment as a global public health problem and to secure access to rehabilitation services for the visually impaired.

The global eye health action plan is based on five principles and approaches which underpin the plan: universal access and equity, human rights, evidence-based practice, a life course approach, and empowerment of people with visual impairment. As there have been significant shifts in the pattern of causes of visual impairment, the action plan is structured to particularly address the global trend towards an increasing incidence of chronic eye diseases related to ageing . These are expected to be the most prevalent causes of avoidable visual impairment in the next decades.

The global eye health action plan is built using the health system approach, which encompasses the integration of eye care programmes into the wider health care system at all levels (primary, secondary and tertiary). As a global target, the reduction in prevalence of avoidable visual impairment by 25 per cent by 2019, from the baseline of 2010 has been selected for this action plan.

There are three indicators at the goal and purpose levels to measure progress at the national level : (1) The prevalence and causes of visual impairment; (2) The number of eye care personnel; and (3) Cataract surgery.

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ORAL DISEASES

Oral diseases are the most common non-communicable diseases and affect people throughout their lifetime, causing pain, discomfort, disfigurement and even death. Oral health is a key indicator of overall health, wellbeing and quality of

life. WHO defines oral health as "a state of being free from chronic mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal (gum) disease, tooth decay, tooth loss, and other diseases and disorders that limit an individual's capacity in biting, chewing, smiling, speaking, and psychosocial wellbeing" *(1)*.

Problem Statement

WORLD

Seven oral diseases and conditions account for most of the oral disease burden. They include dental caries (tooth decay), periodontal (gum) diseases, oral cancers, oral manifestations of HIV, oro-dental trauma, cleft lip and palate, and noma. Almost all diseases and conditions are either largely preventable or can be treated in their early stages. It is estimated that oral diseases affected at least 3.58 billion people in 2016 worldwide, with caries of the permanent teeth being the most prevalent of all conditions assessed. Globally, it is estimated that 2.4 billion people suffer from caries of permanent teeth and 486 million children suffer from caries of primary teeth. In most middle and low income countries, with increasing urbanization and changes in living conditions, the prevalence of oral diseases continues to increase notably due to inadequate exposure to fluoride and poor access to primary oral health care services. Heavy marketing of sugars, tobacco and alcohol leads to growing consumption of unhealthy products.

INDIA

Two large scale oral health surveys have been conducted in India: (i) National Oral Health Survey & Fluoride Mapping by Dental Council of India in 2003; and (ii) Oral Health in India : Report of multi-centric oral health survey by Ministry of Health and Family Welfare in collaboration with dental department of AIIMS in 2007. These two surveys indicate the prevalence of some of the oral diseases and conditions in the country. The burden of diseases are as shown in Table 1.

TABLE 1
Burden of oral diseases (Multi-centric survey 2007), India

Disease	Prevalence
Dental Caries	40–45%
Periodontal diseases	>90% (Advanced disease in 40%)
Malocclusion	30% of children
Cleft lip and palate	1.7 per 1000 live births
Oral cancer	12.6 per lakh population
Oral submucous fibrosis (premalignant and crippling condition of mouth)	4 per 1000 adults in rural India
Dental fluorosis	Endemic in 230 districts of 19 States
Edentulousness (tooth loss)	19–32% of elderly population >65 years
Oral lesions due to HIV/AIDS	72% of HIV/AIDS patients
Birth defects involving oro-facial complex	0.82 to 3.36 per 1000 live births
Others: Traumatic injuries, • Mucosal lesions associated with radiation and chemotherapy • Morbidity and deformity following oral cancer surgery.	

Source : *(2)*

Taking into account the oral health situation in the country, Govt. of India has initiated a National Oral Health Programme during the year 2014–2015, to provide integrated and comprehensive oral health care in the existing health care facilities *(3)*.

RISK FACTORS

Most oral diseases and conditions share modifiable risk factors (such as tobacco use, alcohol consumption and unhealthy diets high in free sugars) common to the four leading NCDs (cardiovascular diseases, cancer, chronic respiratory diseases and diabetes). In addition, it is reported that diabetes mellitus is linked in a reciprocal way with the development and progression of periodontitis. Moreover, there is a causal link between high sugars consumption and diabetes, obesity and dental caries.

Oral health inequalities :

Oral health inequalities are caused by a broad range of interacting biological, socio-behavioural, psychosocial, societal and political factors that create 'the conditions in which people are born, grow, live, work and age' - the so-called social determinants. Oral diseases disproportionally affect the poor and socially-disadvantaged members of society. There is a very strong and consistent association between socioeconomic status (income, occupation and educational level) and the prevalence and severity of oral diseases. This association exists across the life course from early childhood to older age, and across populations in high, middle and low-income countries. Oral health inequalities are therefore considered as differences in oral health that are avoidable, and deemed both unfair and unjust in modern society *(1)*.

Oral diseases *(1)*

Dental caries (tooth decay)

Dental caries results when microbial biofilm (plaque) formed on the tooth surface converts the free sugars contained in foods and drinks into acids that dissolve tooth enamel and dentine over time. With continued high intake of free sugars, inadequate exposure to fluoride and without regular microbial biofilm removal, tooth structures are destroyed, resulting in development of cavities and pain, impacts on oral-health-related quality of life, and, in the advanced stage, tooth loss and systemic infection.

Periodontal (gum) disease

Periodontal disease affects the tissues that both surround and support the tooth. This often presents as bleeding or swollen gums (gingivitis), pain and sometimes as bad breath. In its more severe form, loss of gum attachment to the tooth and supporting bone causes "pockets" and loosening of teeth (periodontitis). Severe periodontal disease, which may result in tooth loss, was the 11th most prevalent disease globally in 2016. The main causes of periodontal disease are poor oral hygiene and tobacco use.

Tooth loss

Dental caries and periodontal diseases are major causes of tooth loss. Severe tooth loss and edentulism (no natural teeth remaining) are widespread and particularly seen among older people. Severe tooth loss and edentulism was one of the leading ten causes of years lived with disability (YLD) in some high income countries due to their aging populations.

Oral cancer

Oral cancer includes cancers of lip and all subsites of the

oral cavity, and oropharynx. The age-adjusted incidence of oral cancer (cancers of the lip and oral cavity) in the world is estimated at 4 cases per 100,000 people. However, there is wide variation across the globe: from no recorded cases to around 20 cases per 100,000 people. Oral cancer is more common in men, in older people, and varies strongly by socio-economic condition. In some Asian-Pacific countries, the incidence of oral cancer ranks among the three top cancers. Tobacco, alcohol and areca nut (betel quid) use are among the leading causes of oral cancer. In regions like North America and Europe, "high risk" human papillomavirus infections are responsible for a growing percentage of oro-pharyngeal cancers among young people.

Oral manifestations of HIV infection

Oral manifestations occur in 30–80% of people with HIV, with considerable variations depending on the situations such as affordability of standard antiretroviral therapy (ART). Oral manifestations include fungal, bacterial or viral infections of which oral candidiasis is the most common and often the first symptom early in the course of the disease. Oral HIV lesions cause pain, discomfort, dry mouth, eating restrictions and are a constant source of opportunistic infection. Early detection of HIV-related oral lesions can be used to diagnose HIV infection, monitor the disease's progression, predict immune status and result in timely therapeutic intervention. The treatment and management of oral HIV lesions can considerably improve oral health, quality of life and wellbeing.

Oro-dental trauma

Oro-dental trauma is an impact injury to the teeth and/or other hard or soft tissues within and around the mouth and oral cavity. The world prevalence of traumatic dental injuries in either dentition (primary and permanent) is around 20%. Oro-dental trauma can be caused by oral factors (e.g. increased overjet); environmental factors (for example, unsafe playgrounds or schools); risk-taking behaviour; and violence. Treatment is costly and lengthy and sometimes can even lead to tooth loss, resulting in complications for facial and psychological development and quality of life.

Noma (1)

Noma is a necrotizing disease that affects children between the ages of 2 and 6 years suffering from malnutrition, affected by infectious disease, living in extreme poverty and with weakened immune systems.

Noma is mostly prevalent in sub-Saharan Africa, but rare cases are reported in Latin America and Asia. Noma starts as a soft tissue lesion (a sore) of the gums, inside the mouth. The initial gum lesion then develops into an ulcerative, necrotizing gingivitis that progresses rapidly, destroying the soft tissues and further progressing to involve the hard tissues and skin of the face.

In 1998, WHO estimated that there were 140,000 new cases of noma annually. Without treatment, noma is fatal in 90% of cases. Where noma is detected at an early stage, its progression can be rapidly halted, through basic hygiene, antibiotics and nutritional rehabilitation. Such early detection helps to prevent suffering, disability and death. Survivors suffer from severe facial disfigurement, have difficulty speaking and eating, face social stigma, and require complex surgery and rehabilitation.

Cleft lip and cleft palate

Clefts of the lip and palate are heterogeneous disorders that affect the lips and oral cavity, and occur either alone (70%) or as part of a syndrome, affecting more than 1 in 1000 newborns worldwide. Although genetic predisposition is an important factor for congenital anomalies, other modifiable risk factors such as poor maternal nutrition, tobacco consumption, alcohol and obesity during pregnancy also play a role. In low-income settings, there is a high mortality rate in the neonatal period. If lip and palate clefts are properly treated by surgery, complete rehabilitation is possible.

Prevention of oral diseases *(1)*

The burden of oral diseases can be reduced through public health interventions by addressing common risk factors. These are :

- Promoting a well-balanced diet:
  - Low in free sugars to prevent development of dental caries, premature tooth loss and other diet-related NCDs;
  - With adequate fruit and vegetable intake, which may have a protective role in oral cancer prevention;
- Reducing smoking, the use of smokeless tobacco including chewing of areca nuts, and alcohol consumption to reduce the risk of oral cancers, periodontal disease and tooth loss; and
- Encouraging use of protective equipment in sports and when traveling in motor vehicles, to reduce the risk of facial injuries.

Dental caries can be largely prevented by maintaining a constant low level of fluoride in the oral cavity. Optimal fluoride can be obtained from different sources such as fluoridated drinking water, salt, milk and toothpaste. Twice-daily tooth brushing with fluoride-containing toothpaste (1000 to 1500 ppm) should be encouraged. Long-term exposure to an optimal level of fluoride results in substantially lower incidence and prevalence of tooth decay across all ages.

Oral health inequalities must be reduced by tacking the broader social determinants through a range of complementary downstream, midstream and integrated upstream policies such as: water fluoridation; regulation of the marketing and promotion of sugary foods to children and taxes on sugar-sweetened beverages. Moreover, promoting healthy settings such as healthy workplaces and health promoting schools is critical to building comprehensive supporting environments to promote oral health.

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ACCIDENTS AND INJURIES

An accident has been defined as : "an unexpected, unplanned occurrence which may involve injury" *(1)*. A WHO Advisory Group in 1956 defined accident as an "unpremeditated event resulting in recognizable damage" *(2)*. According to another definition, an accident is that "occurrence in a sequence of events which usually produces unintended injury, death or property damage".

Accidents represent a major epidemic of non-communicable disease in the present century. They are no longer considered accidental. They are part of the price we pay for technological progress.

Accidents have their own natural history and follow the

same epidemiological pattern as any other disease – that is, the agent, the host and the environment interacting together to produce injury or damage. They occur more frequently in certain age–groups, at certain times of day and week and at certain localities. Some people are more prone to accidents than others and susceptibility is increased by the effect of alcohol and other drugs as well as physiological state such as fatigue. Lastly, a majority of accidents are preventable.

Measurement of the problem

a. MORTALITY

The following epidemiological indices will be useful in assessing the magnitude of the problem : (i) Proportional mortality rate : That is, the number of deaths due to accidents per 100 (or 1000) total deaths. (ii) Number of deaths per million population : The term "killed" (in a road traffic accident) is defined as any person who was killed outright or who died within 30 days as a result of the accident *(3)*. (iii) Death rate per 1000 (or 100,000) registered vehicles per year. (iv) Number of accidents or fatalities as a ratio of the number of vehicles per kilometre or passengers per kilometre. (v) Deaths of vehicle occupants per 1000 vehicles per year, etc.

b. MORBIDITY

Morbidity is measured in terms of "serious injuries" and "slight injuries" *(4)*. The seriousness of the injury is assessed by a scale known as "Abbreviated Injury Scale" *(3)*. Morbidity rates are generally less reliable because of under-reporting and mis-reporting.

c. DISABILITY

An important outcome of the accident process is disability, which may be temporary or permanent, partial or total. Measurement of disability in terms of its duration is a limited concept; it does not take into consideration the psychological or social aspects of an accident or injury *(5)*. The International classification of "Functioning, Disability and Health" (ICF) is an attempt by WHO *(6)* to estimate the disability of individuals at a given moment.

The problem

WORLD

Injuries constitute a variable epidemic. Injuries are commonly classified based on "intentionality". Most road traffic injuries, poisoning, falls, fire and burn injuries and drowning are unintentional. Intentional injuries include interpersonal violence (homicide, sexual assault, neglect and abandonment, and other maltreatment), suicide and collective violence (war). Evidence suggests that some children and adolescents are more vulnerable to certain types of injuries. For example poisoning, drowning, burns and maltreatment by caregivers affects primarily small children, while road traffic accidents, interpersonal violence and sports injuries tend to affect older children, adolescents and adults *(7)*.

The leading cause of injury deaths is road traffic injury, followed by suicide, falls and interpersonal violence. Other important cause of injuries include drowning, fires and burns, poisoning, and war or conflict *(1)*. Table 1 shows the global estimated deaths by type of injury, percentage of total deaths, crude death rate per lakh population and age specific death rate per lakh population due to injuries during the year 2021 *(8)*.

TABLE 1

Leading causes of injuries and deaths worldwide, 2021

Type of injury	Deaths (000)	% of total deaths	Crude death rate (per lakh population)
A. Unintentional injuries	3,143	5.0	40.0
1. Road injury	1,182	2.0	15.0
2. Poisonings	59	0.0	1.0
3. Falls	739	1.0	9.0
4. Fire, heat & hot substance	124	0.0	2.0
5. Drowning	300	0.0	4.0
6. Exposure to mechanical forces	104	0.0	1.0
7. Natural disasters	9	0.0	0.0
8. Other unintentional injuries	624	1.0	8.0
B. Intentional injuries	1,336	2.0	17.0
1. Self harm	726	1.0	9.0
2. Interpersonal violence	484	1.0	6.0
3. Collective violence and legal intervention	125	0.0	2.0
Total	4,479	7.0	57.0

Sources: *(8)*

Injuries and violence are included in multiple Sustainable Development Goals targets. Road traffic injuries and unintentional injuries are included in the health goal SDG 3 with targets related to violence and disasters part of other goals. Table 2 enumerates the indicators related to the goal targets, the global and Indian scenario.

TABLE 2

Selected indicators of SDG, global and India scenario

Cause	Global	India
Average death rate due to natural disaster (per 100,000 population) 2016	<0.1	<0.1
Mortality rate due to homicide (per 100,000 population) 2016	6.4	2.1
Estimated direct deaths from major conflicts (per 100,000 population) 2016	2.5	<0.1
Mortality rate unintentional poisoning (per 100,000 population) 2016	2.5	1.9
Suicide mortality rate (per 100,000 population) 2016	10.6	14.7
Road traffic mortality rate (per 100,000 population) 2016	18.8	8.0

Source : *(8A)*

INDIA

Accidents are definitely on an increase in India. Increasing mechanization in agriculture and industry, induction of semi-skilled and unskilled workers in various operations and rapid increase in vehicular traffic have resulted in an increase in morbidity and mortality due to accidents. Overcrowding, lack of awareness and poor implementation of essential safety precautions result in an increasing number of accidents. Consumption of poisonous substances accidentally or intentionally is also on the rise. Deaths, disabilities and hospitalization due to injuries continue to have impact of socio-economic loss to individuals, families, society and infrastructure. The

traditional view of injury as an accident, has resulted in the neglect of this aspect of public health. Today injuries are low in priority for policy makers, and only few plans are drawn for injury prevention.

Table 3 shows the reported number of accidental deaths by main causes in India.

TABLE 3

Reported number of accidental deaths in India by main cause (2020–2021)

Causes	No. of Deaths	
	2020	2021
A. Un-natural Causes		
Air-crash	26	16
Collapse of structures	1,536	1,630
Drowning	37,238	36,362
Electrocution	13,446	12,529
Explosions	494	454
Falls	20,579	21,609
Factory/machine accidents	705	774
Fire	9,110	8,348
Fire Arms	318	278
Sudden deaths	49,925	50,773
Killed by animals	1,305	1,264
Mines or quarry disaster	77	78
Poisoning	22,221	23,472
Stampede	14	25
Suffocation	2,096	1,235
Traffic accidents	1,46,354	1,73,860
Other causes	43,869	40,450
Causes not known	15,097	14,753
Total (A)	3,64,410	3,87,910
B. Natural calamity	7,405	7,126
Total (A+B)	3,71,815	3,95,036

Source : *(9)*

TYPES OF ACCIDENTS

1. Road traffic accidents

The number of road traffic deaths continues to rise steadily, reaching 1.19 million in 2021. However, the rate of death relative to the size of the world's population has remained constant. When considered in context of the increasing global population and rapid motorization that has taken place over the same period. This suggest that existing road safety efforts may have mitigated the situation from getting worse.

As progress is made in the prevention and control of infectious diseases, the relative contribution of deaths from injuries have increased. Road traffic injuries are the top most leading cause death for children and young adults aged 5–29 years, and 12th leading cause when all ages are considered. Two thirds of all deaths occur among working age (18–59 years), causing huge health, social and economic harm throughout society *(10)*.

Motorcyclists and other powered two and three-wheeler riders account for 30% of deaths. Occupants of four-wheeled vehicles account for 25% of fatalities. Pedestrians account for 21% of deaths and cyclists account for 5%. Occupants of vehicles carrying more than 10 people, heavy goods vehicles and "other" users constitute 19% of deaths.

A number of countries have seen success in reducing road traffic deaths over the last few years, but progress varies significantly between different regions and countries of the world.

Nine in 10 deaths occur in low and middle-income countries, while people in low-income countries continue to face the highest risk of death per population. Globally, 28% of all fatalities occur in the WHO South-East Asia Region, 25% in the Western Pacific Region, 19% in the African Region, 12% in the Region of the Americas, 11% in the Eastern Mediterranean Region, and 5% in the European Region *(10)*.

In addition to fatal injuries, there are as many as 20–50 million non-fatal injuries and 10–20 million serious injuries requiring long period of expensive care, nursing and treatment. From a young age, males are more likely to be involved in road traffic crashes than females. They are almost 3 times as likely to be killed in a car crash as young females *(10, 12)*.

INDIA

During the year 2023, about 4.80 lakh road accidents happened with 1.74 lakh deaths and 4,62,825 serious injuries. That amounts to 55 crashes and 20 fatalities every hour. 35,000 accidents took place outside school areas and 10,000 out side colleges. 35,000 pedestrians died in road accidents, 54,000 deaths happened due to not wearing helmets and 16,000 due to non-use of seat-belts. A total of 12,000 deaths occurred due to overloaded vehicles. Over speeding caused maximum deaths, about 1,17,682, wrong side overtaking 9,432, drunk driving 3,674, driver busy with other activities (mobile) 2,884, red light jump 818 and other causes 38,400, were responsible for the crash fatalities. Of these, two wheelers accounted for 44.8 per cent of deaths, and pedestrians accounted for nearly 20 per cent fatalities *(12A)*. 55.5 per cent deaths were in below 35 years age group. 31.5 per cent people were urban and 68.5 per cent from rural areas. 85.8 per cent accidental deaths were in men and 14.2 per cent in women *(12A)*.

State-wise, Uttar Pradesh had highest accidental mortalities, about 23,652 i.e. 13.7 per cent of all the mortalities in the year 2023, followed by Tamil Nadu (18,347 deaths – 10.6 per cent), Maharashtra (15,366 deaths – 8.9 per cent),, Madhya Pradesh (13,798 deaths – 8.0 per cent), Karnataka (12,321 deaths – 7.1 per cent) and Rajasthan (11,762 deaths – 6.8 per cent). As far as number of accidents are concerned, Keral tops in the country with 48,091 road accidents in the year 2023, i.e. 10.0 per cent of all the accidents in the country, followed by Uttar Pradesh (44,534 accidents – 9.3 per cent), Karnataka (43,440 accidents – 9.0 per cent), Maharashtra (35,243 accidents – 7.3 per cent), Rajasthan (24,692 accidents – 5.1 per cent) and Telangana (22,903 accidents – 4.8 per cent) *(12A)*.

Risk factors *(11)*

Speed

An increase in average speed is directly related both to the likelihood of a crash occurring and to the severity of the consequences of the crash. Some other facts are as below.

- Pedestrians have a 90% chance of surviving a car crash at 30 km/h or below, but less than a 50% chance of surviving an impact of 45 km/h or above.

- 30 km/h speed zones can reduce the risk of a crash and are recommended in areas where vulnerable road users are common (e.g. residential areas, around schools).
- Apart from reducing road traffic injuries, lower average traffic speeds can have other positive effects on health outcomes (e.g. by reducing respiratory problems associated with car emissions).

Drink-driving

Drinking and driving increases both the risk of a crash and the likelihood that death or serious injury will result.

- The risk of being involved in a crash increases significantly above a blood alcohol concentration (BAC) of 0.04 g/dl.
- Laws that establish BACs of 0.05 g/dl or below are effective at reducing the number of alcohol-related crashes.
- Enforcing sobriety check-points and random breath testing can lead to reductions in alcohol-related crashes by about 20%, and have shown to be very cost-effective.

Motorcycle helmets

- Wearing a motorcycle helmet correctly can reduce the risk of death by almost 42% and the risk of severe head injury by over 69%.
- When motorcycle helmet laws are enforced effectively, helmet wearing rates can increase to over 90%.
- Requiring helmets to meet a recognized safety standard is important to ensure that helmets can effectively reduce the impact of a collision to the head in the event of a crash.

Seat-belts and child restraints

- Wearing car seat-belt reduces the risk of fatality among front-seat passengers by 40–50% and of rear-seat passengers by between 25–75%.
- Mandatory seat-belt laws and their enforcement have been shown to be very effective at increasing seat-belt wearing rates.
- If correctly installed and used, child restraints reduce deaths among infants by approximately 70%, and deaths among small children by between 54% and 80%.

Distracted driving

There are many types of distractions that can lead to impaired driving, but recently there has been a marked increase around the world in the use of mobile phones by drivers that is becoming a growing concern for road safety. The distraction caused by mobile phones can impair driving performance in a number of ways, e.g. longer reaction times (notably braking reaction time, but also reaction to traffic signals), impaired ability to keep in the correct lane, and shorter following distances.

- Text messaging also results in considerably reduced driving performance, with young drivers at particular risk of the effects of distraction resulting from this use;
- Drivers using a mobile phone are approximately four times more likely to be involved in a crash than when a driver does not use a phone. Hands-free phones are not much safer than hand-held phone sets;
- While there is little concrete evidence yet on how to reduce mobile phone use while driving, governments need to be proactive. Actions that can be taken include adopting legislative measures, launching public awareness campaigns, and regularly collecting data on distracted driving to better understand the nature of this problem.

Developing countries are very different from the industrialized countries with regard to the environment and the mix of vehicles in the traffic stream. The following are the more important differences *(13)*:

1. Large numbers of pedestrians and animals share the roadway with fast-moving and slow-moving (e.g., bullock carts) vehicles. There is almost no segregation of pedestrians from wheeled traffic;
2. Large numbers of old, poorly maintained vehicles;
3. Large numbers of motor cycles, scooters, and mopeds;
4. Low driving standards;
5. Large numbers of buses, often overloaded;
6. Widespread disregard of traffic rules;
7. Defective roads, poor street lighting, defective lay-out of cross roads and speed breakers; and
8. Unusual behaviour of men and animals.

In South-East Asia region countries, semi-urban and rural areas contribute 60–80 per cent of road accident injuries, although all media attention is focussed on urban road accidents.

Road traffic injuries cause the considerable economic loss to victims, their families, and to the nation as a whole. These losses arise from the cost of treatment (including rehabilitation and incident investigation) as well as reduced/ lost productivity (e.g. in wages) for those killed or disabled by their injuries, and for family members who need to take time off work (or school) to care for the injured *(12)*.

Multiple causation

Accidents are a complex phenomena of multiple causation (Fig. 1). The aetiological factors may be classified into two broad categories – human and environmental. Upto 90 per cent of the factors responsible for accidents are attributed to human failure. Many of the psychological circumstances in which accidents occur are still poorly known *(5)*.

PREVENTION

Accidents don't just happen; they are caused. The causes in a given situation must be identified by epidemiological methods. Since accidents are multifactorial, they call for an intersectoral approach to both prevention and care of the injured. The various measures comprise the following :

1. Data collection

There should be a basic reporting system of all accidents. The national data should be supplemented by special surveys and in-depth studies. These studies will bring out the risk factors, the circumstances and chain of events leading upto the accident. These details are rarely provided by the basic reporting system. Detailed environmental data relating to the road, vehicle, weather, etc must also be collected. The police have a statutory duty in many countries to investigate accidents, for legal as well as preventive purposes; the data collecting systems should recognize this and take police records as their starting point *(3)*. Without adequate data collection, analysis and interpretation there could be no effective counter–measures, evaluations and strategies for prevention.

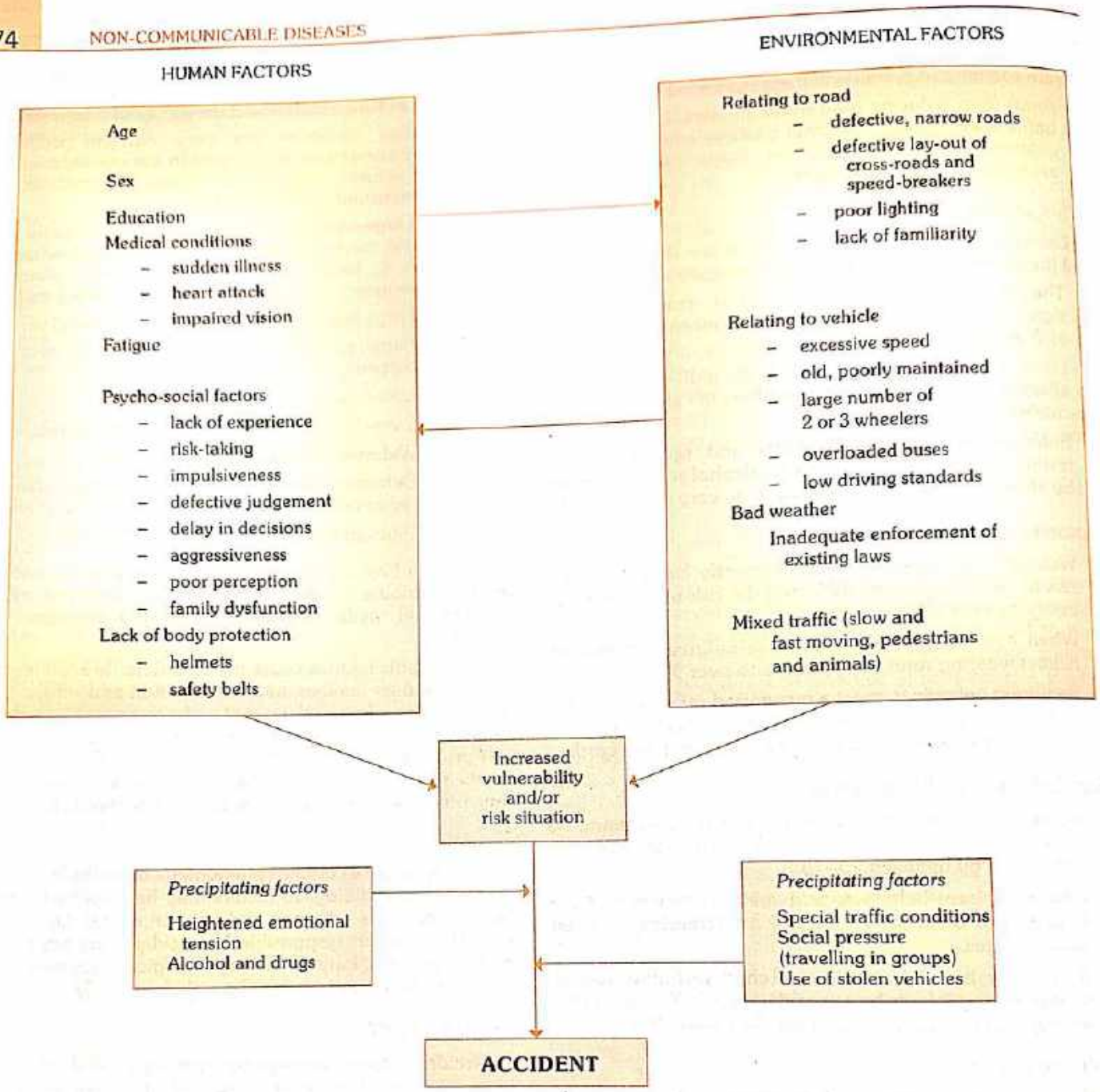

FIG. 1
Primary factors in accidents

2. Safety education

There is a widespread belief that accidents are inevitable; this fatalistic attitude must be curbed. Safety education must begin with school children. The drivers need to be trained in proper maintenance of vehicles and safe driving. Young people need to be educated regarding risk factors, traffic rules and safety precautions. They should also be trained in first aid. It has been aptly said that "if accident is a disease, education is its vaccine".

3. Promotion of safety measures

(a) Seat belts: The use of seat belts reduces the number of fatalities and non-fatal injuries by approximately 50 per cent each. They should be made compulsory for cars, light trucks and similar vehicles *(3)*. *(b) Safety helmets:* They reduce the risk of head injury by 30 per cent on an average and that of fatalities by 40 per cent *(5)*. They prevent laceration of the scalp to a great extent. Recently, the full-face integral helmet has become very popular. *(c) Children:* Another safety measure is to ensure that children remain seated when they are in a vehicle. They should be prohibited to take the front seats of cars *(5)*. A few countries have introduced laws which require that children of under 12–15 years in cars to be in the rear seats only. *(d) Others:* These comprise use of door locks, proper vehicle design, use of laminated high-penetration resistance windscreen glass, etc.

4. Alcohol and other drugs

Alcohol impairs driving ability and increases the risk of an accident as well as the severity of its consequences.

Conclusions of surveys carried out in several countries have shown that alcohol is the direct cause of 30 to 50 per cent of severe road accidents.

Drugs such as barbiturates, amphetamines, and cannabis impair one's ability to drive safely. They should be avoided totally.

5. Primary care

Planning, organization and management of trauma treatment, and emergency care services should be a fundamental element of health service managerial process. Emergency care should begin at the accident site, continued during transportation, and conclude in the hospital emergency room. At any of these stages a life may be saved or lost, depending upon the skill of the health care worker and the availability of needed emergency equipment. To achieve these ends, there should be an Accident Services Organization and one fully equipped specialized trauma care hospital in all major cities.

6. Elimination of causative factors

The factors which tend to cause accidents must be sought out and eliminated, e.g., improvement of roads, imposition of speed limits and marking of danger points.

7. Enforcement of laws

Legislation embodies codified set of rules. These are enforced by the State to prevent accidents. These include driving tests, medical fitness to drive, enforcement of speed limits, compulsory wearing of seat-belts and crash-helmets, checking of blood alcohol concentration, road-side breath testing for alcohol, regular inspection of vehicles, periodic re-examination of drivers over the age of 55, etc.

8. Rehabilitation services

Rehabilitation consists of a number of elements which each injured person should benefit from. These are medical rehabilitation, social rehabilitation, occupational rehabilitation, etc. The aim of rehabilitation is to prevent, reduce or compensate disability and thereby handicap.

9. Accident research

The future of accident prevention is in research. Such research will be concerned with gathering precise information about the extent, type and other characteristics of accidents, correlating accident experience with personal attributes and the environments in which accidents occur, investigating new and better methods of altering human behaviour; seeking ways to make environments safer; and evaluating more precisely the efficiency of control measures. This area is now termed **accidentology**.

2. Domestic accidents

By "domestic accident" is meant an accident which takes place in the home or in its immediate surroundings, and, more generally, all accidents not connected with traffic, vehicles or sport *(14)*. The most frequent causes of domestic accidents are :

1. drowning;
2. burns (by a flame, hot liquid, electricity, crackers or fire works, chemicals);
3. falls;
4. poisoning (e.g., drugs, insecticides, rat poisons, kerosene);
5. injuries from sharp or pointed instruments; and
6. bites and other injuries from animals.

Drowning *(15)*

Drowning is the process of experiencing respiratory impairment from submersion/immersion in liquid.

Victims of drowning have a very slim chance of survival after immersion. The victim loses consciousness after approximately 2 minutes of immersion, and irreversible brain damage can take place after 4–6 minutes. Therefore, prevention strategies are very important.

In 2021, an estimated 300,250 people died from drowning, making drowning a major public health problem worldwide. Injuries account for nearly 7% of total global mortality. Drowning is the 3rd leading cause of unintentional injury/ death. It accounts for 9% of all injury-related deaths. It is a common method of suicide *(16)*.

The global burden and death from drowning is found in all economies and regions, however; low and middle-income countries account for 90% of unintentional drowning deaths; over 50% of the world's drowning occurs in the WHO Western Pacific Region and WHO South-East Asia Region; China and India have particularly high drowning mortality rates and together contribute 43% of the world's drowning deaths and 41% of the total global DALYs (disability-adjusted life years) lost related to drowning.

There is a wide range of uncertainty around the estimate of global drowning deaths. It is important to point out that the global problem is much greater than the above figures reveal; due to the way data are classified, global numbers exclude drowning due to floods (cataclysms), boating and water transport mishaps. Non-fatal drowning statistics in many countries are not readily available or are unreliable.

Risk factors *(15)*

1. *Age :* Age is one of the major risk factor for drowning. This relationship is often associated with a lapse in supervision. In general, children under 5 years of age have the highest drowning mortality rates worldwide. Canada and New Zealand are the only exceptions, where adult males drown at higher rates.

2. *Gender :* Males are especially at risk of drowning with twice the overall mortality rate of females. They are more likely to be hospitalized than females for non-fatal drowning. Studies suggest that the higher drowning rates among males are due to increased exposure to water and riskier behaviour such as swimming alone, drinking alcohol before swimming alone, and boating.

3. *Access to water :* Increased access to water is another risk factor for drowning. Individuals with occupations such as commercial fishing or fishing for subsistence, using small boats in low-income countries, are more prone to drowning. Children who live near open water sources, such as ditches, ponds, irrigation channels, or pools are especially at risk.

4. *Other risk factors :* There are other factors that are associated with an increased risk of drowning, such as :

a. infants left unsupervised or alone, or with another child in a bathtub;
b. unsafe or overcrowded transportation vessels lacking flotation devices;
c. alcohol use, near or in the water;
d. medical conditions, such as epilepsy;

e. tourists unfamiliar with local water risks and features; and
f. floods and other cataclysmic events like tsunamis.

Prevention *(15)*

Drowning prevention strategies should be comprehensive and include: engineering methods which help to remove the hazard, legislation to enforce prevention and assure decreased exposure, education for individuals and communities to build awareness of risk and to aid in response if a drowning occurs.

Engineering methods to eliminate exposure to water hazards are the most effective strategy for drowning prevention. Examples include :

- development and implementation of safe water systems, such as drainage systems, piped water systems, flood control embankments in flood prone areas;
- building four-sided pool fences or barriers preventing access to standing water;
- creating and maintaining safe water zones for recreation;
- covering of wells or open cisterns;
- emptying buckets and baths, and storing them upside-down.

Laws or regulations which target risk factors for drowning include laws requiring regular safety checks of transportation vessels, and laws on alcohol use while boating or swimming.

Individual and community education on drowning awareness, learning water survival skills and ensuring the presence of lifeguards at swimming areas are promising strategy to prevent drowning.

Burns *(17)*

A burn is an injury to the skin or other organic tissue primarily caused by heat or due to radiation, radioactivity, electricity, friction or contact with chemicals. Thermal (heat) burns occur when some or all of the cells in the skin or other tissues are destroyed by :

- hot liquids (scalds)
- hot solids (contact burns), or
- flames (flame burns).

The problem

Burns are a global public health problem, accounting for an estimated 180,000 deaths annually. About 11 million people worldwide require medical attention due to severe burns. The majority of these occur in low and middle-income countries and almost half occur in the South-East Asia Region.

In many high-income countries, burn death rates have been decreasing, and the rate of child deaths from burns is currently over seven times higher in low and middle-income countries than in high-income countries.

Non-fatal burns are a leading cause of morbidity, including prolonged hospitalization, disfigurement and disability, often with resulting stigma and rejection.

It is estimated that over one million people are moderately or severely burnt every year in India. In Bangladesh 1.73 lac children get moderate or severe burns every year with about 17 per cent getting temporary disability and 18 per cent permanent disability. Burns are the second most common injury in rural Nepal accounting for 5 per cent disabilities.

Risk factors *(17)*

Gender : Females suffer burns more frequently than males. Women in the South-East Asia Region have the highest rate of burns, accounting for 27% of global burn deaths and nearly 70% of burn deaths in the region. The high risk for females is associated with open fire cooking, or inherently unsafe cookstoves, which can ignite loose clothing. Open flames used for heating and lighting also pose risks, and self-directed or interpersonal violence are also important factors (although understudied).

Age : Along with adult women, children are particularly vulnerable to burns. Burns are the 11th leading cause of death of children aged 1–9 years and are also the fifth most common cause of non-fatal childhood injuries. While a major risk is improper adult supervision, a considerable number of burn injuries in children result from child maltreatment.

Socio-economic factors

People living in low and middle-income countries are at higher risk for burns than people living in high-income countries. Within the countries also, burn risk correlates with socio-economic status.

Other risk factors

There are a number of other risk factors for burns, including :

- occupations that increase exposure to fire;
- poverty, overcrowding and lack of proper safety measures;
- placement of young girls in household roles such as cooking and care of small children;
- underlying medical conditions, including epilepsy, peripheral neuropathy, and physical and cognitive disabilities;
- alcohol abuse and smoking;
- easy access to chemicals used for assault (such as in acid violence attacks);
- use of kerosene (paraffin) as a fuel source for non-electric domestic appliances;
- inadequate safety measures for liquefied petroleum gas and electricity.

Burns occur mainly in the home and workplace. Community surveys in Bangladesh and Ethiopia showed that 80–90% of burns occur at home. Children and women usually get burns in domestic kitchens, from upset receptacles containing hot liquids, or flames, or from cookstove explosions. Men are more likely to get burns in the workplace due to fire, scalds, chemicals and electricity.

Prevention *(17)*

Burns are preventable. High-income countries have made considerable progress in lowering rates of burn deaths, through a combination of prevention strategies and improvemetns in the care of people affected by burns. Most of these advances in prevention and care have been incompletely applied in low and middle-income countries. Increased efforts to do so would likely lead to significant reduction in rates of burn-related death and disability.

Prevention strategies should address the hazards for specific burn injuries, education for vulnerable populations and training of communities in first-aid. An effective burn prevention plan should be multisectoral. There are a number of specific recommendations for individuals, communities and public health officials to reduce burn risk.

FIRST-AID *(17)*

Do's

1. Stop the burning process by removing clothing and irrigating the burns.
2. Use cool running water to reduce the temperature of the burn.
3. Extinguish flames by allowing the person to roll on the ground, or by applying a blanket, or by using water or other fire-extinguishing liquids.
4. In chemical burns, remove or dilute the chemical agent by irrigating with large volumes of water.
5. Wrap the patient in a clean cloth or sheet and transport to the nearest appropriate facility for medical care.

Don'ts

1. Do not start first-aid before ensuring your own safety (switch off electrical current, wear gloves for chemicals etc.)
2. Do not apply paste, oil, haldi (turmeric) or raw cotton to the burn.
3. Do not apply ice because it deepens the injury.
4. Avoid prolonged cooling with water because it may lead to hypothermia.
5. Do not open blisters until topical antimicrobials can be applied, by a health-care provider.
6. Do not apply any material directly to the wound as it might become infected.
7. Avoid application of topical medication until the patient has been placed under appropriate medical care.

Falls

Globally, falls are a major public health problem. An estimated 684,000 fatal falls occur each year, making it the second leading cause of unintentional injury death, after road traffic injuries. Though not fatal 37.3 million falls are severe enough to require medical attention. Such falls are responsible for 38 million DALYs lost. Over 80% of fall-related fatalities occur in low and middle-income countries, with regions of the Western Pacific and South East Asia accounting for more than two-thirds of these deaths. In all regions of the world, death rates are highest among adults over the age of 60 years *(18)*.

Falls are responsible for the largest number of hospital visits for non-fatal injuries, especially for children and young adults. Falls from rooftops, balconies, windows and stair cases are common. Factors specific to SEAR countries are falls from trees of workers picking fruits or coconuts, tapping toddy, children falling from rooftops while flying kites, high incidence of falls among construction and forestry workers. As life expetancy increases in these countries, the incidence of hip and other fractures due to fall among the elderly are also assuming greater proportions *(19)*.

Some of the risk factors include *(18)* :

- occupations at elevated heights or other hazardous working conditions;
- alcohol or substance use;
- socio-economic factors including poverty, overcrowded housing, young maternal age;
- underlying medical conditions, such as neurological, cardiac or other disabling conditions;
- side-effects of medication, physical inactivity and loss of balance, particularly among older people;
- unsafe environments, particularly for those with poor balance and limited vision.

Prevention *(18)*

For children, effective interventions include multifaceted community programmes; engineering modifications of nursery furniture, playground equipment, and other products; and legislation for the use of window guard.

For older individuals, fall prevention programmes can include a number of components to identify and modify risk, such as :

- screening within living environments for risks for falls;
- clinical interventions to identify risk factors, such as medication review and modification, treatment of low blood pressure, Vitamin D and calcium supplementation, treatment of correctable visual impairment;
- home assessment and environmental modification for those with known risk factors or a history of falling;
- prescription of appropriate assistive devices to address physical and sensory impairments;
- muscle strengthening and balance retraining prescribed by a trained health professional;

Poisoning

Poisoning was responsible for an estimated 252,000 deaths during the year 2008 worldwide. In India about 28,012 poisoning deaths were reported during the year 2010 *(20)*. The most common agents responsible for poisoning are pesticides, kerosene, prescription drugs, and household chemicals. Pesticides are widely used in many countries where agriculture is an important part of the economy. Reports from India, Indonesia, Sri Lanka, and Thailand indicate that common availability and use of toxic pesticides is responsible for intentional and unintentional morbidity and mortality.

In Sri Lanka, pesticides are one of the main agents used in attempted suicide in rural areas. The use of organophosphorous insecticides in suicide events has been reported to be as high as 20–30 per cent. Paraquat intoxication is known to cause irreversible damage in patients. Many countries also report accidental ingestion of kerosene as a leading cause of poisoning, especially among children *(19)*. A study from Thailand revealed that 54 per cent of cases of poisoning among pre-school children involved therapeutic drugs.

Snake bite

Snake bite is a neglected public health issue in many tropical and subtropical countries. About 5.4 million snake bites occur each year, resulting in upto 1.8 to 2.7 million envenomings (poisoning from snake bites) at least 81,410–137,880 deaths and around three times as many amputations and other permanent disabilities. Most of these occur in Africa, Asia and Latin America. In Asia alone there are an estimated 2 million snake bites annually with about half needing treatment. This type of injury is often found among women, children and farmers in poor rural communities in low and middle-income countries *(21)*.

The outcome of snake bite depends on numerous factors, including the species of snake, the area of the body bitten, the amount of venom injected, and the health condition of the victim. Feelings of terror and panic are common after a

snake bite and can produce a characteristic set of symptoms mediated by the autonomic nervous system, such as a tachycardia and nausea. Bites from non-venomous snakes can also cause injury, often due to lacerations caused by the snake's teeth, or from a resulting infection. A bite may also trigger an anaphylactic reaction, which is potentially fatal. First-aid recommendations for bite depends on the snakes inhabiting the region, as effective treatment for bite inflicted by some species can be ineffective for others.

The venom of poisonous snakes may be predominantly neurotoxic or predominantly cytolytic. Neurotoxins cause respiratory paralysis and cytolytic venoms cause tissue destruction by digestion and haemorrhage due to haemolysis and destruction of the endothelial lining of the blood vessels. The manifestations of rattlesnake envenomation are mostly local pain, redness, swelling and extravasation of blood. Perioral tingling, metallic taste, nausea, and vomiting, hypotension and coagulopathy may also occur. Neurotoxic envenomation may cause ptosis, dysphagia, diplopia, and respiratory failure. Venom emitted from some types of cobras, almost all vipers cause necrosis of muscle tissue. Muscle tissues begin to die throughout the body and it results in accumulation of myoglobin in the renal tubules which leads to acute renal failure.

Early clues that a patient has severe envenoming *(22)* :

- Snake identified as a very dangerous one;
- Rapid early extension of local swelling from the site of the bite;
- Early tender enlargement of local lymph nodes, indicating spread of venom in the lymphatic system;
- Early systemic symptoms: collapse (hypotension, shock), nausea, vomiting, diarrhoea, severe headache, "heaviness" of the eyelids, inappropriate (pathological) drowsiness or early ptosis/ophthalmoplegia;
- Early spontaneous systemic bleeding;
- Passage of dark brown/black urine.

MANAGEMENT AT COMMUNITY OR VILLAGE LEVEL *(23)*

A. First-aid

The Government of India developed a national snake-bite protocol in 2007 which includes following advice :

1. Reassure the patient. 70% of all snake bites are from non-venomous species. Only 50% of bites by venomous species actually envenomate the patient;
2. Immobilize in the same way as a fractured limb. Use bandages or cloth to hold the splints, not to block the blood supply or apply pressure. Do not apply any compression in the form of tight ligatures, they don't work and can be dangerous;
3. Do not give alcoholic beverages or stimulants. They are known vasodilators and they speed up the absorption of venom;
4. Remove any items or clothings which may constrict the bitten limb if it swells (rings, bracelets, watches, footwear, etc.);
5. Do not incise or manipulate the bitten site. Do not apply ice; and
6. Transport the patient to a medical faculty for definitive treatment.

B. At the Rural Clinic, Dispensary, Health Post, or Primary Health Centre

1. *Assess for signs of local and systemic envenoming* : carry out a simple medical assessment including history and simple physical examination – local swelling, painful tender enlarged local lymph glands, persistent bleeding from the bite wound, blood pressure, pulse rate, bleeding (gums, nose, vomit, stool or urine), level of consciousness, drooping eyelids (ptosis) and other signs of paralysis. Monitor these signs hourly.
2. *Check* : 20 minute whole blood clotting test (20WBCT), urine examination (appearance, sticks testing for blood etc.). Identify the snake or a photo of it (if brought).
3. *Analgesia* : give analgesia by mouth if required: paracetamol (acetaminophen) (adult dose 500 mg to 1g maximum, 4g in 24 hours; children 10–15 mg/kg, maximum 100mg/kg/day) or codeine phosphate (adult dose 30–60 mg, maximum 240 mg in 24 hours; children more than 2 years old, 0.5 mg/kg, maximum 2 mg/kg/day) can be given every 4–6 hours by mouth as required (not aspirin or non-steroidal anti-inflammatory drugs which can cause bleeding).
4. *Antivenom* : if the patient fulfils criteria for antivenom treatment and if the necessary skills, equipment, antivenom, adrenaline and other necessary drugs are available, give antivenom. These skills include ability to diagnose local and systemic envenoming, set up intravenous infusion or intravenous injection, identify the early signs of anaphylaxis and treat it with intramuscular adrenaline. Re-assess for repeated dose(s) of antivenom. If no antivenom is available, transfer to a hospital.
5. *If the patient is in shock/hypotensive* : give cautious intravenous fluid challenge (adult 250–500 ml of 0.9% saline) to correct hypovolaemia shock.
6. *If the patient has evidence of respiratory paralysis* : give oxygen by mask, consider atropine and neostigmine, and transfer to a hospital. It is assumed that assisted ventilation other than by a tight-fitting face mask connected to an anaesthetic (Ambu) bag will not be possible at this level.
7. *If the patient is oliguric* : initiate conservative management.
8. *The bite wound* : if necrotic, tampered with (incisions etc.) or obviously septic, give antibiotics and tetanus prophylaxis.
9. Assess the need and feasibility of transporting the patient to a higher level of the health service (see A above) especially in case of :
   a. Substantial bleeding, 20WBCT still positive (non-clotting) 6 hours after initial antivenom dose
   b. Progressive paralysis (muscle weakness) or respiratory difficulty
   c. Reduced urine output
   d. Anaphylaxis – unresponsive to adrenaline
   e. Shock/hypotension – unresponsive to fluids
   f. Severe local necrosis or signs suggestive of compartment syndrome
10. Discourage the use of ineffective and potentially harmful drugs (e.g. corticosteroids, antihistamines, and heparin).

C. At the District Hospital *(23)*

Proceed as in B above plus :

1. *Assessment* : carry out a more detailed clinical and laboratory assessment including biochemical and haematological measurements, ECG or radiography, as indicated.
2. *Antivenom* : if no antivenom is available, transfer to a hospital that has antivenom or treat conservatively; this may require transfusion of blood or fresh frozen plasma.
3. *Analgesia* : (see B above) and, if required, consider stronger parenteral opioid drugs as required, all with great caution (e.g. subcutanous, intramuscular or even intravenous pethidine, initial adult dose 50–100 mg; children 1–1.5 mg/kg; or morphine, initial adult dose 5–10 mg; children 0.03-0.05 mg/kg,).
4. *If the patient has evidence of local necrosis (gangrene)* : give tetanus toxoid booster, antibiotics and do surgical debridement of dead tissue.
5. *If the patient has evidence of bulbar or respiratory paralysis* : insert endotracheal tube, laryngeal mask airway or i-gel airway. If there is evidence of respiratory failure, assist ventilation manually by anaesthetic (Ambu) bag or mechanical ventilator.
6. *If the patient has evidence of acute kidney injury* : treat with peritoneal dialysis. If this is not available, transfer to a specialized hospital.
7. *If the patient is bleeding severely or is already seriously anaemic* : cross-match and transfuse.
8. *Rehabilitation* : encourage exercising of bitten limb.

D. At the Referral (Specialized) Hospital *(23)*

Proceed as in B and C above plus :

1. More advanced surgical management of local necrosis (e.g. split skin grafting).
2. More advanced investigations including bacterial cultures and imaging (CT scans) as indicated.
3. If the patient has evidence of acute renal failure peritoneal or haemodialysis or haemofiltration.
4. Implement rehabilitation by physiotherapists.

Strengthening of health system in managing snakebite

To reduce complications and deaths from snakebites, health systems need to be improved at various levels. The government must develop a policy for snakebite, making it a notifiable disease, developing a snakebite programme that includes standard treatment guidelines, training of health personnel and ensure an adequate supply, distribution and storage of good quality antivenom.

ANTIVENOM *(22)*

Until the advent of antivenom, bites from some species of snake were almost universally fatal. Despite huge advances in emergency therapy, antivenom is often still the only effective treatment for envenomation. The first antivenom was developed in 1895 by French physician Albert Calmette for the treatment of Indian cobra bites. Antivenom is made by injecting a small amount of venom into an animal (usually a horse or sheep) to initiate an immune system response. The resulting antibodies are then harvested from the animal's blood.

Antivenom is injected into the person intravenously, and works by binding to, and neutralizing venom enzymes. It cannot undo damage already caused by venom, so antivenom treatment should be sought as soon as possible. Modern antivenoms are usually polyvalent, making them effective against the venom of numerous snake species.

Pharmaceutical companies which produce antivenom target their products against the species native to a particular area. Although some people may develop serious adverse reactions to antivenom, such as anaphylaxis, in emergency situations this is usually treatable and hence the benefit outweighs the potential consequences of not using antivenom.

3. Industrial accidents

There are approximately 580 million workers in the South–East Asia Region. Approximately 60–80 per cent of these workers are employed in agriculture, fisheries, home industries, and small-scale units. Injuries due to these occupations result in an estimated 120 million injuries and 200,000 deaths per year *(19)*.

Though reliable estimates for work related injuries and deaths in the Region are not available, partly because a majority of the workers are employed in unorganized sectors, few studies indicate that nearly one per cent of deaths and 10 per cent of permanent impairment result from agricultural injuries. Agriculture workers are exposed to wide variety of physical, chemical (pesticide and fertilizers), biological (animal bites and animal related injuries) and mechanical injuries. The estimates from agriculture injury vary from 22–29 per 1000 workers. The incidence rate of injury among agriculture workers in India is estimated to be 116 per 100,000 workers. In a study population of 23,000 in rural Haryana, nearly 31 per cent of the injuries were related to agricultural activity *(24)*. Of these, serious injuries were caused by mechanized equipment and tractors *(19)*.

Rapid industrialization has also resulted in mortality and morbidity of many workers in hazardous industries.

The unique features common to the workplace in this region are that the manual labour content is high and the man–machine interaction is unsafe. In addition, there is greater emphasis on attempts to change the worker's behaviour, but designs that provide automatic protection are ignored. Children and people who are challenged physically as well as mentally are at a greater risk of encountering occupational injuries *(19)*.

4. Railway accidents

With the increase in number of trains and passengers, the increase in the number of accidents and casualties resulting therefrom is not unexpected. During 2020, about 8,700 people died of railway accidents in India *(9)*. The main factor involved in railway accidents is human failure.

5. Violence

Homicide and collective violence account for around 10% of global, injury-related death. In 2016, there were an estimated 1.2 million murders. Four fifths of homicide victims are men, and 60% of victims, males age 15–44. The low- and middle-income countries of the Region of the Americas has the most homicides, with 28.5 per 100,000 population, while the lowest murder rate, almost 14 times lower (2.1 per 100,000 population), is found in the low- and middle-income countries of The Western Pacific Region *(25)*.

Violence is reported to be increasing rapidly. It also follows the same epidemiological pattern as any other disease (host, agent and environment), i.e. a motivated person who injures; a suitable target; and a suitable environment or the absence of a guardian, all coinciding in time and space. Often, it may only be possible to initiate steps for prevention after an episode of violence has already taken place.

Some of the risk factors for violent behaviour are *(19)* :

- Exposure to violence and societal acceptability of violence as a means to solve problems. The image of violence as an acceptable and effective tool for solving problems, whether across international borders, on the street, or around the home, may spill over into real behaviour;
- Availability of lethal weapons like fire-arms significantly increases the possibility of both fatal and non-fatal injuries;
- Consumption of alcohol and other drugs is linked to almost 2/3 of cases of violence according to several studies.

Violence due to war and political unrest is fairly common in several countries. Organized and unorganized, ethnic and communal violence are well known in some places.

Suicides *(26)*

Globally, every year about 726,000 people take their own life and there are many more people who make suicide attempts. Every suicide is a tragedy that affects families, communities and entire country and has long-lasting effects on the people left behind. Suicide occurs throughout the lifespan and was the third leading cause of death among 15–29-year-olds globally in 2021. Poisoning, hanging, self immolation and drowning are the most commonly reported method of suicide *(24)*. The reasons for suicide are multi-faceted, influenced by social, cultural, biological, psychological, and environmental factors present across the life-course.

Suicide is a global phenomenon, occurs in all regions of the world. Close to three quarters (73%) of global suicides occurred in low and middle-income countries in 2021.

The link between suicide and mental disorders (in particular, depression and alcohol use disorders) and a previous suicide attempt is well established in high-income countries. However, many suicides happen impulsively in moments of crisis with a breakdown in the ability to deal with life stresses, such as financial problems, relationship disputes, or chronic pain and illness.

In addition, experiencing conflict, disaster, violence, abuse or loss and a sense of isolation are strongly associated with suicidal behaviour. Suicide rates are also high among vulnerable groups who experience discrimination, such as refugees and migrants; lesbian, gay, bisexual, transgender, intersex (LGBTI) persons; and prisoners.

In India, an average of 369 suicides take place every day, out of these 248 are committed by males and 121 by females (62 are house wives). Family problems (89) and illness (72) are the main cause of suicides. Majority cases are below 29 years of age (136) followed by 30–44 years of age group (125) *(27)*.

Prevention measures

There are several measures that can be taken at population, sub-population and individual levels to prevent suicide and self-harm. LIVE LIFE, WHO's initiative for suicide prevention, recommends the following key effective evidence-based interventions :

- limit access to the means of suicide (e.g. pesticides, firearms, certain medications);
- interact with the media for responsible reporting of suicide;
- foster socio-emotional life skills in adolescents; and
- early identify, assess, manage and follow up anyone who is affected by suicidal behaviours.

Suicide prevention efforts require coordination and collaboration among multiple sectors of society, including the health sector and other sectors such as education, labour, agriculture, business, justice, law, defence, politics and the media. These efforts must be comprehensive and integrated given the multifaceted nature of suicide.

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7 Health Programmes in India

"Those who would benefit most from a service are least likely to obtain it"

Since India became independent, several measures have been undertaken by the National Government to improve the health of the people. Prominent among these measures are the NATIONAL HEALTH PROGRAMMES, which have been launched by the Central Government for the control/ eradication of the communicable diseases, improvement of environmental sanitation, raising the standard of nutrition, control of population and improving rural health. Various international agencies like WHO, UNICEF, UNFPA, World Bank, as also a number of foreign agencies like SIDA, DANIDA, NORAD and USAID have been providing technical and material assistance in the implementation of these programmes. A brief account of these programmes which are currently in operation is given below :

NATIONAL VECTOR BORNE DISEASE CONTROL PROGRAMME

The National Vector Borne Disease Control Programme (NVBDCP) is implemented in the State/UT's for prevention and control of vector borne diseases namely Malaria, Filariasis, Kala-azar, Japanese Encephalitis (JE), Dengue and Chikungunya. The Directorate of NVBDCP is the nodal agency for planning, policy making and technical guidance and monitoring and evaluation of programme implementation in respect of prevention and control of these vector borne diseases under the overall umbrella of NRHM. The States are responsible for planning, implementation and supervision of the programme. The vector borne diseases are major public health problems in India. Chikungunya fever which has re-emerged as epidemic outbreaks after more than three decades has added to the problem. The prevention and control of vector borne diseases is complex; as their transmission depends on interaction of numerous ecological, biological, social and economic factors including migration *(1)*.

Out of the six vector borne diseases, malaria, filariasis, japanese encephalitis, dengue and chikungunya are transmitted by different kind of vector mosquitoes, while kala-azar is transmitted by sand flies. The transmission of vector borne diseases in any area is dependent on frequency of man-vector contact, which is further, influenced by various factors including vector density, biting time, etc. Mosquito density is directly related with water collection, clean or polluted, in which the mosquitoes breed.

Under NVBDCP, the three pronged strategy for prevention and control of VBDs is as follows : (i) Disease management including early case detection and complete treatment, strengthening of referral services, epidemic preparedness and rapid response; (ii) Integrated vector management (IVM) for transmission risk reduction including indoor residual spraying in selected high-risk areas, use of insecticide treated bed-nets, use of larvivorous fish, anti-larval measures in urban areas, source reduction and minor environmental engineering; and (iii) Supportive interventions including behaviour change communication (BCC), public private partnership and inter-sectoral convergence, human resource development through capacity building, operational research including studies on drug resistance and insecticide susceptibility, monitoring and evaluation through periodic reviews/field visits, web based management information system, vaccination against JE and annual mass drug administration against lymphatic filariasis *(1)*.

(A) MALARIA

The programme began originally as National Malaria Control Programme in 1953, during the First Five Year Plan. Because of the spectacular success achieved in the control of malaria, the control programme, was converted in 1958 into an eradication programme, with the objective of eradicating malaria once and for all from the country. Since then the programme has undergone many changes and the milestones of malaria control activities in India are as shown below *(2)* :

Milestones of malaria control activities in India

Year	Milestone
Prior to 1953	Estimated malaria cases in India – 75 million; Deaths due to malaria – 0.8 million.
1953	Launching of National Malaria Control Programme (NMCP).
1958	NMCP was changed to National Malaria Eradication Programme.
1965	Cases reduced to 0.1 million.
Early 1970's	Resurgence of malaria.
1976	Malaria cases – 6.46 million.
1977	Modified Plan of Operations implemented.
1997	World Bank assisted Enhanced Malaria Control Project (EMCP) launched.
1999	Renaming of programme to National Anti Malaria Programme (NAMP).
2002	Renaming of NAMP to National Vector Borne Disease Control Programme.
2005	Global Fund assisted Intensified Malaria Control Project (IMCP) launched.
2005	NVBDCP became integral part of NRHM.

2005	Introduction of RDT in the programme.
2006	ACT introduced in areas showing chloroquine resistance in falciparum malaria.
2008	ACT extended to high *Pf* predominant districts covering about 95% *Pf* cases.
2008	World Bank supported National Malaria Control Project launched.
2009	Introduction of LLINs.
2010	New drug policy 2010.
2012	Introduction of bivalent RDT.
2013	New drug policy 2013.
2016	National Framework for Malaria Elimination in India 2016–2030 launched.
2017	National Strategic Plan for Malaria Elimination in India 2017–2022 launched.
2023	National Strategic Plan : Malaria Elimination 2023–2027 launched.

The main activities of the programme are :

1. Formulating policies and guidelines.
2. Technical guidance.
3. Planning.
4. Logistics.
5. Monitoring and evaluation.
6. Coordination of activities through the States/Union Territories and in consultation with national organizations such as National Centre for Disease Control (NCDC), National Institute of Malaria Research (NIMR).
7. Collaboration with international organizations like the WHO, World Bank, GFATM and other donor agencies.
8. Training.
9. Facilitating research through NCDC, NIMR, Regional Medical Research Centres etc.
10. Coordinating control activities in the inter-state and inter-country border areas.

Organization *(2)*

There are 19 Regional Offices for Health and Family Welfare under Directorate General of Health Services, Ministry of Health and Family Welfare, located in 19 states, which play a crucial role in monitoring the activities under NVBDCP. These offices are equipped with malaria trained staff.

The state governments are required to plan and implement the malaria control operations in their respective states. Every state has a Vector Borne Disease Control Division under its Department of Health and Family Welfare. It is headed by the State Programme Officer (SPO) who is responsible for supervision, guidance and effective implementation of the programme and for coordination of the activities with the neighbouring States/UTs. States are responsible for the procurement of certain insecticides for indoor residual spray (IRS), spray equipment and certain anti-malarials, the central government supplies DDT and larvicides.

Each state has established a State Vector Borne Disease Control Society, which includes civil society and sometimes private sector representation. These are now merged with similar entities for other centrally sponsored schemes into a single state-level Health and Family Welfare Society. The main role of these societies is to channelize funds from GOI to the states and onwards to districts for financing of the programmes. They also play a role in district level planning and in monitoring of programme activities within districts.

At the divisional level, zonal officers have technical and administrative responsibilities of the programme in their areas under the overall supervision of Senior Divisional Officers (SDOs).

At the district level, the Chief Medical Officer (CMO)/ District Health Officer (DHO) has the overall responsibility of the programme. At the district level, district malaria offices have been established in many places headed by the DVBDC officer to assist the CMO/DHO. This office is the key unit for the planning and monitoring of the programme. Spray operations are the direct responsibility of DMO/ DVBDC officer in the entire district under overall supervision of CMO and collaborative supervision/ monitoring by PHC's Medical Officer. There is one Assistant Malaria Officer (AMO) and Malaria Inspectors (MIs) to assist him *(2)*.

In many districts, District Vector Borne Disease Control Societies (now merged with District Health Societies under NRHM) have been established to assist the management of funds and planning, and monitoring of programme activities.

The laboratories have been decentralized and positioned at the PHCs. The medical officer – PHC has the overall responsibility for surveillance and laboratory services, and also supervises the spray. Case detection management and community outreach services are carried out by MPWs as well as ASHAs and other community health volunteers.

DRUG DISTRIBUTION CENTRES AND FEVER TREATMENT DEPOTS

With the increasing number of malaria cases, the demand for antimalarial drugs has increased tremendously. It became clear that drug supply only through the surveillance workers and medical institutions was not enough. This led to the establishment of a wide network of Drug Distribution Centres and Fever Treatment Depots and malaria clinics at some sub-centres. Drug Distribution Centres are only to dispense the anti-malarial tablets as per NMEP schedules. Fever Treatment Depots collect the blood slides in addition to the distribution of antimalarial tablets. These centres are manned by voluntary workers from the community.

URBAN MALARIA SCHEME

The urban malaria scheme was launched in 1971 to reduce or interrupt malaria transmission in towns and cities. The methodology comprises vector control by intensive antilarval measures and drug treatment.

About 7.4 per cent of the total cases of malaria and 10.9 per cent of deaths due to malaria are reported from urban areas. Maximum cases are reported from Chennai, Vadodara, Visakhapatnam, Ahmedabad, Kolkata, New Mumbai, Vijayawada etc. *(3)*. The vector of malaria in the urban areas breeds largely in man-made containers including overhead tanks and underground water storage tanks, water coolers, cisterns, roof gutters, flower vases, bottles and ornamental ponds, old tyres etc., which can collect water. Large construction activities provide suitable breeding sites for the mosqitoes. Influx of migrant labour, from malarious zones contribute to increase in incidence. Control of urban malaria lies primarily in the implementation of civil bye-laws to prevent mosquito breeding in the domestic and peridomestic areas. Use of larvivorous fish in the water bodies such as slow moving streams, ornamental ponds etc. is recommended. Larvicides

are used for water bodies which are unsuitable for fish use (2). The urban malaria scheme under national vector disease control programme is presently protecting 130 million population from malaria and other mosquito borne diseases in 131 towns in 19 states and Union Territories. The civic bye-laws have been enacted and implemented in Delhi, Mumbai, Kolkata, Chandigarh, Bengaluru, Chennai, Ahmedabad and Goa etc (3).

The Expert Committee on Malaria had recommended the inclusion of all urban areas with more than 50,000 population and reporting slide positivity rate of 5 per cent and above, under Urban Malaria Scheme and introduction of active surveillance under this scheme.

National Framework for Malaria Elimination in India (2016–2030) (4)

Encouraged by the success achieved in malaria control in recent years, the vision of India's malaria control programme has been now shifted to sustained malaria elimination to contribute more effectively to improved health and quality of life of the people. The National Framework for malaria elimination in India 2016–2030 was launched in February 2016.

Goals

In line with the WHO Global Technical Strategy (GTS) for Malaria 2016–2030 and the Asia Pacific Leaders Malaria Alliance Malaria Elimination Roadmap, the goals of the National Framework for Malaria Elimination in India 2016–2030 are:

- Eliminate malaria (zero indigenous cases) throughout the entire country by 2030; and
- Maintain malaria-free status in areas where malaria transmission has been interrupted and prevent re-introduction of malaria.

Objectives

The National Framework for Malaria Elimination in India has formulated the following objectives:

- By 2022, transmission of malaria interrupted and zero indigenous cases to be attained in all 26 States/UTs that were under Categories 1 and 2 in 2014;
- By 2024, incidence of malaria to be reduced to less than 1 case per 1000 population in all States and UTs, and their districts;
- By 2027, indigenous transmission of malaria to be interrupted in all States and UTs of India; and
- By 2030, malaria to be eliminated throughout the entire country, and re-establishment of transmission prevented.

Programme phasing

Malaria elimination in India will be carried out in a phased manner because the various States/UTs have different levels of malaria burden. While some low burden states are in a position to plan action for malaria elimination right now, the high burden states will need to reduce the malaria burden first before proceeding towards elimination. Therefore, states and UTs have been categorized into phases, based on their API as primary criterion with due consideration given to ABER and SPR as secondary criteria. For the categorization details, please refer to page 484.

Category-wise distribution of states/UTs in the year 2022 is as shown :

TABLE 1
Category-wise states/UTs in India, 2022

Category	Definition
Category 0 States with zero indigenous cases	Puducherry and Lakshadweep
Category 1 States with API < 1 case/1000 population in all districts	Delhi, Himachal Pradesh, Jammu & Kashmir, Goa, Kerala, Sikkim, Chandigarh, Daman & Diu, Dadra & Nagar Haveli, Haryana, Manipur, Punjab, Rajasthan, Uttarakhand, Andhra Pradesh, Nagaland, Tamil Nadu, Karnataka, Assam, Gujarat, Telangana, Bihar, Arunachal Pradesh, Madhya Pradesh, Uttar Pradesh, Ladakh (25)
Category 2 States with API < 1 case/1000 population but some districts having API > 1	Maharashtra, Chhattisgarh, Jharkhand, West Bengal, Odisha, Meghalaya, Andaman & Nicobar islands (7)
Category 3 States with API ≥ 1 case/1000 population	Mizoram, Tripura (2)

Source: (5)

Milestones and targets (4)

The milestones and targets set for malaria elimination in India are as follows:

By the end of the year 2016

All states and UTs to have included malaria elimination in their broader health policies and planning framework.

By the year 2020

1. All 15 states/UTs that were under category 1 (elimination phase) in 2014 to completely interrupted malaria transmission and achieved zero indigenous cases and deaths due to malaria;
2. All 11 states/UTs under category 2 (pre-elimination phase) in 2014 to enter into category 1 (elimination phase);
3. 5 states/UTs under category 3 (intensified control phases) in 2014 to enter into category 2 (pre-elimination phase)
4. 5 states/UTs under category 3 (intensified control phase) in 2014 to reduce disease burden but continue to remain in category 3; and
5. Estimated malaria burden at national level to reduce by 15–20% as compared to 2014.

Additionally, states with stronger health systems such as Gujarat, Maharashtra and Karnataka may implement accelerated malaria elimination programmes to achieve interruption of transmission and demonstrate early elimination followed by sustenance of zero indigenous cases.

By the year 2022

1. All 26 states/UTs that were under categories 1 and 2 in 2014 to interrupt malaria transmission and achieved zero indigenous cases and deaths due to malaria;
2. 5 states/UTs which were under category 3 (intensified control phases) in 2014 to enter into category 1 (elimination phase);

3. 5 states/UTs which were under category 3 (intensified control phases) in 2014 to enter into category 2 (pre-elimination phase); and
4. Estimated malaria burden at national level reduced by 30–35% as compared to 2014.

By the year 2024

1. All states and UTs and their districts to reduce API to less than 1 case per 1000 population at risk, sustain zero deaths due to malaria and establish fully functional malaria surveillance to track, investigate and respond to each case;
2. 31 states/UTs to interrupt transmission of malaria and zero indigineous cases and deaths attained; and
3. 5 states/UTs which were under category 3 (intensified control phases) in 2014 to enter into elimination phase.

By the year 2027

Indigenous transmission of malaria interrupted and the entire country to have no indigenous cases and no deaths due to malaria.

By the year 2030

The entire country to sustain status of zero indigenous cases and deaths due to malaria for 3 consecutive years; and India to initiate the processes for certification of malaria elimination status.

Focus on High-Endemic Areas and Tribal Population:

Most of the malaria cases in India are reported from Andhra Pradesh, Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra, Meghalaya, Mizoram, Odisha, Telangana and Tripura. The high incidence in these states is particularly noted in tribal populations living in foothills forested or conflict - affected areas. The malaria programme plans to scale up interventions in these areas along with innovative strategies.

Special strategy for P. vivax elimination (4)

India accounts for more than 50% of the estimated *P. vivax* cases in the world. Elimination of *P. vivax* from India is a serious challenge due to its magnitude as well as the need for a special strategy as *P. vivax* usually disappears from an area much after *P. falciparum*, because: (1) *P. vivax* hypnozoites prolong the parasite's lifespan and are difficult to detect; (2) RDTs currently available to detect *P. vivax* are less sensitive than RDTs for *P. falciparum* detection; (3) Radical treatment for *P. vivax* requires 14 days of primaquine therapy to kill the hypnozoites whereas treatment for *P. falciparum* can be completed in only 3 days; and (4) *P. vivax* strains have a longer incubation period.

The states and UTs with *P. vivax* preponderance will now initiate special measures for elimination of *P. vivax* by expanding bivalent RDTs and quality microscopy services to detect all *P. vivax* infections; ensuring compliance of the 14–days radical treatment by affected individuals; and tackling urban malaria by targeting *An. stephensi* by antilarval measures.

District as the unit of planning and implementation :

States and UTs should categorize their districts so that even if the given state/UT is not yet in the elimination phase, their districts with API < 1 per 1000 population could be considered eligible for initiating elimination phase activities. In addition, each district may sub-categorize its blocks into different phases based on their API; and further each block into its PHCs, PHC into SCs and SC to villages. This would facilitate some category 2 districts to start elimination activities in their blocks falling in category 1. Stratification may be done in this manner up to the subcentre level (4).

Each district should stratify its PHCs and sub-centres (with their population) into the following five strata, as those with :

1. Zero cases
2. API > 0 to < 1 per 1000 population
3. API 1 to < 2 per 1000 population
4. API 2 to < 5 per 1000 population
5. API ≥ 5 per 1000 population

Strategies *(4)*

The overall objectives of the malaria elimination programme are rapid reduction of transmission in areas with high malaria incidence; interruption of malaria transmission in low transmission areas; and prevention of re-establishment of malaria in areas where transmission has been interrupted.

The broad strategies of the malaria elimination framework are:

- Early diagnosis and radical treatment
- Case-based surveillance and rapid response
- Integrated vector management (IVM)
  - Indoor residual spray (IRS)
  - Long-lasting insecticidal nets (LLINs) / Insecticide treated bed nets (ITNs)
  - Larval source management (LSM)
- Epidemic preparedness and early response
- Monitoring and evaluation
- Advocacy, coordination and partnerships
- Behaviour change communication and community mobilization
- Programme planning and management

The key interventions recommended for each category of states/UTs are detailed below.

Category 3 (Intensified control phase : States/UTs with API ≥ 1)

1. Massive scaling up of existing disease management and preventive approaches and tools, aimed at a significant reduction in the prevalence and incidence of malaria as well as associated deaths.
2. Screening of all fever cases suspected for malaria.
3. Classification of areas as per local malaria epidemiology and grading of areas as per risk of malaria transmission followed by implementation of tailored interventions.
4. Strengthening of intersectoral collaboration. Special interventions for high-risk groups such as tribal populations and populations residing in conflict affected or hard-to-reach areas.
5. One-stop centres or mobile clinics on fixed days in tribal or conflict affected areas to provide malaria diagnosis and treatment, and increasing community awareness with the involvement of other agencies and service providers as required.
6. Timely referral and treatment of severe malaria cases to reduce malaria-related mortality. Strengthening all district and sub-district hospitals in malaria endemic

areas as per Indian Public Health Standards with facilities for management of severe malaria cases.
7. Establishment of a robust supply chain management system.
8. Maintenance of an optimum level of surveillance using appropriate diagnostic measures.
9. Equipping all health institutions (primary health care level and above), especially in high-risk areas, with microscopy facilities and RDTs for emergency use and injectable artemisinin derivatives for treatment of severe malaria.

Category 2 (Pre-elimination phase : States/UTs with API < 1, but some of their districts reporting API ≥ 1)

The states/UTs in pre-elimination phase are those close to entering the elimination phase. Therefore, malaria elimination interventions will be introduced with particular focus on setting up an elimination surveillance system and initiating elimination phase activities in those districts where the API has been reduced to less than 1 case per 1000 population at risk per year. The planning of elimination measures will be based on epidemiological investigation and classification of each malaria case and focus.

Category 1 (Elimination phase : States/UTs with API<1, and all their districts reporting API < 1)

1. All efforts will be directed at interrupting local transmission in all active foci of malaria.
2. Mandatory notification of each case of malaria from the private sector, other organized government sectors or any other health facility.
3. Adequate case-based surveillance and complete case management established and fully functional across the entire country to handle each case of malaria.
4. Investigation and classification of all foci of malaria.
5. A strict total coverage of all active foci by effective vector control measures.
6. Early detection and treatment of all cases of malaria by means of ACD and/or PCD to prevent onward transmission.
7. State and national level malaria elimination database established and made operational.
8. Implementation of interventions for effective screening, management and prevention of malaria among mobile and migrant populations.
9. Establishment of an effective epidemic forecasting and response system.
10. Ensuring rigorous quality assurance of all medicines and diagnostics.
11. Setting up a national-level reference laboratory to serve following two functions:
    (a) All positive and a fixed percentage of negative slides will be referred to this laboratory for confirmation of diagnosis and cross-checking. After elimination has been achieved in each State/UT, 100% of cases will be notified to this laboratory for confirmation of diagnosis. The laboratory will be notified immediately on all positive cases of malaria by each state/UT through either SMS, e-mail or telephone with information on name, gender, address (village and district), date and type of testing and type of parasite for each positive case of malaria so that a national level database can be maintained.
    (b) Training of master trainers and accreditation/ certification of microscopists as per Indian Public Health Standards shall also be undertaken at this laboratory.
12. During investigation of foci, all suspected cases of malaria are to be screened for malaria. These could include household members, neighbours, school children, workplace colleagues and relatives.
13. Surveillance of special groups, migrant populations or populations residing in the vicinity of industrial areas are also to be covered under surveillance operations.

Category 0 (prevention of re-establishment phase)

When any area, whether a state/UT or a district within a state/UT has, achieved malaria elimination, the specific objectives will be as follows:

1. Detect any re-introduced case of malaria;
2. Notify immediately all detected cases of malaria;
3. Determine the underlying causes of resumed local transmission;
4. Apply rapid curative and preventive measures;
5. Prevent re-introduction and possible re-establishment of malaria transmission; and
6. Maintain malaria-free status in these areas.

Surveillance *(2, 4)*

The malaria surveillance system in India was initially set up in the early 1960s. The system has since been adapted to the needs of control and now monitors malaria incidence trends and geographic distribution. The aim is to target control interventions in high transmission areas and assessing their impact. Surveillance also plays a key role in the early detection of outbreaks.

Active case detection (ACD) is carried out in rural areas with blood smears collected by MPWs/ANM during fortnightly house visits. Passive case detection (PCD) is done in fever cases reporting to peripheral health volunteers/ ASHAs and at sub-centres, malaria clinic, CHC, and other secondary and tertiary level health institutions that patients visit for treatment. ASHA and other volunteer workers provide diagnostic services by RDTs, and at PHCs by examination of blood smears. In villages where no ASHA or other volunteer has been trained and deployed for providing early diagnosis and effective treatment, ACD and case management is done by the MPWs.

The surveillance data of NVBDCP reflects malaria trends reasonably well because the ABER in the country as a whole has remained relatively constant at about 10%, and the surveillance system has not undergone any major changes. The ABER is, however, low in a few states, while in most of the high endemic areas it is much above 10%. Microscopy remains the best method of diagnosis on account of its high sensitivity and specificity. It is also more economical in facilities where large number of slides are examined daily.

There are about 100 million blood slides collected from fever cases in India annually from which about 1.5 million malaria cases are detected. The new norms for case management emphasize quality care for patients. The implementation of use of Rapid Diagnostic Tests (RDTs) and Artesunate combination therapy (ACT) and the improvements in service delivery is expected to attract greater number of fever cases to the programme in the coming years. The programme also plans to supply RDT kits

to private providers in return for data. The current level of screening of 100 million fever cases will not be reduced as it is aimed to screen 10% of the population, even though the disease transmission is expected to reduce.

During 2003, the NVBDCP introduced the use of RDT for early diagnosis of malaria. In the year 2012, bivalent RDT were introduced in the programme to detect *P. vivax* and *P. falciparum*. Since then, the programme has procured and distributed RDTs to community level workers/volunteers who have been trained to use them to enable timely diagnosis in these areas. In remote and inaccessible rural and tribal areas, RDTs are now the established method of choice for malaria diagnosis.

Parameters of malaria surveillance

By definition, surveillance also implies the continuing scrutiny of all aspects of occurrence and spread of a disease, that are pertinent to effective control. Included in these are the systematic collection and evaluation of field investigations, etc. The following parameters are widely used in the epidemiological surveillance of malaria : (a) Annual parasite incidence (API); (b) Annual blood examination rate (ABER); (c) Annual *falciparum* incidence (AFI); (d) Slide positivity rate (SPR); and (e) Slide *falciparum* rate (SFR).

Sentinel surveillance

One of the weakness of the existing malaria surveillance system is the lack of articulation with hospitals, which means that severe malaria cases are not reported separately and that only a small fraction of malaria deaths are recorded. Therefore, sentinel surveillance is being established in high endemic districts, by selecting in each district, depending on its size, 1–3 sentinel sites in large hospitals for recording of all out-patient and in-patient cases of malaria, and malaria related deaths.

Case management

According to the revised drug policy, there is no scope of presumptive treatment in malaria control. For further details please refer to page 314, chapter 5.

Integrated vector management (IVM)

The NVBDCP aims to achieve effective vector control by the appropriate biological, chemical and environmental interventions of proven efficacy, separately or in combination as appropriate to the area through the optimal use of resources. Efforts are made for collaboration with various public and private agencies and community participation for vector control. Integration of IVM is done by using identical vector control methods to control malaria and leishmaniasis in rural areas, and malaria and dengue in urban areas, to achieve cost-effectiveness and synergy. The IVM includes safe use of insecticides and monitoring of insecticide resistance. The measures of vector control and protection include :

- Measures to control adult mosquitoes : Indoor Residual Spray (IRS).
- Antilarval measures : chemical, biological and environmental.
- Personal protection : use of bed-nets, including insecticide treated nets.

The national malaria control programme is currently using IRS as the primary method of vector control in rural settings, and anti-larval measures in the urban areas. Insecticide treated bed-nets have been introduced in the programme and the programme envisages a scale up in their use as vector control option for full population coverage, which will replace IRS in areas, where operational factors indicate that this method alone will give sufficient impact.

As much as possible, the village is to be the unit of intervention, but in some districts, data available with knowledge of ecological conditions may make it more rational to classify whole sub-centre areas as high-risk areas. High risk areas and populations will be re-defined at least annually. Such villages shall be protected by indoor residual spray and insecticide treated nets and the coverage will be more than 80 per cent, whatever may be the intervention.

The population living in areas with API ≥ 5 is planned to be covered by LLINs and population living in endemic areas registering API ≥ 2 is covered with conventional net treated with insecticides and IRS. Conventional nets treated with insecticides will continue to be used in areas registering API 2 to 5. IRS is still the preferred method of vector control in areas with very hot summers and where ITNs are not acceptable to population.

A population of about 80 million is at present being covered by IRS in the country *(2)*. DDT is the insecticide of choice; in areas where the vector has shown resistance to DDT, the alternatives are malathion and synthetic pyrethroids. Two rounds of spraying are done for DDT and synthetic pyrethroids to provide protection during the entire transmission season, and in the case of malathion, three rounds of spraying are required. About 60 per cent of the high risk areas targeted under IRS are under coverage with DDT. The real coverage by IRS is, however, limited by the low community acceptance due to the white marks left on plastered surface, acrid smell associated with malathion, re-plastering of walls after completion of IRS etc. *(4)*.

Malaria paradigms/ecotypes *(2)*

The association between malaria and various ecological situations have been studied in India since the early part of the 20th century. There is considerable heterogenicity in malaria transmission characteristics between and within the states of the country, and many ecotypes/paradigms of malaria have been recognized. They are discussed in detail on page 307 chapter 5.

Presently, malaria burden in the country is highly concentrated in a few forest-tribal states and areas. In most of these states, vector control interventions are limited to villages with API ≥ 5 or other high risk criteria, due to resource constraints. The North-East has specific difficulties in implementation and monitoring due to various reasons. A large section of tribal population lives in inaccessible terrains, forest, hilly and riverbed conditions, and characterized by high degree of mobility, poverty, inadequate clothing, outdoor sleeping habits, forest based economy etc. Presence of efficient vectors, triple insecticide resistance and innumerous breeding sites add to the problem. Moreover, health infrastructure is generally found to be inadequate in these areas. All these factors maintain malaria as one of the most important cause of morbidity and mortality affecting tribal populations. The predominant parasite species in tribal areas is *P. falciparum* which is known to cause severity and lead to mortality if timely treatment is not provided.

A tribal-specific strategy is being envisaged to be implemented through a Tribal Malaria Action Plan (TMAP). Category 2 and 3 districts are planned to be covered initially.

This will enable concentration of available resources to high endemic areas. The key interventions are as follows *(4)* :

1. Strengthening surveillance : Introduction of mobile-based surveillance, where routine health services/ facilities are not available.
2. Provision of hamlet-wise ASHAs instead of village-wise.
3. Wherever engagement of ASHAs is not possible, anganwadi workers of ICDS, faith healers, local medical/ health care providers, village headmen, PRIs or school teachers may be trained and provided relevant logistics to diagnose and treat malaria cases. In forest areas, involvement of forest department in diagnosis and treatment may be done.
4. In areas with civic disturbance, provision of well-informed and pre-scheduled mobile health services.
5. Involvement of locally available, credible NGOs.
6. Strengthening of PHCs with quality microscopy facilities.
7. Provision of diagnosis and treatment facilities by contractors/owners of development projects to the labours on site, should be made mandatory.
8. On the spot, species-specific radical treatment of all positive cases of malaria.
9. Identification of serious cases and early referral to specialized health facilities, ensuring free transport services.
10. Follow up and epidemiological tracking of all positive cases.
11. Mass screening of migrants wherever necessary.
12. Integrated Vector Management (IVM) for appropriate vector control. Prioritization of villages according to degree of risk for taking appropriate vector control measures (IRS/LLINs or treatment of community- owned bed nets with insecticides).
13. Social marketing to increase usage of bed nets.
14. Minor environmental engineering like cleaning/de-silting of drainage, filling pits and ditches, solid waste management through Village Health, Sanitation and Nutrition Committee (VHSNC) as well as MNREGA.
15. Regular and efficient supply chain management.
16. Intensive training for all cadres of staff, ASHAs/ community volunteers.
17. Community mobilization by utilizing traditional IEC/BCC tools and practices.

Table 2 summarizes the key indicators that will be used to mensure the country's progress towards elimination at national and sub-national level.

Behaviour change communication (BCC)

BCC is a systematic process that motivates individuals, families and communities to change their inappropriate or unhealthy behaviour, or to continue a healthy behaviour. BCC is a key supportive strategy for malaria prevention and treatment under NVBDCP.

BCC is directed at : (a) early recognition of signs and symptoms of malaria; (b) early treatment seeking from appropriate provider; (c) adherence to treatment regimens; (d) ensuring protection of children and pregnant women; (e) use of ITNs/LLINs; and (f) acceptance of IRS, etc.

Anti-malaria month campaign

Anti-malaria month is observed every year in the month of June throughout the country, prior to the onset of monsoon and transmission season, to enhance the level of awareness and encourage community participation through mass media campaign and inter-personal communication and consolidate inter-sectoral collaborative efforts with other government departments, corporate and voluntary agencies at national, state and district levels.

Interaction of malaria control with other health programmes

The other main public health programmes related to malaria control are :

(1) Integrated Disease Surveillance Project (IDSP) : The project, with weekly fever alerts is increasingly providing the early warning signals on malaria outbreaks.

TABLE 2

Key indicators to measure progress towards malaria elimination

	IMPACT
1	Number and incidence rate of confirmed malaria cases classified according to sex, age, parasite species and other relevant parameters.
2	Number and incidence of severe malaria cases as well as case fatality rate.
3	Number of malaria cases in pregnancy.
4	Number and type of malaria foci(in areas eligible for elimination).
5	Number of confirmed deaths due to malaria.
6	Number of states/UTs which have eliminated malaria and are currently in the phase of prevention of re-establishment of local transmission.
7	Number of states/UTs which are in elimination phase.
8	Number of states/UTs which are in pre-elimination phase.
9	Number of states/UTs which are in intensified control phase.
	OUTCOME
1	Proportion of population at risk who slept under insecticide-treated net/LLIN in the previous night.
2	Proportion of population at risk protected by indoor residual spraying within the past 12 months.
3	Proportion of patients with confirmed malaria who received anti-malarial treatment as per national policy.
4	Proportion of cases investigated and classified(in areas eligible for elimination).
5	Proportion of foci investigated and classified(in areas eligible for elimination).
6	Proportion of expected monthly reports received from health facilities at the national and subnational level.

Source: *(6)*

(2) Other vector borne diseases : Dengue and malaria control activities overlap in many urban areas, malaria and kala-azar in a few districts of Jharkhand, and malaria and filariasis in some areas including a few districts of Odisha.

(3) Reproductive and child health : Antenatal care services are utilized in distribtuion of LLINs to pregnant women in some areas of the country. Janani Suraksha Yojana also makes provision of bed-nets distribution to pregnant women. Changes in the malaria case management norms have been included in the Integrated Management of Neonatal and Childhood Illness.

Achievements under National Framework for Malaria Elimination in India : *(7)*

1. India has made considerable progress in malaria reduction. The country has achieved a reduction of 84% in malaria morbidity and 76% in malaria mortality between 2015 and 2020.
2. India has achieved National Annual Parasite Incidence (API) less than 1 per 1000 population in 2012. In 2023, National API was 0.16 per 1000 population. In 2023, total 34 States/UTs have achieved API less than 1 except two states, Tripura (5.69) and Mizoram (14.23) have API more than 1. Only 32 districts have Annual Parasite Incidence (API) one and above. 116 districts in the country have reported 'zero malaria case'.
3. Among 182 tribal districts, there has been 82.29% reduction in malaria morbidity and 78.22% reduction in malaria mortality between 2015 and 2023.
4. Malaria has been made notifiable in 34 States/ UTs (Andhra Pradesh, Arunachal Pradesh, Assam, Chhattisgarh, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Manipur, Mizoram, Nagaland, Odisha, Punjab, Rajasthan, Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, Uttarakhand, West Bengal, Puducherry, Chandigarh, Daman & Diu, D&N Haveli and Lakshadweep).
5. Till September 2023, 28 States have constituted State Task Force and District Task Force for malaria elimination. Remaining States/UTs are under process of constituting State Task Force and District Task Force.
6. Malaria microscopy, the gold standard for malaria elimination, has also been strengthened by national refresher trainings and certification of a core group of laboratory technicians from different states.
7. Award to Districts/States for achieving 'Zero indigenous case status' and maintaining it for three consecutive years on attaining sub-national malaria elimination, instituted for Year 1 and Year 3.
8. Mass Screening and Treatment (MSAT) campaign has been initiated in the high burden districts of Tripura, Mizoram and Chhattisgarh to break the ongoing transmission cycle of malaria in asymptomatic carriers.
9. Availability of Bivalent Rapid Diagnostic Tests (RDTs) and anti-malarials with ASHAs for early diagnosis and prompt treatment at community level.

During the last 6 years, 9.7 crore LLINs have been distributed in the high malaria endemic areas of various states/UTs.

High Burden and High Impact (HBHI) initiative of WHO has been started in four states i.e. West Bengal, Jharkhand, Chhattisgarh and Madhya Pradesh in July, 2019 for intensification of malaria elimination activities in these states.

Setting up of health web based reporting system for the whole country on Integrated Health Information Platform (IHIP) - malaria included, and mapping of high malaria prone areas using GIS maps and hotspots.

Global Fund Supported Malaria Elimination Project : *(7)*

The Global Fund to fight AIDS, Tuberculosis & Malaria (GFATM) is supporting malaria control in India since 2005. GF supported Intensified Malaria Control Projects (IMCP) I to III were implemented from July 2005–December 2017. From January 2018–March 2021 Intensified Malaria Elimination Project (IMEP) was implemented in 7 North-eastern states and Madhya Pradesh. At present, Intensified Malaria Elimination Project–2 is being implemented in 7 North-eastern states (Arunachal Pradesh, Assam, Meghalaya, Mizoram, Nagaland, Manipur & Tripura), Odisha, Jharkhand and Chhattisgarh, covering 166 million population in 155 districts within the existing framework of National Vector Borne Disease Control Programme. At present Global Fund supports for LLINs, human resources, monitoring etc.

(B) ELIMINATION OF LYMPHATIC FILARIASIS

The disease is endemic in 328 districts in 16 states and 4 UTs. According to recent estimates about 740 million people are exposed to the risk of infection *(8)*.

The National Filaria Control Programme has been in operation since 1955. In June 1978, the operational component of the NFCP was merged with the urban malaria scheme for maximum utilization of available resources. The training and research components, however, continue to be with the Director, National Institute of Communicable Diseases, Delhi.

Training in filariology is being given at three Regional Filaria Training and Research Centres situated at Calicut (Kerala), Rajahmundry (A.P.) and Varanasi (U.P.) under the National Institute of Communicable Diseases, Delhi. Besides, 12 headquarters bureaux are functioning at the state level.

Filaria control strategy includes vector control through anti larval operations, source reduction, detection and treatment of microfilaria carriers, morbidity management and IEC. National Filaria Control Programme is being implemented through 206 filaria control units, 199 filaria clinics and 27 survey units, primarily in endemic urban towns. In rural areas anti filaria medicines and morbidity management services are provided through primary health care system.

In India, the National Health Policy (2002), envisages elimination of lymphatic filariasis (ELF) by 2015 and National Health Policy 2017 to maintain elimination status. The elimination is defined as "lymphatic filariasis ceases to be public health problem, when the number of microfilaria carriers is less than 1 per cent and the children born after initiation of ELF are free from circulating antigenaemia (presence of adult filaria worm in human body).

The strategy of lymphatic filariasis elimination is through :

(a) Annual Mass Drug Administration (MDA) of single dose of antifilarial drug for 5 years or more to the eligible population (except pregnant women, children below 2 years of age and seriously ill persons) to interrupt transmission of the disease.

(b) Home based management of lymphoedema cases and up-scaling of hydrocele operations in identified CHCs/ district hospitals/medical colleges.

To achieve elimination of lymphatic filariasis, during 2004 the Govt. of India launched annual MDA with single dose of DEC tablets in addition to scaling-up home based foot care and hydrocele operation. The co-administration of DEC + Albendazole has been upscaled since 2007. The programme covered 202 districts in 2004 whereas by the year 2007, all the 250 LF endemic districts were covered. The mass drug administration starts in the month of November. Presently, antifilarial drug i.e., DEC + Albendazole (DA)/ Ivermectin + DEC + Albendazole (IDA) is administered.

The achievements of the programme are as follows :

Key achievements Status 2020

Stage in the programme	Total endemic districts in 2020
Total Lymphatic Filariasis endemic districts	272
Districts conducted MDA in 2020	97
DEC + Albendazole administered	89
Ivermectin + DEC + Albendazole administered	8
Districts cleared 1st Transmission Assessment Survey (TAS) and Stopped MDA	98
Districts cleared 2nd Transmission Assessment Survey (TAS)	88
Districts cleared 3rd Transmission Assessment Survey (TAS)	42

Source : *(7)*

The line listing of lymphoedema and hydrocele cases were initiated since 2004 by door-to-door survey in filaria endemic districts. The updated figure till December 2014 reveals about 12.5 lakh cases with clinical manifestation of filariasis were line listed which includes 8.7 lakh cases of lymphoedema and 3.8 lakh cases of hydrocele. Initiation has also been taken to demonstrate the simple washing of foot to maintain hygiene for prevention of secondary bacterial and fungal infection in chronic lymphoedema cases, so that the patients get relief from frequent acute attacks.

The microfilaria survey in all the implementation units is being done through night blood survey before MDA. The survey is done in 4 sentinel and 4 random sites collecting total 4000 slides (500 from each site). There is definite evidence of microfilaria reduction in the MDA districts. However, the coverage of population with MDA should be above 80 per cent persistently for 5–6 years, which would reduce microfilaria load in the community, and thereby, interrupt the transmission *(3)*.

(C) KALA-AZAR

Kala-azar is now endemic in 33 districts of Bihar, 4 districts of Jharkhand, 11 districts of West Bengal and 6 districts of Uttar Pradesh, besides sporadic cases in few other districts of Uttar Pradesh. A centrally sponsored programme was launched in 1990–91. This has brought down the incidence of the disease from 77,102 cases in 1992 to 595 cases in 2023 *(9)*.

The strategies for Kala-azar elmination are : (a) Enhanced case detection and complete treatment including introduction of rK39 rapid diagnostic kits and oral drug Miltefosine for treatment of Kala-azar cases; (b) Interruption of transmission through vector control. It has been decided to replace DDT with synthetic pyrethroid for the purpose of fogging to eliminate sandfly, as the insect is becoming resistant to DDT; (c) Communication for behavioural impact and intersectoral convergence; (d) Capacity building; (e) Monitoring, supervision and evaluation; and (f) Research guidelines on prevention and control of Kala-azar have been developed and circulated to the states.

ACTIVE CASE SEARCH : The frequency of case searches has been increased from a single annual case search to quarterly case searches. The active case searches are carried out during a fortnight designated as the "Kala-azar Fortnight", during which the peripheral health workers and volunteers are engaged to make door-to-door search and refer the cases conforming to the case definition of kala-azar and PKDL to the treatment centres for definitive diagnosis and treatment *(3)*.

An incentive amount of Rs. 300 is provided to ASHA for identifying each case of kala-azar and Rs. 100 for ensuring one round and Rs. 200 for two rounds of insecticide spraying. Even the patient being treated in the hospital will be given Rs. 500 as compensation of daily wage for the time he spends in the hospital during the treatment for kala-azar and Rs. 2,000 for PKDL. This revised strategy of total eradication of kala-azar was launched on 2nd September 2014.

The new strategy also includes introduction of Rapid Diagnostic Kit developed by ICMR into the programme and single dose treatment with Liposomal Amphotericin B, which is given intravenously in 10 mg/kgbw dose. It is to reduce the human reservoir of infection. WHO will supply the drug free of cost *(10)*.

Achievements

All 633 endemic blocks have started reporting less than 1 case per 10,000 population, indicating that the bench mark for the kala-azar as a public health programme stands achieved by the end of 2023. Elimination may be announced any time. Uttar Pradesh (2019), West Bengal (2017), Bihar (2022) and Jharkhand (2023) states have achieved the elimination target at the block level and are sustaining the progress *(9)*.

(D) JAPANESE ENCEPHALITIS

Japanese encephalitis is a disease with high mortality rate and those who survive do so with various degrees of neurological complications. During the last few years it has become a major public health problem. States of Andhra Pradesh, West Bengal, Assam, Tamil Nadu, Karnataka, Bihar, Maharashtra, Manipur, Haryana, Kerala and Uttar Pradesh are reporting maximum number of cases.

The strategies for prevention and control of Japanese encephalitis include strengthening of the surveillance activities through sentinel sites in tertiary health care institutions, early diagnosis and proper case management, integrated vector control, particularly personal protection and use of larvivorous fishes, capacity building and behaviour change communication. As the JE vectors are outdoor resters, indoor residual spray is not effective. The government of India provides need–based assistance to the states, including support for training programmes and social mobilization.

As there is no specific cure for this disease, early case management is very important to minimize the risk of complications and death. JE vaccination is recommended for children between 1 to 15 years of age. In addition, health education through different media and interpersonal communication for the community is crucial. Emphasis should be given on keeping pigs away from human dwellings, or in pigsties, particularly during dusk to dawn, which is the biting time of vector mosquitoes. Use of clothes which cover

the body fully to avoid mosquito bites are advocated. Use of bed-nets is also very important precaution. Since early reporting of case is important to avoid complications, the community should be given full information about the signs and symptoms of the disease, and the health facilities available at health centres/hospitals. The states are advised to use malathion for outdoor fogging as outbreak control measure in the affected areas *(53)*. Epidemiological monitoring of the disease for effective implementation of preventive and control measure and technical support is provided on request by the state health authorities.

(E) DENGUE FEVER/ DENGUE HAEMORRHAGIC FEVER

During 1996, an outbreak of dengue was reported in Delhi. Since then dengue has been reported from other states also. In view of this major outbreak of the disease a "Guideline of Preparation of Contingency Plan in case of outbreak/epidemic of Dengue/Dengue haemorrhagic fever" was prepared and sent to all the states. It includes all the important aspects of control measures like identification of outbreak, demarcation of affected area, containment of outbreak, case management, vector control, IEC activities about Do's and Dont's for prevention of dengue, monitoring and reporting etc. Dengue is a notifiable disease since 2016.

Since early reporting of cases is crucial to avoid any complication and mortality, the community is given full information about the signs and symptoms as well as availability of health services at health centres/hospitals. Alerting the hospitals for making adequate arrangements for management of dengue/dengue haemorrhagic fever cases has also been advised.

Government of India in consultation with states has identified 521 sentinel surveillance hospitals with laboratory support for augmentation of diagnostic facilities in the endemic states. Further, for advanced diagnosis and back-up support 14 Apex Referral Laboratories have been identified and linked with sentinel surveillance hospitals. To make these functional IgM capture ELISA test kits are provided through National Institute of Virology, Pune free of cost. Contingency grant is also provided to meet the operational costs.

For early diagnosis ELISA based NSI kits have been introduced under the programme which can detect the cases from 1st day of infection. IgM capture ELISA tests can detect the cases after 5th day of infection.

The GOI has taken the following steps for prevention and control of dengue *(7)* :

- Monitoring the situation through reports received from state health authorities.
- A mid-term plan for prevention and control of dengue has been developed in 2011 and circulated to the states for implementation. The main components of mid term plan for prevention and control of dengue are as follows :
  - (a) *Surveillance* : Disease and entomological surveillance.
  - (b) *Case mangement* : Laboratory diagnosis and clinical management.
  - (c) *Vector management* : Environmental management for source reduction, chemical control, personal protection and legislation.
  - (d) *Outbreak response* : Epidemic preparedness and media management.
  - (e) *Capacity building* : Training, strengthening human resource and operational research.
  - (f) *Behavioural change communication* : Social mobilization, and information, education and communication (IEC).
  - (g) *Inter-sectoral coordination* : with ministries of urban development, rural development, panchayati raj, surface transport and education sector.
  - (h) *Monitoring and supervision* : Analysis of reports, review, field visit and feed-back.

(F) CHIKUNGUNYA FEVER

Chikungunya fever is a debilitating non-fatal viral illness, re-emerging in the country after a gap of three decades. Govt. of India is continuously monitoring the situation. Guidelines for prevention and control of the disease have been prepared. Since same vector is involved in the transmission of dengue and chikungunya, strategies for transmission risk reduction by vector control are also the same. Support in the form of logistics and funds are provided to the states.

For carrying out proactive surveillance and enhancing diagnostic facilities for chikungunya, the 521 sentinel surveillance hospitals involved in dengue in the affected states also carry out chikungunya tests. The diagnostic kits are provided through National Institute of Virology, Pune, by the central government.

NATIONAL LEPROSY "ERADICATION" PROGRAMME

The National Leprosy Control Programme (NLCP) was launched in 1955. Multi Drug Therapy (MDT) for leprosy was introduced and the NLCP was renamed as National Leprosy Eradication Programme (NLEP) in 1983 and implemented as a Centrally Sponsored Scheme which significantly accelerated the elimination of leprosy as a public health problem. In 1983 the prevalence rate of leprosy was 57.8 per 10,000 population and by 1992 it was reduced to 24 per 10,000 population.

As India stepped into the new millennium, the prevalence rate of leprosy was 3.7 per 10,000 in March 2001. The country adopted the strategy of decentralization of the leprosy programme to States and Union Territories and integration of leprosy into the general health care services. With this, treatment of leprosy became more accessible and leprosy patients received treatment from health facilities of the general health care system. The peripheral staff was involved in delivering of MDT to the patients. The MDT comprises of the antibiotics, Rifampicin, Clofazimine and Dapsone.

In 2005, India achieved the goal set by the National Health Policy, 2002 of elimination of leprosy as a public health problem, defined as less than 1 case per 10,000 population at the national level. However, prevalence rate remained above 1 per 10,000 population in several districts and blocks and new cases continued to occur. In March 2020, 114,451 annual new cases were reported and 610 out of 717 districts had achieved prevalence rate of less than 1 per 10,000 population. Among the new cases detected, 2.41 percent had reported with visible deformities *(9)*.

Major initiatives

Major initiatives taken are as follows :

(1) More focus has now been given to new case detection than prevalence which only gives the number of cases on record at a point in time. The new case detection rate is the main indicator for programme monitoring.

(2) Treatment completion rate has been taken as an important indicator, to be calculated by states at yearly basis.

(3) More emphasis is being given on providing disability prevention and medical rehabilitation (DPMR) services to leprosy affected persons. The aid provided is as follows :

(a) Dressing materials, supportive medicines and ulcer kits are provided to leprosy affected persons with ulcers and wounds. These services are also provided to leprosy affected persons residing in self settled colonies.

(b) Micro-cellular rubber footwear is provided for protection of insensitive feet. 41 NGOs in the country and 42 Government Medical Colleges have been strengthened for providing reconstructive surgery services to leprosy affected persons for correction of their disability, thus totalling to 83 centres for conducting reconstructive surgeries in the country.

(c) An amount of Rs. 12,000/- is provided as incentive to each leprosy affected person from BPL family undergoing reconstructive surgery in these identified institutions to compensate for loss of wages.

(d) Support is also provided to government institutions/ PMR centres in the form of Rs 5,000/- per reconstructive surgery conducted.

(4) ASHAs have been involved in bringing out suspected leprosy cases from their villages for diagnosis and treatment at PHC and follow-up of confirmed cases for their treatment completion. To facilitate the involvement of ASHA in the programme, they are being paid incentive money as below *(7)* :

(a) On confirmed diagnosis of case brought by them – Rs. 250/-.

(b) On completion of full course of treatment of the case within specified time – PB leprosy case – Rs. 400/-, and MB leprosy case – Rs. 600/-.

(c) An early case before onset of any visible deformity – Rs. 250/-.

(d) A new case with visible deformity in hands, feet or eye – Rs. 200/-.

Activities to be performed by ASHA are as follows :

(a) Search for suspected cases of leprosy i.e. before any sign of disability appears. Such early detection will help in prevention of disability and also cut down transmission potential. ASHA based surveillance for leprosy suspects (ABSULS) was launched on 1st July 2019 *(11)*.

(b) Follow-up all cases for completion of treatment in scheduled time. During follow up visit, also look for symptoms of any reaction due to leprosy and refer them to the Health Workers/PHC for treatment. This will again reduce chances of disability occurring in cases under treatment.

(c) Advise and motivate self-care practices by disabled cases for proper care of their hands and feet during the follow-up period. This will improve quality of life of the affected persons and prevent deterioration of disabilities.

(d) Spreading awareness.

(e) There are 612 self settled colonies in the country where more than 50,000 leprosy affected persons reside. Free medical facilities like care of ulcers, self care training, counselling and MCR footwear are provided to leprosy affected persons residing in these colonies through para-medical workers/NGOs on weekly/fortnightly basis.

6. Intensive IEC campaign with a theme "Towards Leprosy Free India" has been carried out towards further reduction of leprosy burden in the community, early reporting of cases and their treatment completion, provision of quality leprosy services and reduction of stigma and discrimination against leprosy affected persons. Awareness generation activities are carried out through mass media and local media.

Disability prevention and medical rehabilitation (DPMR)

The main activities carried out under DPMR are as follows *(12)* :

(1) Implementation of DPMR activities as per guidelines and reporting its outcome eg. treatment of leprosy reaction, ulcers, physiotherapy, reconstructive surgery and, providing MCR footwear.

(2) Integrating DPMR services – There are provision of services to persons with disability by various departments under different ministries. Convergence of NLEP services into NRHM facilitates this integration.

(3) To develop a referral system to provide prevention of disability services to all leprosy disabled persons in an integrated set-up.

The DPMR activities are planned to be carried out in a three tier system i.e. the primary level care (First level), secondary level care (Second level) and the tertiary level care (Third level). The primary level care institutions are all PHCs, CHCs, Sub-divisional hospitals and urban leprosy centres/dispensaries. The secondary level care institutions are all District Head Quarter Hospitals and District Nucleus Units. The tertiary level care institutions are :

1. Central Government Institutes (CLTRI Chengalpattu and RLTRI at Aska/Gauripur/Raipur).
2. ICMR Institute JALMA, Agra.
3. ILEP supported Leprosy Hospitals.
4. All PMR Institutes and departments of medical colleges.

The other support units are :

(1) Orthopaedics and plastic surgery departments of medical colleges.

(2) Identified NGO institutions.

(3) All National Institutes under Ministry of Social Justice and Empowerment.

(4) Contractual surgeons skilled in RCS and Rehabilitation Programmes.

The treatment and care pathway in NLEP is as summarized in Fig. 1.

Decentralization and institutional development : Integration of leprosy services into the general health care system has been completed. Services are available from all PHCs, and other health centres where a medical officer is available. District nucleus has been formed to supervise and monitor the programme. State leprosy societies formed will merge with the state health society under the National Rural Health Mission.

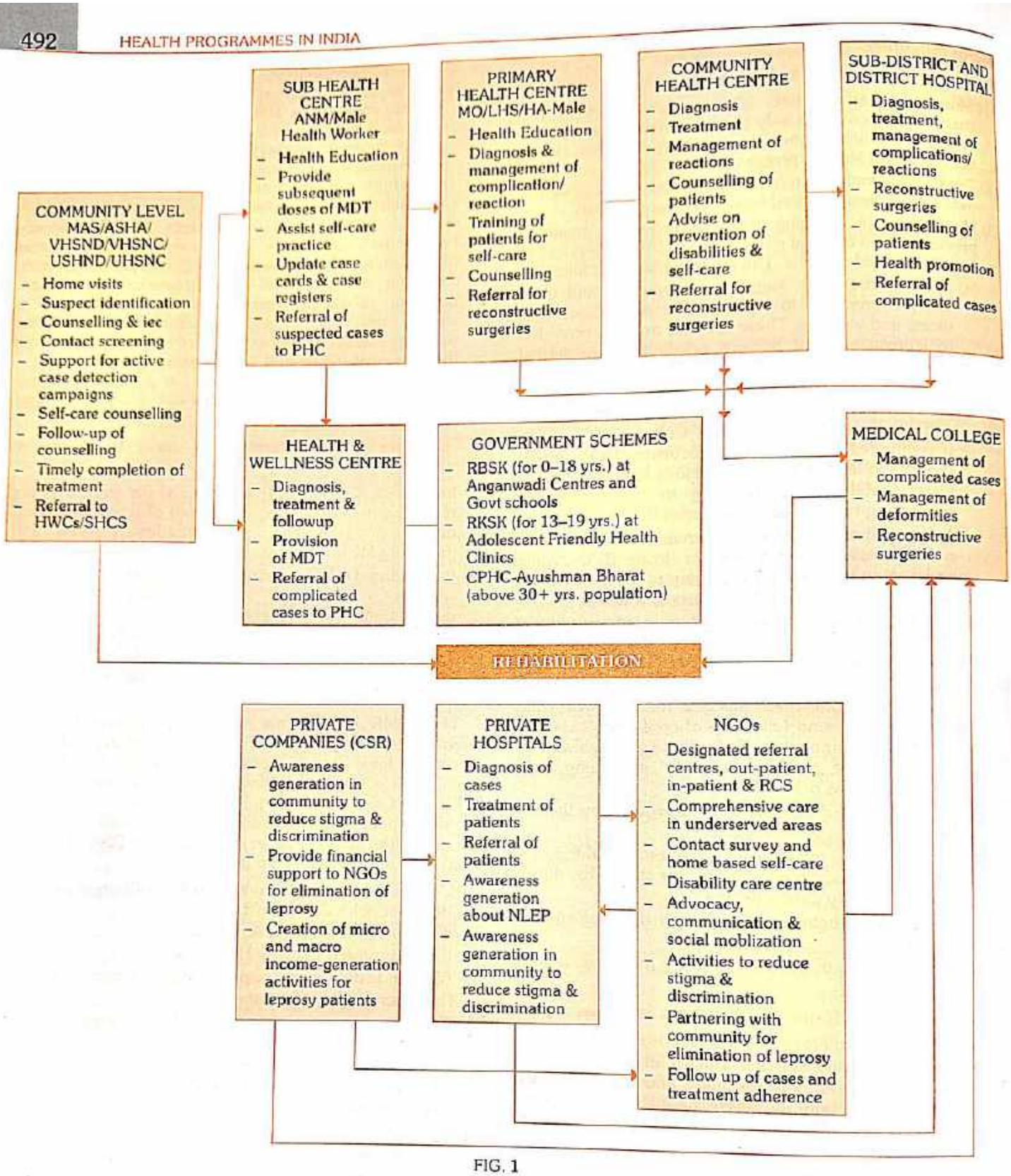


FIG. 1

The treatment and care pathway in NELP

Source : *(13)*

Services in the urban areas *(14)*

The health services in the urban areas differ from the rural areas because of non-availability of infrastructure like PHC and manpower for providing services upto domiciliary level. The services in urban areas are provided mainly through institutional level. Multiple organizations provide health services in urban localities without much of coordination amongst them.

More number of cases are detected in urban localities due to migration of people, availability of good quality institutions with easy accessibility, but treatment completion rate is less as compared to rural areas.

For the implementation of special action under the plan, about 524 urban localities have been identified out of 4,388 urban areas (census 2011). These localities are having population more than 100,000. Remaining areas will be covered by PHC services as in rural areas *(14)*. These urban areas are divided into 4 categories : (a) Town and city (population 1 lac to 5 lacs) – 432 areas; (b) Medium city (population >5 lac to 1 million) – 53 areas; (c) Mega city (population >1 million to 4.5 million) – 34 areas; and (d) Areas with >4.5 million population – 5 areas.

Programme Implementation Plan for 12th Plan period (2012–13 to 2016–17)

As the disease was still prevalent with moderate endemicity in about 15 per cent of the country, the plan objectives were set as follows *(14)*.

a. Elimination of leprosy i.e. prevalence of less than 1 case per 10,000 population in all districts of the country.
b. Strengthen disability prevention and medical rehabilitation of persons affected by leprosy.
c. Reduction in the level of stigma associated with leprosy.

To achieve the objectives of the plan, the main strategies to be followed were :

- Integrated leprosy services through general health care system.
- Early detection and complete treatment of new leprosy cases.
- Carrying out house-hold contact survey for early detection of cases.
- Involvement of Accredited Social Health Activist (ASHA) in the detection and completion of treatment of leprosy cases on time.
- Strengthening of disability prevention and medical rehabilitation (DPMR) services.

Case detection and management *(14)*

It is expected that the new cases will continue to occur regularly but the people are still hesitant to come forward to get themselves diagnosed and treated due to the stigma associated with the disease. Detection of the new cases at the early stage is the only solution to cut down the transmission potential in the community, and also to provide relief to the leprosy affected persons by preventing disabilities. It is therefore suggested that the states will draw up innovative plans :

(i) To improve access to services.
(ii) To involve women including leprosy affected persons in case detection.
(iii) To organize skin camps for detecting leprosy patients while providing services for other skin conditions.
(iv) To undertake contact survey to identify the source in the neighbourhood of each child or multibacillary case.
(v) To increase awareness through the ANM, AWW, ASHA and other health workers visiting the villages and people affected by leprosy, to motivate leprosy affected persons for early reporting to the medical officer.

Integrated leprosy services through all the primary health care facilities will continue to be provided in the rural areas. However, for providing technical support to the primary health care system, to strengthen the quality of services being provided, a team of dedicated workers including medical officer and para-medical workers are placed at district level. This will be known as "District Leprosy Cell".

Three pronged strategy was introduced in the National Leprosy Eradication Programme from 2016–2017. The components of the strategy are:

1. Leprosy Case Detection Campaign (LCDC);
2. Focused Leprosy Campaign; and
3. Special plan for hard to reach areas.

During 2016–17, LCDC was carried out in 163 districts of 20 states, wherein 34,672 cases were detected and were put on treatment. The activity was aimed at early case detection and timely treatment. The success of the campaign, as shown by the drastic decline of grade 2 disability, led to continuation of LCDC and during 2017–18 about 305 districts in 23 states were identified for LCDC phase I *(15)*.

In the year 2016–17, Focused Leprosy Campaign was carried out by house to house survey in the village/ urban areas (covering 300 households) wherein one case of grade 2 disability due to leprosy was detected.

The purpose of the special plan for hard to reach areas is to find the cases in population in areas of difficult terrains, naxalite affected areas and other geographically difficult locations *(15)*.

Sparsh leprosy awareness campaign

Sparsh leprosy awareness campaign was launched in the year 2017 through Gram Sabhas and carried out with the help of Panchayat and Village Health and Sanitation Community. The aim was to generate awareness, reduce stigma and improve self-reporting of the cases. The campaign activity was carried out in 60 per cent of the total villages across India *(16)*. The campaign continued during the year 2018.

Survey education and treatment (SET) scheme

Under the SET scheme, the NGOs are presently involved in disability prevention and ulcer care, IEC, referral of suspected cases, referral for reconstruction surgery (RCS), research and rehabilitation. NGO support is mainly required for follow-up of under treatment cases in urban locations and difficult to reach areas.

Incentive to patient *(9, 16)*

An incentive of Rs. 12,000/- will be paid to all patients affected by leprosy undergoing major reconstructive surgery irrespective of their financial status. The payment will be made by the district leprosy officer. As on January 2017, there were 115 recognized RCS centres (61 Government and 54 NGO) in the country.

Information, education and communication (IEC/BCC)

The IEC strategy during the 12th plan period was focus on communication for behavioural changes in general public against the stigma and discrimination against the leprosy affected persons. Making the public aware about the availability of MDT, correction of deformity through surgery and that the leprosy affected person can live a normal life with the family.

Research into the basic problems of leprosy is also part of the activities of the NLEP. This is mainly carried out in the Government sector, viz. the Central JALMA Institute of Leprosy at Agra and the Central Leprosy Teaching and Training Institute at Chengalpattu, Chennai supported by Regional Training and Referral Institutes at Aska (Orissa), Raipur (Chhattisgarh) and Gouripur (West Bengal).

The present day strategy : *(7, 17)*

1. A well laid out operational strategy for active case detection and regular surveillance has been put in place, both in rural and urban areas, through ASHAs and frontline workers in order to ensure detection of leprosy cases on regular basis and at an early stage in order to prevent grade II disabilities.
2. Leprosy screening has been integrated with Rashtriya Bal Swasthya Karyakram (RBSK) and Rashtriya Kishore Swasthya Karyakram (RKSK) for screening of children (0–18 years).
3. Leprosy screening has been integrated with the activities of Comprehensive Primary Health Care under Ayushman Bharat - Health and Wellness Centre (AB-HWC) for screening of people above 30 years of age.
4. Contact tracing is done and Post Exposure Prophylaxis (PEP) is administered to the eligible contacts of Index case (Person diagnosed with leprosy) in order to interrupt the chain of transmission at the community level.
5. Various services are provided under the programme for Disability Prevention and Medical Rehabilitation (DPMR) i.e., reaction management, provision of Microcellular Rubber (MCR) footwear, aids & appliances, self-care kits etc.
6. Reconstructive Surgeries (RCS) are conducted at District Hospitals/Medical Colleges/ Central Leprosy Institutes, and welfare allowance of Rs 12,000 is paid to each patient undergoing RCS.

National Strategic Plan and Roadmap for Leprosy 2023–2027 *(13)*

The implementation of the National Strategic Plan and Roadmap for Leprosy 2023–2027 aims to achieve interruption of transmission at district level, evidenced by zero occurrence of new child cases for at least five consecutive years. After achieving interruption of transmission, districts shall move on to achieve elimination of leprosy as a disease with zero new cases reported for at least three consecutive years. The strategic pillers and targetted time period is as follows :

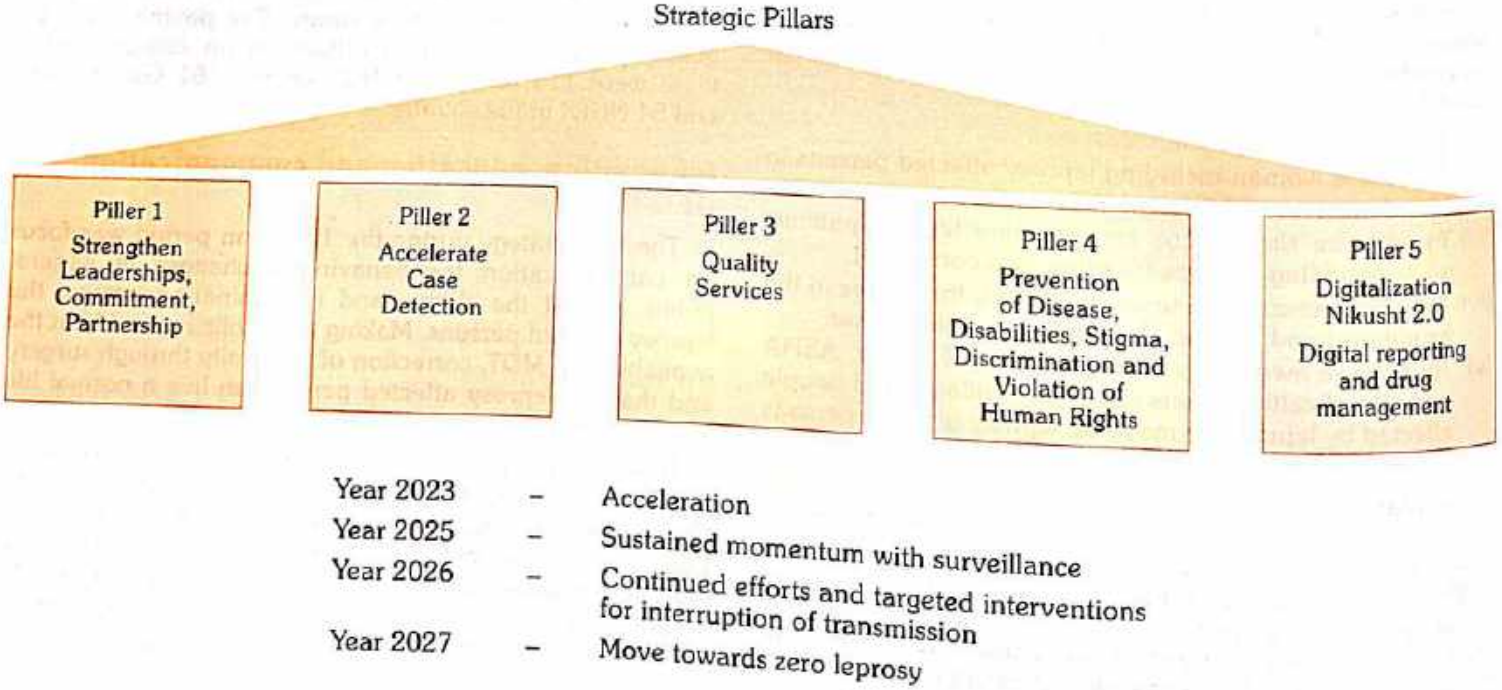
Activities under the starategic plan and roadmap 2023–2027 are summarised as *(13)* :

Pillar 1 : Strengthen leadership, commitment and partnerships

1. Launch and Rollout of NSP & Roadmap 2023–2027
2. States and UTs Specific Roadmap
3. Continued political commitment (National, State and District level)
4. Ensure availability of dedicated programme managers at National, State, and high burden district's level
5. Resource mapping, pooling and redistribution (at National, State & District level)
6. Increase investment at Central and State levels for acceleration, enhancing coverage and addition of new components as per NSP 2023–2027
7. Training of healthcare service providers at least once in 3 years
8. Fill up vacant positions under programme
9. Involvement of AYUSH for NLEP
10. Launch of Guidelines for AMR surveillance for leprosy
11. Rollout of AMR surveillance
12. Adopt the global and national new evidence and research (if any)
13. Strengthen partnership with existing partners and add new partners and donors

Pillar 2 : Accelerate Case Detection

1. Develop behavioural change communication plan
2. Develop and rollout mobile App for self-examination and voluntary reporting
3. High Intensity Awareness Campaigns in high endemic settings and Focused High Intensity Awareness Campaigns in low endemic settings for self-examination and voluntary reporting
4. Continued LCDC, FLC, ABSULS, Special plans for hard-to-reach areas



5. Coordination with other National Health Programmes for case detection
6. Inter-sectoral coordination with other govt. departments and private sector for case detection
7. Long term follow-up of contacts of leprosy cases (for 5 years)

Pillar 3 : Provide Quality Services

1. Develop tool (checklist) for complete package of services and ensure access and availability
2. Coordination with other National Health Programmes for case management and supportive care
3. Provision of nutritional support and supportive medicines
4. Coordination with medical colleges, private practitioners, NGO and private clinics/hospitals etc.
5. Orientation of Non-Govt. stakeholders for following the NLEP guidelines
6. Introduce & roll out pharmacovigilance for adverse reactions to drugs

Pillar 4 : Prevention of Disease, Disabilities, Stigma, Discrimination and Violation of Human Rights

1. Expand coverage of Post Exposure Prophylaxis (PEP)
2. Implementation Research for improved PEP, vaccines, reaction management and disability prevention etc.
3. Introduction of leprosy vaccine
4. Integrate counselling services for self-care, mental health issues, diabetes and other co-morbidities for leprosy patients
5. Monitor availability and quality of assistive devices (aids and appliances)
6. Post treatment surveillance for 5 years, identify high risk cases at time of RFT
7. Repealing and amendment of all existing discriminatory laws on leprosy

Pillar 5 : Develop Digital Surveillance Systems for NLEP

1. Launch and rollout of Nikusth 2.0
2. Integration of reporting on IHIP

ILEP Agencies

The International Federation of Anti-Leprosy Associations is actively involved as partner in NLEP. In India, ILEP is constituted by 10 agencies viz. The Leprosy Mission, Damien Foundation of India Trust, Netherland Leprosy Relief, German Leprosy Relief Association, Lepra India, ALES, AIFO, Fontilles–India, AERF–India and American Leprosy Mission. ILEP is providing support in the form of planning, monitoring and supervision of the programme, capacity building of general health care staff, IEC, providing re-constructive surgery services and socio-economic rehabilitation of persons affected with leprosy. 36 NGOs conducting re-constructive surgeries for disability correction in leprosy affected persons are also supported by ILEP *(1)*.

Non Government Organizations have been involved in the programme for many decades and have provided valuable contribution in reducing the burden of leprosy. Presently, 54 NGOs are getting grant-in-aid from Government of India under SET scheme. NGOs serve in remote, inaccessible areas, urban slums, industrial/labour population and other marginalized population groups. IEC, prevention of disability, case detection and referral, and follow-up for treatment completion are some important activities taken up by NGOs *(1)*.

The leprosy scene in India is passing through an important phase of transition – from a high burden country of leprosy to a relatively low burden country, from a partially vertical programme to a more integrated one, from a programme aimed at increase in coverage for leprosy services to one of sustaining quality services, and from centralization to decentralization *(18)*.

NATIONAL TB ELIMINATION PROGRAMME

National Tuberculosis Programme (NTP) has been in operation since 1962. However, the treatment success rates were unacceptably low and the death and default rates remained high. Spread of multidrug resistant TB was threatening to further worsen the situation.

In 1993, in order to overcome these lacunae, the Government of India decided to give a new thrust to TB control activities by revitalizing the NTP, with the assistance from international agencies. The Revised National TB Control Programme (RNTCP) thus formulated, adopted the internationally recommended Directly Observed Treatment Short-course (DOTS) strategy, as the most systematic and cost-effective approach to revitalize the TB control programme in India. Political and administrative commitment, to ensure the provision of organized and comprehensive TB control services was obtained. Adoption of smear microscopy for reliable and early diagnosis was introduced in a decentralized manner in the general health services. DOTS was adopted as a strategy for provision of treatment to increase the treatment completion rates. Supply of drugs was also strengthened to provide assured supply of drugs to meet the requirements of the system *(19)*.

The objectives of the RNTCP are :

1. Achievement of at least 85 per cent cure rate of infectious cases of tuberculosis, through DOTS involving peripheral health functionaries; and
2. Augmentation of case finding activities through quality sputum microscopy to detect at least 70 per cent of estimated cases.

The revised strategy was introduced in the country in a phased manner. The RNTCP has expanded rapidly over the years and since March 2006, it covers the whole country. The RNTCP has now entered into it's second phase in which the programme aims to consolidate the gains made to date, to widen services in terms of activities and access and to sustain the achievements. The new initiatives and the wider collaboration with other sectors aim to provide standardized treatment and diagnostic facilities to all TB patients irrespective of the health care facility from which they seek treatment. The RNTCP also envisages improved access to marginalized groups such as urban slum dwellers and tribal groups etc.

RNTCP is built upon infrastructure already established by the previous national tuberculosis programme, while incorporating the elements of the internationally recommended DOTS.

DOTS strategy adopted by Revised National TB Control Programme initially had the following five main components :

1. Political will and administrative commitment.

2. Diagnosis by quality assured sputum smear microscopy.
3. Adequate supply of quality assured short course chemotherapy drugs.
4. Directly observed treatment.
5. Systematic monitoring and accountability.

In 2006, STOP TB strategy was announced by WHO and adopted by RNTCP. The components are as follows :

- Pursuing quality DOTS – expansion and enhancement.
- Addressing TB/HIV and MDR-TB.
- Contributing to health system strengthening.
- Engaging all care providers.
- Empowering patients and communities.
- Enabling and promoting research (diagnosis, treatment, vaccine).

Many of the initiatives like developing and piloting the feasibility of National Airborne Infection Control Guidelines, developing and piloting strategy for 'Practical Approach to Lung Health' are the examples of initiatives taken by RNTCP under the comprehensive strategy of STOP TB *(19)*.

In 2014, the World Health Assembly unanimously approved to end global TB epidemic by **"End TB Strategy"**, a 20 year programme with vision of a world with zero death, disease and suffering due to TB. For details please refer to page 241.

In view of End TB targets, the programme has been renamed from Revised National Tuberculosis Control Programme (RNTCP) to National Tuberculosis Elimination Programme (NTEP).

NTEP Organogram *(20)*

NTEP structure comprises of five levels: National, state, district, sub-district and peripheral health institution levels as shown in Fig. 2 *(20)*.

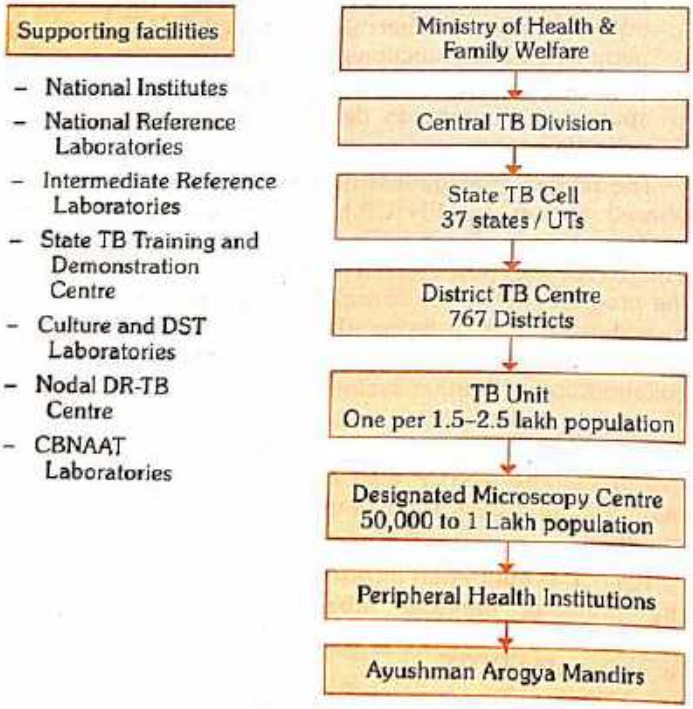


FIG. 2
Organization structure of NTEP
Source : *(7, 20)*

National level

Central TB Division (CTD) manages the National TB Control Programme for the entire country at the central level under AS&DG (RNTCP & NACO) through a national programme manager, Deputy Director General TB (DDG TB). The financial and administrative control of the programe is managed by the Joint Secretary from the administrative arm of the MoHFW.

The CTD is supported by a National TB Institute (NTI) Bengaluru, six National Reference Laboratories (NRL) including NTI, National Institute for Research in Tuberculosis (NIRT), Chennai, National Institute of Tuberculosis and Respiratory Diseases (NITRD), Delhi, National Japanese Leprosy Mission for Asia (JALMA), Institute for Leprosy and other mycobacterial diseases, Agra, Regional Medical Research Centre, Bhubaneswar and Bhopal Memorial Hospital & Research Centre – (BMHRC), Bhopal. The CTD is also supported by National Task Force for collaboration of Medical Colleges activities in the country through ZTF/STF.

Various committees of experts to guide the programme at different levels on technical & policy matters are there supporting Central TB Division.

State Level

The states have total ownership and accountability for the TB control in their state. State health society or its equivalent under National Health Mission of the state manages the TB control programme. A full-time State Tuberculosis Officer (STO), trained at national level and based at the State TB Cell (STC), is responsible for planning, training, supervising and monitoring the programme in all the districts of their respective states. STO is administratively accountable to the state government, technically follows the instructions of the CTD, and coordinates with CTD and the districts, and is assisted by other technical & secretarial staff.

State TB cell is being supported by State TB Training and Demonstration Centre (STDC) in many states through its three units – a training unit, supervision and monitoring unit and an Intermediate Reference Laboratory (IRL) supporting an effective quality assurance system of the sputum smear microscopy network and laboratary services for PMDT (molecular DR testing and C&DST) in the State. Operational Research is also a component of STDC.

Each state also has one fully operational State Drug Store (SDS) for each 5 crore of population. It is responsible for effective management of medicines and other logistics, and ensuring uninterrupted supply of good quality 1st & 2nd line anti-TB medicines for adults and paediatric population.

District level

The key level for the management of primary health care services is the district. The Chief District Health Officer (CDHO)/Chief District Medical Officer (CDMO)/Civil Surgeon or an equivalent functionary in the district is responsible for all medical and public health activities including control of TB. The District Tuberculosis Centre (DTC) is the nodal point for TB control activities in the district. A full-time District Tuberculosis Officer (DTO), trained at national level & based at the DTC, is responsible for planning, training, supervising and monitoring the programme in the district. DTO is assisted by other technical & secretarial staff. The primary role of the DTC is a managerial one.

Sub-District Level (Tuberculosis Unit Level)

Integrating the TB control programme with the health system increases effectiveness and efficiency of TB care and control. India's TB control programme has been mainstreamed efficiently with National Health Mission (NHM).

A major organizational change in NTEP is the creation of a sub-district level (Tuberculosis Unit-TU). The TU is the nodal point for TB control activities in the sub-district. TUs are based mainly in NHM health blocks with the overall aim to align with NHM Block Programme Management Unit (BPMU) for optimum resource utilization and appropriate monitoring. In urban areas the TUs have been created based on a population of 1 per 2,00,000 (range 1.5–2.5 lakh) for rural and urban population and 1 per 1,00,000 (0.75–1.25 lakh) population in hilly/tribal/difficult areas. The Tuberculosis Unit (TU) consists of a designated Medical Officer - Tuberculosis Control (MO-TC), as well as one full-time supervisory staff – Senior Treatment Supervisor (STS). However, One Senior TB Laboratory Supervisor (STLS) will continue to be in 5 lakh population (one per 2.5 lakh population for tribal/hilly/difficult areas). There is a provision of additional STS if more than 300 TB cases are registered in public sector annually in a TU; additional STS if more than 50 private health establishments are registered in NIKSHAY in a TU and more than 200 TB patients are notified from these private health establishments annually in a TU.

The Block Medical Officer also functions as a Medical Officer TB Control (MO-TC). For the urban TB Units, a medical officer from the health facility where TU is located should be designated, in coordination with CMHO/DHO to function as a MO-TC. All MO-TCs should be trained in NTEP at a state level institution. MO-TC has the overall responsibility of management of TB Control Programme at the TU and is expected to undertake supervisory visits for seven days in a month. The team of STS and STLS are under the administrative supervision of the MO-TC and the DTO. The TU will have one Microscopy Centre for every 100,000 population (50,000 in tribal, desert, remote and hilly regions) referred to as the Designated Microscopy Centre (DMC, however, for complete geographic coverage National programme envisages to expand sputum smear microscopy services at PHC level). Microscopy Centres may also be established beyond population norms in Medical colleges, corporate hospitals, ESIC, railways, NGOs, private hospitals, etc.

Peripheral Health Institutions (PHIs)

For the purpose of NTEP, a PHI is a health facility which is manned by at least a medical officer. At this level, there are dispensaries, PHCs, CHCs, referral hospitals, major hospitals, speciality clinics or hospitals (including other health facilities), TB hospitals, ART Centres and medical colleges within the respective district. All health facilities in the private and NGO sectors participating in NTEP are also considered as PHIs by the programme. Some of these PHIs also function as DMCs. Peripheral health institution undertake tuberculosis case-finding and treatment activities as a part of the general health services. In situations where more than one MO is posted in any of the peripheral health centres, one of them may be identified and entrusted with the responsibilities of the NTEP. There is 1 TB Health Visitor (TBHV) per one lakh urban population to support the urban TB control activities *(20)*.

TB laboratory services *(20)*

The services of the laboratory are utilized for diagnosing TB & DR-TB cases and for monitoring of treatment of these patients. The laboratory network under NTEP is a tier system for provision of diagnostic services and maintaining its quality.

A. *The peripheral laboratories* are situated in the public sector like the dispensaries, PHCs, CHCs, referral hospitals, major hospitals, specialty clinics/other sector hospitals/TB hospitals/medical colleges and in the private/NGO sectors. For establishment of microscopy centre in a lab, it must have adequate physical infrastructure, Binocular microscope and a trained LT. These laboratories are covered under quality assurance mechanisms

   i. Some of the labs not having facility for sputum microscopy, function as a sputum collection centres, and such facilities are also established in areas such as the tribal, hilly, desert and difficult to reach areas of the country for improving the access to diagnostic services.

   ii. In addition, large hospitals and medical colleges have facilities of digital X-Ray, rapid molecular test (Cartridge based nucleic acid amplification test – CBNAAT & Line Probe Assay-LPA), Fine Needle Aspiration Cytology (FNAC), histopathology, and culture & DST for diagnostic services of TB.

B. *At the state level* a nodal laboratory is designated as intermediate reference laboratory (IRL) which is usually situated in the State TB Training and Demonstration Centre (STDC)/medical college/public health laboratory. The main functions of IRLs are monitoring of laboratory services across the state and maintenance of its quality through external quality assurance. There are 27 IRLs with facilities for culture & DST using Phenotypic (Solid – LJ & Liquid Culture – MGIT) and Genotypic technology (LPA & CBNAAT).

CBNAAT sites

In addition to the culture DST laboratories, CBNAAT centres are also established to diagnose Rifampicin resistance among all TB patients (Universal DST). Usually these are established in DTCs, TB units and medical colleges. The country is in the process of expanding CBNAAT site network. They also serve to diagnose TB among presumptive TB cases from key population.

DRTB Centres (20)

DRTB Centres are specialized centres for clinical management of drug resistant TB. At state/regional/division level, there are Nodal DRTB Centres (NDRTBC), to manage seriously ill DRTB cases, DRTB with extensive resistance and DRTB cases to be treated with regimes containing new drugs (Bedaquiline and Delamanid).

At the district level, there are district DRTB centres (DDRTBC), to manage DRTB cases with MDRTB, and H mono/poly-resistance. These centres will function under the guidance of NDRTBCs.

C. *At the central level* there are six designated National Reference Laboratories (NRLs) namely National Tuberculosis Institute, Bengaluru, National Institute for Research in Tuberculosis (NIRT), Chennai, National Institute of Tuberculosis and Respiratory Diseases

(NITRD), Delhi, National JALMA Institute, Agra, Regional Medical Research Centre, Bhubaneswar and Bhopal Memorial Hospital & Research Centre (BMHRC), Bhopal. NIRT Chennai is also a Supra National Reference Lab (SNRL) for World Health Organization (WHO) for the South East Asia Region. NTI is a WHO collaborating centre for training, while NITRD is WHO centre of excellence in TB laboratory services. The NRLs are mainly responsible for external quality assurance of Lab network, drug resistance surveillance, training and research.

Quality-assured TB diagnostic services are offered free of cost to all the patients seeking care in the public health system as well as those referred from the private sector, through the network of laboratories under NTEP.

National policy for diagnosis *(21)*

A. Drug-Sensitive TB (DS-TB)

- Offer of upfront NAAT for diagnosis of TB has been prioritized by the programme.
- Response to DS-TB treatment is monitored by using sputum smear microscopy.

B. Drug-Resistant TB (DR-TB)

- Microbiologically confirmed TB patients are offered NAAT for determining resistance to Rifampicin.
- First-line-line probe assay (FL-LPA) is offered to patients with Rifampicin-sensitive (RS) and Rifampicin-resistant TB (RR-TB).
- Second-line-LPA (SL-LPA) is offered to RR and isoniazid (H) resistant TB patients.
- Liquid Culture (LC) and DST are performed for determining resistance to additional drugs.
- LC is used for monitoring response to DR-TB treatment

The tiered system of laboratory network includes Culture and Drug Susceptibility Testing (C&DST) laboratories, NAAT facilities and microscopy facilities at National, State, District, sub-district and peripheral levels as shown in Fig. 3.

National reference laboratories (NRLs), Intermediate reference laboratories (IRLs) and C&DST laboratories are equipped to perform DST by various technologies such as Liquid culture (LC) and molecular tests such as LPA and NAAT.

- NRLs and IRLs conduct training, handholding and M&E for their respective States/district/ block-level facilities/ laboratories.
- Amongst 87 laboratories, which are equipped to support LC system, 68 are certified for First line liquid culture - Drug susceptibility test (FL-LC-DST) and 60 are certified for Second line-liquid culture DST (SL-LCDST)
- Overall 88 laboratories are certified for FL-LPA and 78 laboratories are additionally certified for SL-LPA.
- 56 laboratories are certified for performing LC-DST to Linezolid and Pyrazinamide.
- NIRT, Chennai; NITRD, New Delhi; NTI, Bengaluru; Sir JJ Hospital and Grant Medical College, Mumbai; P.D. Hinduja Hospital, Mumbai and Christian Medical College (CMC), Vellore are certified for performing LC-DST to Bedaquiline and Delamanid.

New Initiatives

1. *NIKSHAY : TB surveillance using case based, web based IT system (22)*

Central TB Division in collaboration with National Informatics Centre has undertaken the initiative to develop a case based web based application named Nikshay. The word is combination of two Hindi words NI and KSHAY, meaning eradication of TB.

This software was launched in May 2012 and has following functional components.

- Master management
- User details
- TB patient registration and details of diagnosis, DOT provider, HIV status, follow-up, contact tracing, outcomes.
- Details of solid and liquid culture and DST, LPA, CBNAAT details.
- DR-TB patient registration with details.
- Referral and transfer of patients.

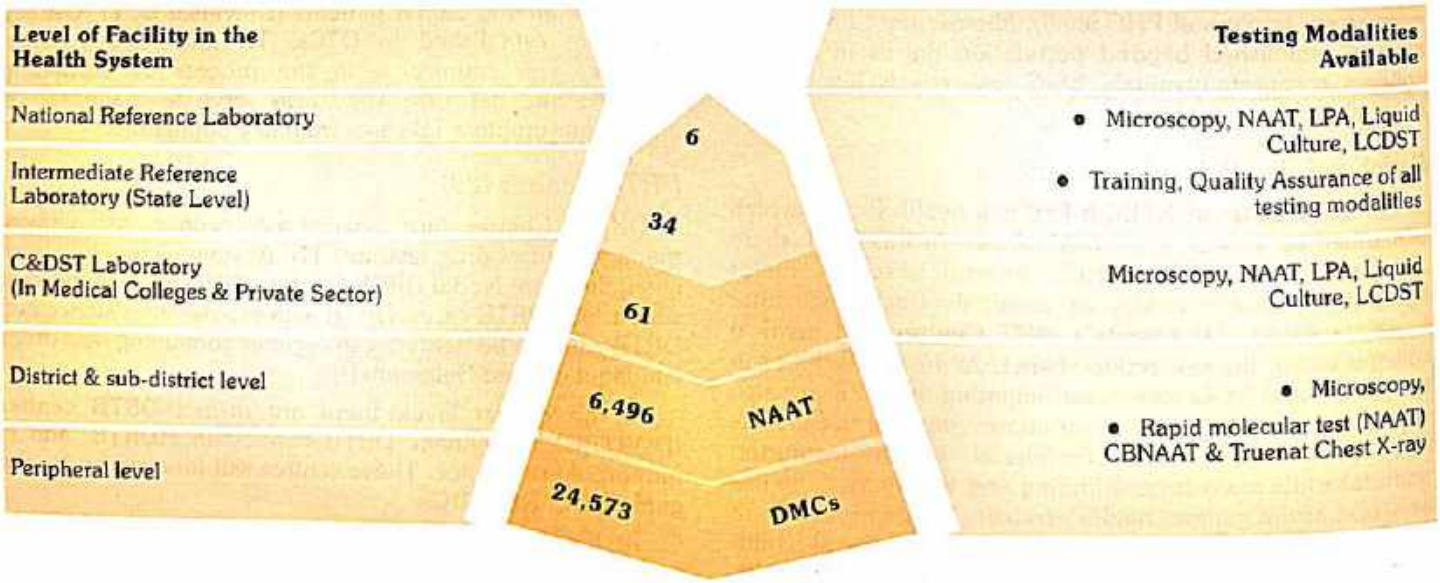


FIG. 3
Tiered system of laboratory network and testing modalities available

Source : *(21)*

- Private health facility registration and TB notification.
- Mobile application for TB notification.
- SMS alerts to patients on registration.
- SMS alerts to programme officers.
- Automated periodic reports:
  a. Case finding
  b. Sputum conversion
  c. Treatment outcome.

The programme has started using IT enabled adherence tools like 99 DOTS for HIV-TB patients. This will be expanded to all TB patients with implementation of daily regimen *(16)*.

2. TB Notification

In order to ensure proper diagnosis and management of TB cases, and to reduce TB transmission and the emergence and spread of MDR-TB, it is essential to have complete information of all TB cases. According to the Government of India notification dated 7th May 2012, it is now mandatory for all healthcare providers to notify every TB case to local authorities i.e. District Health Officer/Chief Medical Officer of a district and Municipal health officer, every month in a given format *(23)*.

3. Ban on TB Serology

The serological tests are based on antibody response, which is highly variable in TB and may reflect remote infection rather than active disease. Currently available serological tests are having poor specificity and should not be used for the diagnosis of pulmonary or extra-pulmonary TB. Their import, manufacturing, sale, distribution and use is banned by the Government of India *(22)*.

4. Direct benefit transfer schemes

Direct beneficiary transfer systems are being established by linking TB patients reported in NIKSHAY with AADHAR and PEMS to effectively deliver benefits to TB patients and their providers *(16)*.

Initiation of treatment

Early identification of people with high probability of having active TB (presumptive TB) is the most important activity of the case finding strategy. Patients presenting themselves with symptoms suspicious of tuberculosis are screened through 2 sputum smear examinations. Sputum microscopic examination is done in designated RNTCP microscopy centres. They are located either in the CHC, PHC, Taluka Hospitals or in the TB dispensary. Each centre has a skilled technician to ensure quality control, a senior TB laboratory supervisor is appointed for every 5 microscopy centres. The senior TB laboratory supervisor rechecks all the positive slides and 10 per cent of the negative slides of these five microscopy centres. Thus the error in diagnosing a patient is minimized. It is essential to examine 2 sputum specimens of each patient before a conclusive diagnosis can be made. One sputum sample is not sufficient for diagnosis as the chance of detecting smear positive case is only 80 per cent. Sputum microscopy not only confirms the diagnosis, but also indicates the degree of infectivity and response to treatment. Fig. 1 on page number 206 shows the criteria of diagnosis and initiation of treatment.

All patients are provided short-course chemotherapy free of charge. During the intensive phase of chemotherapy all the drugs are administered under direct supervision called Direct Observed Therapy Short-term (DOTS). DOTS is a community based tuberculosis treatment and care strategy which combines the benefits of supervised treatment, and the benefits of community based care and support. It ensures high cure rates through its three components: appropriate medical treatment, supervision and motivation by a health or non-health worker, and monitoring of disease status by the health services. DOTS is given by peripheral health staff such as MPWs, or through voluntary workers such as teachers, anganwadi workers, dais, ex-patients, social workers etc. They are known as DOT 'Agent' and paid incentive/ honorarium of Rs 150 per patient completing the treatment.

Newer initiatives *(11)*

1. *Daily regimen for paediatric TB* : In order to transition the country to the updated guidelines for paediatric treatment in the STCI, which follow the current WHO dosing guidelines, the government has decided to introduce a daily dosing regimen using child-friendly fixed dosage combinations (FDCs). The procurement of anti-TB drugs in daily fixed dose combination (FDC) has been initiated. Treatment with FDCs of anti-Tb drugs will be in six weight bands for paediatric patients. An option for family members to provide Directly Observed Treatment (DOT) to paediatric patients has been incorporated in the guidelines.
2. Daily regimen for all forms of TB in the country.
3. Pilots for universal access to TB cases.
4. *Universal drug susceptibility testing (DST)* : Expansion of rapid molecular diagnostics have been scaled up to 3164 CBNAAT/TrueNat, covering all districts for decentralized diagnosis of drug resistant TB services. Nearly 55 per cent of all notified TB cases were offered universal drug susceptibility testing in 3rd quarter of 2019.
5. *Shorter regimen and Bedaquiline* : In 2018, shorter regimen and Bedaquiline for treatment of drug resistant TB patients have been expanded in the country. From 2018, more than 46,129 DR-TB patients have been initiated on shorter regimen and 7,973 DR-TB patients on newer drug containing regimen.
6. *Campaign mode* – Active case finding : To reach the unreached, the programme has carried out systematic active TB screening among high risk populations through house visits or targeted setting visit (tribal population, slums, old age homes, prisons, orphanages, transit camps etc.) The campaign was conducted in priority districts selected based on burden of TB, case finding efforts, HIV-TB and drug resistant TB in the respective districts *(16)*.

The drugs are supplied in patient-wise boxes containing the full course of treatment, and packaged in blister packs. For the intensive phase, each blister pack contains one day's medication. For the continuation phase, each blister pack contains one weeks supply of medication. The combipack drugs for extension of intensive phase are supplied separately. The boxes are coloured according to the category of the regimen, red for category I patients, blue for category II patients.

Paediatric tuberculosis

Please refer to page 222 for details.

Drug resistance surveillance (DRS) under NTEP (2014–2016) *(19)*

The prevalence of drug resistance to TB can be taken as an indicator of the effectiveness of the TB control activities

over a period of time and, therefore, RNTCP has taken steps to measure this important indicator.

The aim of DRS is to determine the prevalence of antimycobacterial drug resistance among new sputum smear positive pulmonary tuberculosis (PTB) patients, and also amongst previously treated sputum smear positive PTB patients. Drug-resistant TB has frequently been encountered in India, and its presence has been known virtually from the time anti-TB drugs were introduced for the treatment of TB.

To obtain a more precise estimate of Multi-Drug Resistant TB (MDR-TB) burden in the country, RNTCP carried out drug resistance surveillance (DRS) surveys (2014–2016) in accordance with global guidelines in selected states. The results of these surveys indicate prevalence of MDR-TB to be about 2.84 per cent in new cases and 11.60 per cent in retreatment cases *(20)*.

MANAGEMENT OF DRUG RESISTANT TB

The services for quality diagnosis and treatment of drug resistant TB cases were initiated in 2007 in Gujarat and Maharashtra. These services since then have been scaled up and currently these services are available across the country from March 2013. For full details about the patient regimens, please refer to page 222. The milestones in the evolution of PMDT are as shown in Fig. 4.

State-level structure and responsibilities *(24)*

While a national expert technical working group has developed national policies, technical and operational guidelines, the state-level is where the majority of planning activities, implementation and monitoring occur. The state PMDT Committee is responsible for developing the plan of action for implementation, expansion, maintenance, supervision, monitoring and quality enhancement of PMDT services in the respective state.

Drug-resistant tuberculosis centre *(24)*

Programmatic and clinical management of DR-TB is complex but feasible when the health system is strengthened to effectively integrate what is necessary. Treatment of drug-resistant TB is not completely based on centralized and institutionalized care for the entire duration. In fact, clinical care needs the presence of a clinical and patient support expert resource centre. This is the DR-TB Centre, which is a 20–30 bedded tertiary care facility established to serve a population of approximately 10 million, with an airborne infection control compliant ward, facilities for pretreatment evaluations, treatment initiations, follow-up monitoring and management of adverse drug reactions, prevention and relief of physical and social suffering caused by the disease and its treatment, complications and co-morbidities. All these activities are supported by the programme staff in addition to having counselling for patients and undertaking data management.

By 2017, 147 DR-TBCs were established across India, designated as Nodal DR-TB centre, one for approximately every 10 million population, including some in private institutes partnering with RNTCP. About 5 to 10 districts are attached to each centre. DR-TB patients are admitted for a short period and once stabilized on treatment, discharged with advance intimation to the districts and referred back to their districts for continuation and completion of treatment. During treatment they are referred back to DR-TBCs for change of regimens and management of adverse reactions.

To decentralize the pretreatment evaluation, treatment initiation of RR-TB or H mono/poly DR-TB and follow-up processes, two distinct types of DR-TBCs will be established. The existing nodal DR-TB centre (NDR-TBC) will continue for approximately 10 million population. One District DR-TB centre (DDR-TBC) will be established for every district. Some of the states have already established these centres.

The advantages of decentralized "test and treat approach" are *(24)* :

- Early and faster initiation of treatment of all diagnosed DR-TB patients;
- Bringing care closer to the residence of majority of the DR-TB patients;
- Significant reduction in catastrophic expenditure including loss of work hours and family income;

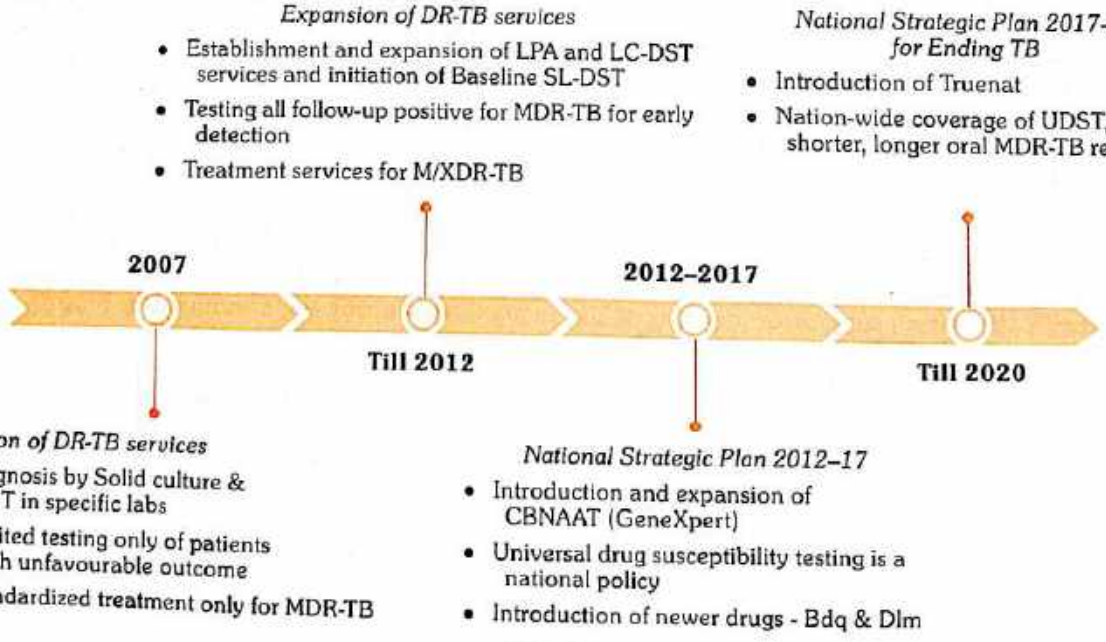


FIG. 4
Milestones in evolution of PMDT in India

Source : *(25)*

- Rationally minimizing the need and duration for hospitalization;
- Minimizing travel of patients, thereby transmission risks during travels;
- Accountability of the district programme management units; and
- Rationalizing utilization of existing DR-TBCs to enable them to concentrate in more complex clinical decisions and ensuring quality assurance of treatment and research.

1. District DR-TB centre *(24)*

The DDR-TBC is responsible for the initiation and management of uncomplicated DR-TB patients like RR-TB or H mono/poly DR-TB in a district, not only on inpatient basis, but also on outpatient basis, wherever advisable and possible. The DDR-TBC can be established at institutes in a certain order of preference, namely, medical colleges, district hospitals, TB hospitals and NGO/private/corporate institutes/other sector hospitals with the availability of required clinical expertise.

2. Nodal DR-TB centre *(24)*

Patients with additional resistance to second-line drugs, drug intolerance, contraindications, failing regimen, patients returning after treatment interruption of >1 month, emergence of any exclusion criteria for standard regimen for RR-TB or H mono/poly DR-TB regimen, non-TB mycobacterium (NTMs) and those needing palliative care would be managed at NDR-TBC.

The requirements for the NDR-TB centre are as follows:

- Should preferably be a tertiary care institute;
- Separate ward for male and female patients should be available with at least 10 beds in each;
- All PMDT services (beds, investigations, ECG and ancillary drugs for management of adverse drug reactions) to be provided free of cost to the patient;
- Relevant specialties including respiratory medicine, general medicine, psychiatry, dermatology, ENT, ophthalmology, gynaecology, paediatrician, anaesthesiologist and cardiologist should be available directly or through linkages;
- NDR-TBC committee to be formed;
- National training of NDR-TBC committee members (including Chairperson);
- National AIC guidelines to be implemented in DR-TB wards and outpatients setting.
- Routine clinical laboratory investigation facility to be made available for pretreatment evaluation and monitoring;
- Ancillary drugs should be available;
- Management of adverse drug reaction as per PMDT guidelines;
- Doctors, nursing and support staff should be available from the institute;
- Reports and records to be maintained for PMDT; and
- Quarterly report to be submitted electronically.

The overall structure and roles of different level of PMDT services are summarized in Fig. 5.

TB care services in the private sector

The private sector is everything outside the ambit of the Government run public health services. It varies widely in its size, nature of service delivery and the socio-economic groups served. It holds a factual predominance of health care service delivery in India. As per National Sample Survey Organization report, about 70 per cent patients seek care in private clinics and hospitals *(26)*.

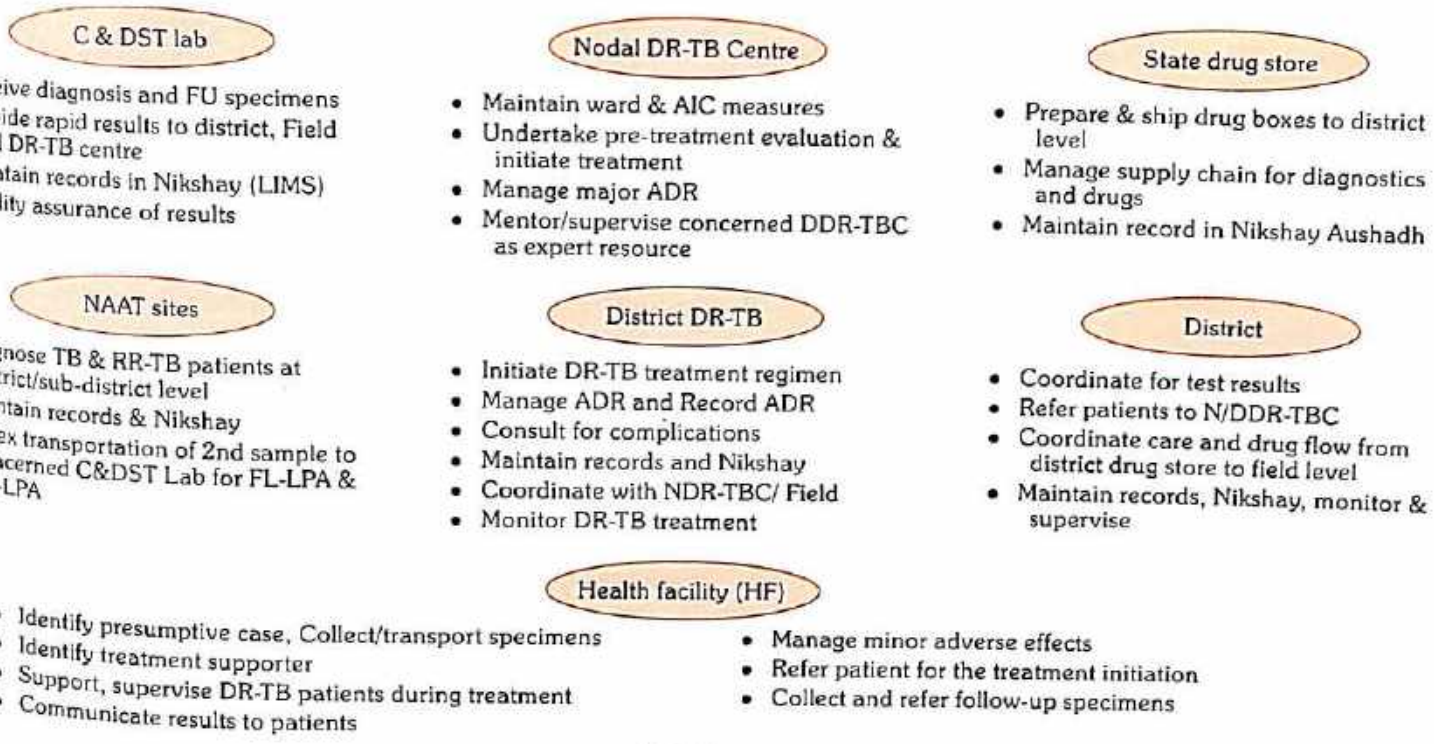


FIG.5
Overall PMDT structure and roles

Source : *(25)*

Delays in diagnosis, over-diagnosis of TB due to an over-dependence on X-rays, the use of multiple non-standard regimens for inappropriate durations, the lack of a mechanism to ensure full course of treatment and to record treatment outcomes are some issues of concern in the private sector. Similar problems in varying degrees are encountered in other health sectors as well. The advantages and disadvantages of public and private sector are as shown below:

	Public sector	Private sector
Advantages	• Free diagnosis • Free treatment • Standardized regimen • Referral and transfer system • Supervision and monitoring • Accountability of treatment outcome	• Wide choices (> 5 lakh practitioners) • Better access – Convenient timings – Shorter distances – Personal attention and care – Projected discounts • Faith and perceptions of better care
Disadvantages	• Staff's non-response to symptoms • Delays between tests and receiving results • Difficulty in transporting specimens • Financial expenditure on travel, food, daily necessities, extra medicines • Perceived low quality of services	• Cost of clinical examination fees • Cost of diagnostic tests • Cost of drugs • Irrational prescriptions • Infrequent use of quality sputum tests for diagnosis of TB • No adherence tracking mechanisms • Fear of losing patient if involved in RNTCP

Source : *(26)*

The strategic vision of RNTCP is to lay down guidelines and norms for TB care in country. The underlying principle is for RNTCP to extend public services to privately managed patients. Standards for TB care in India, mandatory TB notification, NIKSHAY, ban on serodiagnostics are among the tools to improve TB care services in private sector. Regulatory tools, however, are limited and partnership is preferred. Programme staff should understand that RNTCP needs private providers more than private providers need the RNTCP.

Monitoring *(27)*

The program is continuously monitored at the block, district, state, and national levels by the respective program managers, with the aid of the reports generated from Nikshay database The NTEP is also part of all the important health review meetings held under the chairpersonship of elected representatives, Principal Secretary (Health), Mission Directors and District Magistrates/Collectors.

The Central TB Division also releases quarterly, and bi-annual rankings of the states and districts based on the TB Score. This aids the states to identify the areas of lacunae, identify challenges and expedite their resolution on a real-time basis. Nikshay Dashboard plays an important role in real-time monitoring of the program performance.

TB Score

For continuous monitoring of the programme performance at the national, state as well as district level, a composite score calculated from a selected list of key performance indicators from various thematic areas in the National Tuberculosis Elimination Programme. Appropriate weightage has been given to each of these indicators and each state is scored for the performance in each indicator. The individual indicators sum up to a total of 100.

The TB index helps in objectively measuring the performance of the state, identify areas where guidance/ resolution of challenges are necessary as well as promote a healthy competition towards ending TB.

The achievements during COVID-19 pandemic *(7)*

The onset of the COVID-19 pandemic triggered lockdowns, restrictions in movement, repurposing of available NTEP and health system resources, infrastructure, diagnostics, treatment centers and manpower to fight this emerging threat, and disrupted ongoing TB elimination efforts and services all over the country. NTEP's response

The TB Index currently in usage consists of 9 indicators

S.No.	Parameter	Indicator	Score allotted
1.	Achievement of TB notification among the target identified	% of Target TB notification achieved (Source: Nikshay)	20
2.	HIV testing/ screening of TB notified patients	% of net TB notified patients with known HIV status (Source: Nikshay)	10
3.	UDST coverage among the TB notified patients	% of net TB notified patients with UDST done (Source: Nikshay)	10
4.	Treatment Success Rate of TB notified patients	Treatment Success Rate for net TB patients (Source: Nikshay)	15
5.	Nikshay Poshan Yojana implementation Nikshay Poshan Yojana	% of Eligible beneficiaries paid at least once under (Source: Nikshay)	10
6.	DRTB treatment initiation among the diagnosed patients	% of MDR/ RR patients initiated on treatment out of net diagnosed (Source: PMDT Quarterly Reports)	15
7.	Utilisation of the allotted budget	% of expenditure amongst ROP (Source: PFMS)	10
8.	Latent TB infection management	% of children <5/<6 years given chemoprophylaxis against the total eligible children identified (Source: Nikshay)	5
		% of PLHIV given IPT against total eligible PLHIV (Source: NACP)	5

Source : *(27)*

plan and mitigation efforts included integrated TB-COVID bi-directional screening, diagnostic and treatment capacity. Large scale active TB case finding campaigns were undertaken with massive screening and testing in communities, health outreach workers and community volunteers were engaged to facilitate surveillance of symptoms within households, doorstep collection of samples and delivery of monthly medicine stock to help patients stick to treatment regimens, and tele-consultations with patients. Private sector TB care facilities were reopened, call centres were fully activated, digital tools were rolled out along with support like direct cash transfers and supplementary food provisions were delivered to people's home. Contact tracing systems and testing for TB linked to COVID-19 contact tracing were also quickly set up throughout the country.

By December 2020, NTEP had managed notifying a total of 18,05,670 patients which was 11% more than the estimated projections made in April 2020 in view of the ongoing COVID-19 pandemic. The private sector too contributed notification of 5.49 lakh patients (31% of total notifications), 3% more than in 2019. Despite the pandemic, 95% of total patients notified were put on treatment during 2020. During the year 2021, a total of 15,79,410 (Jan-Sep) patients were notified with 95% of patients put on treatment. Treatment Success Rate of TB notified patients remained at 81% in 2021 despite the pandemic.

The NTEP has also initiated Sub-National Certification of Districts/States/UTs for achieving "Progress towards TB Free Status" under Bronze, Silver and Gold categories measured with graded milestones of decline in TB incidence compared to 2015 levels. Districts/States/UTs are certified under the categories upon independent verification by a national team comprising of National Institute of Epidemiology, WHO India and Indian Association of Preventive and Social Medicine.

TB-HIV coordination *(28)*

Since the advent of the collaborative efforts in 2001, TB-HIV activities have evolved to cover most of the recommendations as per the latest WHO policy statement issued in 2012. In 2007, the first national framework for joint TB-HIV collaborative activities was developed which endorsed a differential strategy reflective of the heterogeneity of TB-HIV epidemic. Coordinated TB-HIV interventions were implemented including establishment of a coordinating body at national and state level, dedicated human resources, integration of surveillance, joint monitoring and evaluation, capacity building and operational research.

The implementation of collaborative TB/HIV activities are as follows :

1. Intensified TB case finding has been implemented nationwide at all HIV testing centres (known as integrated counselling and testing centres, or ICTCs), and has now been extended to all ART centres.
2. HIV testing of TB patients is now routine through provider initiated testing and counselling (PITC), implemented in all states with the intensified TB-HIV package.
3. Persons found to be HIV-positive are eligible for free HIV care at a network of antiretroviral treatment (ART) centres. ART centres are located in medical colleges, mainly staffed and operated by the state AIDS control societies, and a few are situated within the facilities of private or NGO partners. As of December 2017, there were 536 ART centres operating in the country, 1120 link-ART centres and 158 link-ART plus centres. Ten Regional Centres of Excellence provide second-line ART services for PLHIV, and 24 centres provide second line ART (ART-plus centres). HIV-infected TB patients who are on protease inhibitor based second line ART are getting rifabutin-based TB treatment in place of Rifampicin.
4. Policy decision has been taken by National Technical Working Group on TB/HIV collaborative activities (NTWG on TB/HIV) to expand coverage of whole blood finger prick HIV screening test at all DMC without a stand-alone or F-ICTC.
5. Provider initiated HIV testing and counselling (PITC) among presumptive TB cases (TB suspects) is now a policy –
   a. In high HIV prevalent states/settings – The implementation will be done in a phased manner, starting with high prevalent states and then in A and B category districts in rest of the country.
   b. In low HIV prevalent states/settings – HIV testing among presumptive TB cases should be routinely implemented in the age-group of 25–54 years in low HIV prevalent districts (C & D) at places where there are co-located TB and HIV testing facilities.
6. Intensified case finding activities to be specifically monitored among HIV infected pregnant women and children living with HIV.
7. The National AIDS Control Programme (NACP) and RNTCP have taken the policy decision to adopt isoniazid prophylaxis therapy (IPT) as a strategy for prevention of TB among PLHIV. The implementation will be in a phased manner.
8. The RNTCP has prioritized presumptive TB cases among people living with HIV for diagnosis of TB and Rifampicin resistance with rapid diagnostic tools having high sensitivity e.g. Xpert MTB/RIF.

The treatment guidelines are discussed in detail on page 239.

Tuberculosis in pregnancy

Please refer to page 231 for details.

NATIONAL STRATEGIC PLAN (2017–2025) FOR TB ELIMINATION

The National Strategic Plan (NSP) 2017–2025 for TB elimination builds on the success of last NSP. It is a three year costed plan and an eight year strategic document. It provides goals and strategies for the country's response to the disease during the period 2017–2025 to bring about significant changes in the incidence, prevalence and mortality of TB, and attain the global End TB targets five years ahead of Sustainable Development Goals of TB free India. The VISION is – TB free India with zero deaths, disease and poverty due to TB *(29)*.

Objectives:

The main objectives of NSP are:

1. Find all drug sensitive TB and drug resistant TB cases with an emphasis on reaching TB patients seeking care from private providers, and undiagnosed TB in high-risk populations.

2. Initiate and sustain all patients on appropriate anti-TB treatment wherever they seek care, with patient friendly systems and social support.
3. Prevent the emergence of TB in susceptible populations.
4. Build and strengthen enabling policies, empowered institutions, additional human resources with enhanced capacities, and provide adequate financial resources.

The key strategies are as follows:

1. Private sector engagement
2. Active case finding
3. Drug resistant TB case management
4. Addressing social determinants including nutrition
5. Robust surveillance system
6. Community engagement and multi-sectoral approach

Expected outcome:

The aim of the National Strategic Plan is to achieve elimination of TB by 2025. During plan period, targets for TB are:

1. 80% reduction in TB incidence (i.e. reduction from 211 per lakh to 43 per lakh)
2. 90% reduction in TB mortality (i.e. reduction from 32 per lakh to 3 per lakh
3. 0% patient having catastrophic expenditure due to TB

New comprehensively deployed interventions are required to accelerate the rate of decline of incidence of TB to more than 10–15 per cent annually. The requirements of moving towards TB elimination have been integrated into four strategic pillars of Detect–Treat–Prevent–Build (DTPB). By taking the DTPB approach, the national programme can achieve significant positive change and make a real difference in the lives of many people it serves.

Table 3 highlights the core impact, outcome indicators and targets of the NSP. The four priority areas include private sector engagement, ensuring a seamless efficient TB care cascade, active TB case-finding among key populations (socially vulnerable and clinically high risk), and preventing progression from latent TB infection (LTBI) to active TB in high risk groups.

Financial resources

The programme is being assisted by the World Bank and the Department for International Development (DFID) via WHO. In addition, the RNTCP is supported by the Global TB Drug Facility (GDF), Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), the United States Agency for International Development (USAID) and DANIDA. Government of India provides 100 per cent grant-in-aid to the implementing agencies i.e., states/UTs, besides free drugs. The states are expected to use the existing infrastructure and also to provide some manpower resources.

NATIONAL AIDS CONTROL PROGRAMME

National AIDS Control Programme was launched in India in the year 1987. The Ministry of Health and Family Welfare has set up National AIDS Control Organization (NACO) as a separate wing to implement and closely monitor the various components of the programme. The aim of the programme is to prevent further transmission of HIV, to decrease

TABLE 3

NSP 2017–25 results framework

Impact indicators	Baseline	Target		
	2015	2020	2023	2025
To reduce estimated TB incidence rate (per 100,000 population)	217 (112–355)	142 (76–255)	77 (49–185)	44 (36–158)
To reduce estimated TB prevalence (per 100,000 population)	320 (280–380)	170 (159–217)	90 (81–125)	65 (56–93)
To reduce estimated mortality due to TB (per 100,000 population)	32 (29–35)	15 (13–16)	6 (5–7)	3 (3–4)
To ensure no family should suffer catastrophic cost due to TB	35%	0%	0%	0%
Outcome Indicators				
Total TB patient notification (in millions)	1.74	3.6	2.7	2
Total patient private providers notification (in millions)	0.19	2	1.5	1.2
MDR/RR TB patients notified	28,096	92,000	69,000	55,000
Proportion of notified TB patients offered DST	25%	80%	98%	100%
Proportion of notified patients initiated on treatment	90%	95%	95%	95%
Treatment success rate among notified DSTB	75%	90%	92%	92%
Treatment success rate among notified DRTB	46%	65%	73%	75%
Proportion of identified targetted key affected population undergoing active case finding	0%	100%	100%	100%
Proportion of notified TB patients receiving financial support through Direct Benefit Transfers (DBT)	0%	80%	90%	90%
Proportion of identified/eligible individuals for preventive therapy/LTBIs - initiated on treatment	10%	60%	90%	95%

Source : *(26)*

orbidity and mortality associated with HIV infection and to minimize the socio-economic impact resulting from HIV infection.

The milestones of the programme are summarized as follows *(30)* :

1986 – First case of HIV detected.
- AIDS Task Force set up by the ICMR.
- National AIDS Committee established under the Ministry of Health.

1990 – Medium Term Plan launched for four states and the four metros.

1992 – NACP–I launched to slow down the spread of HIV infection.
- National AIDS Control Board constituted.
- NACO set-up.

1999 – NACP–II begins, focussing on behaviour change, increased decentralization and NGO involvement.
- State AIDS Control Societies established.

2002 – National AIDS Control Policy adopted.
- National Blood Policy adopted.

2004 – Anti-retroviral treatment initiated.

2006 – National Council on AIDS constituted under chairmanship of the Prime Minister.
- National Policy on Paediatric ART formulated.

2007 – NACP–III launched for 5 years (2007–2012).

2014 – NACP–IV launched for 5 years (2012–2017).

2017 – National Strategic Plan for HIV/AIDS and STIs 2017–2024

2017 – NACP Phase–IV (extension) 2017–2021.

2022 – NACP Phase–V (2021–2026).

The national strategy has the following components : establishment of surveillance centres to cover the whole country; identification of high-risk group and their screening; issuing specific guidelines for management of detected cases and their follow-up; formulating guidelines for blood bank, blood product manufacturers, blood donors and dialysis units; information, education, and communication activities by involving mass media and research for reduction of personal and social impact of the disease; control of sexually transmitted diseases; and condom programme.

The Government of India initiated programmes of prevention and raising awareness under the Medium Term Plan (1990–92), NACP–I (1992–99), NACP–II (1999–2006) and NACP–III (2007–2012). Based on the lessons learnt and achievements made in Phase I, II and III. India developed the Fourth National Programme Implementation Plan (NACP–IV, 2012–2017). Phase–IV was extended from 2017 to 2021. NACP phase–V was launched in the year 2021. The duration of phase–V is from 1st April 2021 to March 31, 2026.

NACP Phase–V *(31)*

The NACP Phase–V consolidates the evidence and learnings from previous phases recognizing the significant progress yet the unfinished agenda. The NACP Phase–V builds on the gamechanger initiatives of the HIV and AIDS (Prevention and Control) Act, 2017 and rules thereof, Test and Treat policy, Universal Viral Load Testing, Mission Sampark, Community-Based Screening, transition to Dolutegravir-based Treatment Regimen etc. with an integral vibrant community engagement.

The NACP Phase–V aims to reduce annual new HIV infections and AIDS-related mortalities by 80% by 2025–26 from the baseline value of 2010. The NACP Phase–V also aims to attain dual elimination of vertical transmission, elimination of HIV/AIDS related stigma while promoting universal access to quality STI/RTI services to at-risk and vulnerable populations.

The NACP Phase–V has specific outputs, outcome and impact targets. Eight guiding principles will be central to strategies and activities to attain the specific targets as shown in Fig. 6.

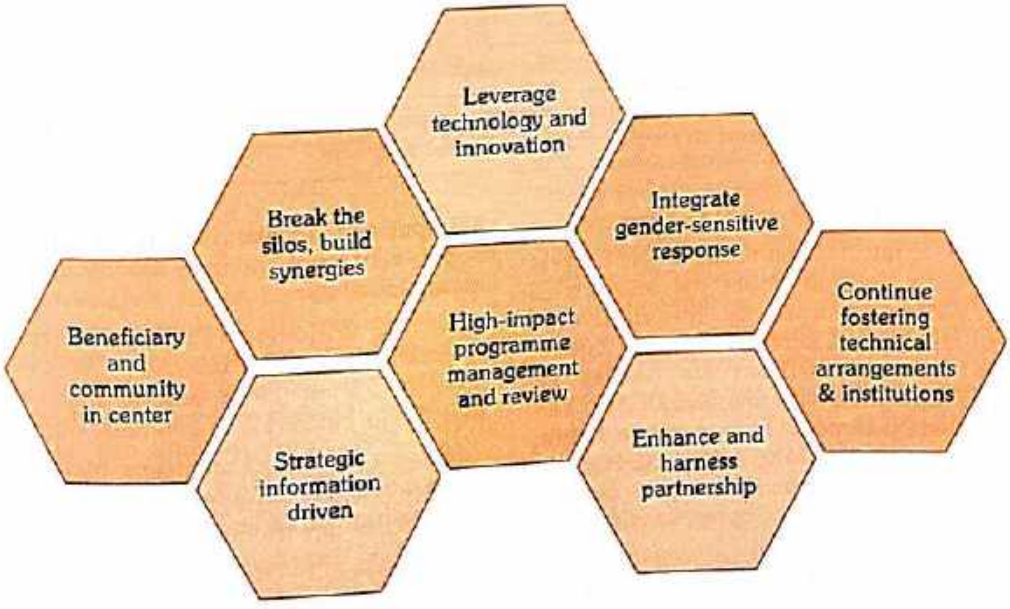


FIG. 6
NACP Phase–V : Guiding Principles

Source : (31)

The goals, objectives, and strategic interventions under NACP Phase–V are as follows *(31)* :

A. Goals

To reduce annual new HIV infections and AIDS-related death by 80% since the baseline value of 2010; Eliminate Vertical Transmission of HIV and Syphilis; Eliminate HIV/AIDS-related stigma and discrimination; promote universal access to quality STI/RTI services

B. Objectives

95% of people who are most at risk of acquiring HIV infection use comprehensive prevention	95% of HIV positive know their status, 95% of those who know their status are on treatment and 95% of those who are on treatment have suppressed viral load	95% of pregnant and breastfeeding women living with HIV have suppressed viral load towards attainment of elimination of vertical transmission of HIV	Less than 10% of people living with HIV and key populations experience stigma and discrimination

Promote universal access to quality STI/RTI services to at-risk and vulnerable populations; Attainment of elimination of vertical transmission of Syphilis

C. Strategic Interventions

New generation communication strategy	Reaching the missing million - The virtual approach	Promoting integrated service delivery through one-stop centers	Provision of comprehensive package of services through "Sampoorna Suraksha"
Augmenting contact tracing and index testing promoting early detection of undiagnosed infections	Leveraging dual test kits (HIV & Syphilis) for dual elimination and integrated service package to the people who are at higher risk	Addressing linkage loss at all levels	Differentiated care model augmenting adherence
Prioritize sexual and reproductive health services for women at increased risk of HIV infection and women living with HIV	Adapting new approaches to expand the reach of viral load testing services	Enhancement of private sector engagement	I.T. enabled client centric integrated monitoring, evaluation, and surveillance system
Enhancement of community support through community system strengthening	Building and augmenting synergies	Anchoring the response through focused programme management and review	Enhancing the strategic information systems to meet the evidence needs in ever evolving and dynamic epidemiological and programmatic context

Leveraging technology to bring efficiency and expand the reach of the services.

Consolidation and expansion of existing interventions across prevention-testing-treatment continuum with critical enablers of IEC, laboratory services and strategic information management.

Organizational structure

The National AIDS Control Organization (NACO) is presently established as a division under the Ministry of Health and Family Welfare, headed by the Additional Secretary, Ministry of Health and Director General, NACO Govt. of India. The technical divisions are headed by officers at the level of Deputy Director General/DGHS. The finance division is headed by Director-Finance while Admin and Procurement is headed by the Joint Secretary, Ministry of Health. Fig. 7 shows the NACO structure.

Country scenario

Based on sentinel surveillance data, the HIV prevalence in adult population can be broadly classified into three groups of States/UTs in the country.

Group I High Prevalence States : includes states of Maharashtra, Tamil Nadu, Karnataka, Andhra Pradesh, Manipur and Nagaland where the HIV infection has crossed 5 per cent mark in high-risk group and 1% or more in antenatal women.

Group II Moderate Prevalence States : includes states of Gujarat, Goa and Puducherry where HIV infection has crossed 5% or more among high risk groups but the infection is below 1% in antenatal women.

Group III Low Prevalence States : includes remaining states where the HIV infection in any of the high risk groups is still less than 5% and is less than 1% among antenatal women.

Categories of Districts

In the country, the districts have been classified according to the epidemiological and vulnerability–criteria using the sentinel surveillance data for the last 3 years (Table 4). Accordingly, 156 districts have been classified as category A, 39 districts as category B, 296 as category C and 118 as

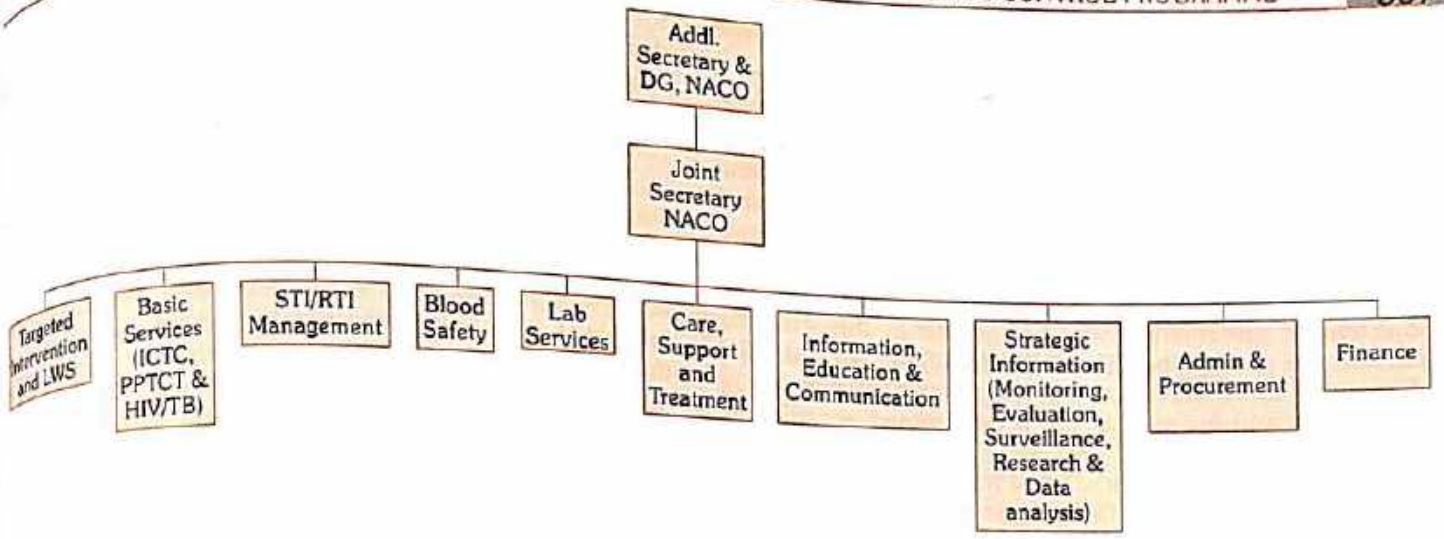


FIG. 7
NACO Structure

Source : *(32)*

category D districts. The planning for HIV related services has also been graded as per categorization of districts. This approach has been implemented since March 2007.

TABLE 4

Categories of districts

Category of Districts	
More than 1% ANC/PTCT prevalence in district at any time in any of the sites in the last 3 years.	A
Less than 1% ANC/PTCT prevalence in all the sites during last 3 years associated with more than 5% prevalence in any HRG group (STD/CSW/MSM/IDU).	B
Less than 1% in ANC prevalence in all sites during last 3 years with less than 5% in all STD clinic attendees or any HRG with known hot spots (Migrants, truckers, large aggregation of factory workers, tourist etc.).	C
Less than 1% in ANC prevalence in all sites during last 3 years with less than 5% in all STD clinic attendees or any HRG OR, poor HIV data with no known hot spots.	D

ANC – Antenatal clinic
PTCT – Parent to child transmission

Source : *(33)*

District HIV/AIDS prevention and control units (DAPCUs) were created during NACP–III (2007–2012) to implement AIDS control and prevention strategies in 188 districts across 22 states with high burden of HIV prevalence and were integrated with the existing public health infrastructure and programmes at district level in a synchronized manner. The process of decentralized service delivery under the programme was further strengthened during NACP–IV. In the present NACP–V phase, new interventions and strategies have been developed to monitor the programme at national, state and district level. These interventions and strategies are being implemented at the facility level, this need to be encompassed in the present ambit of monitoring structure at the district level as District Integrated Strategy for HIV/AIDS (DISHA). Under the DISHA strategy, DISHA clusters consisting of high, moderate and low priority district will be created across the country with an expanded mandate to work in most efficient manner. It will be dynamic approach to tackle the immerging pattern of prevalence of epidemic at the district level. The district prioritization for the year 2019 is as follows :

Priority level	Description	Number of districts	Epidemic burden
High	Adult prevalence of >=1% or PLHIV size of >=5000	144	63% of PLHIV, 49% of new infections and 55% of PMTCT need
Moderate	Adult prevalence of 0.4% –<1% or PLHIV size of 2500 –<5000	155	21% of PLHIV, 27% of new infections and 25% of PMTCT need
Low	Adult prevalence of 0.20% –<0.40% or PLHIV size of 1000 –<2500	180	12% of PLHIV, 16% of new infections and 14% of PMTCT need
Very Low	Adult prevalence of <0.20% or PLHIV size of <1000	256	4% of PLHIV, 8% of new infections and 6% of PMTCT need

Source : *(31)*

HIV surveillance

Different types of surveillance activities are being carried out in the country to detect the spread of the disease and to make appropriate strategy for prevention and control viz., area specific targeted intervention and best practice approach. The types of surveillance are : (a) HIV Sentinel Surveillance, (b) HIV Sero–Surveillance, (c) AIDS Case Surveillance, (d) STD Surveillance, (e) Behavioural Surveillance, and (f) Integration with surveillance of other diseases like tuberculosis etc.

HIV SENTINEL SURVEILLANCE : After the establishment of the fact that HIV infection is present in wide geographic areas, the aim of surveillance was redefined to monitor the trends of HIV infection. The objectives of the surveillance are as follows *(34)* :

1. To determine the level of HIV infection among general population as well as high-risk groups in different states;
2. To understand the trends of HIV epidemic among general population as well as high-risk groups in different states;
3. To understand the geographical spread of HIV infection and to identify emerging pockets;

4. To provide information for prioritization of programme resources and evaluation of programme impact; and
5. To estimate HIV prevalence and HIV burden in the country.

The objective of the surveillance is best achieved by annual cross-sectional survey of the risk group, in the same place over few years by unlinked anonymous serological testing procedures by two ERS (i.e., when HIV testing is carried out without indentification of name of samples collected for other purposes e.g., VDRL in STD clinics. The objective of surveillance may be fulfilled in this example whereas the positive person is not identified). The number of samples to be screened must represent the risk group under study and the sample size is determined accordingly. Clinical based approach for such collection has many advantages including the procedure for collection of samples which should be carried out on the above lines to avoid "selection bias" and "participation bias"

To start with, the HIV sentinel surveillance for HIV was taken up from 1994 in 55 sentinel sites attached to the existing surveillance centres and were increased to 180 in 1998. While the number of the high risk groups of HIV sentinel sites were increased every year, with change of sites, these 180 sites have remained consistent. Inclusion of data from high-risk population through targeted intervention sites and the additional sub–set of rural samples through ante-natal clinics are the key features of HIV sentinel surveillance. Pregnant women attending antenatal clinics are taken as proxy for general population. The number of HIV sentinel surveillance sites for different population groups during 2016–17 are as shown in Table 5.

TABLE 5

Number of HIV sentinel surveillance sites (2016–2017)

Site type	2016–2017
ANC	829
IDU	87
MSM	89
FSW	245
Migrant	27
TG	18
Truckers	28
Total	1,323

Source : *(35)*

The strategy adopted for collection and testing of samples during HIV Sentinel Surveillance Round 2016–2017 was as follows (Table 6).

Counselling and HIV testing services

The Basic Service Division of the department of AIDS control provides HIV counselling and testing services for HIV infection. The national programme is offering these services since 1997 with the goal to identify as many people living with HIV, as early as possible (after acquiring the HIV infection), and linking them appropriately and in a timely manner to prevention, care and treatment services. The introduction of ART services for people living with HIV/AIDS in 2004, gave a major boost to counselling and testing services in India. The HIV counselling and testing services include the following components:

1. Integrated Counselling and Testing Centres (ICTC).
2. Prevention of parent-to-child transmission of HIV (PPTCT).
3. HIV/tuberculosis collaborative activities.

INTEGRATED COUNSELLING AND TESTING CENTRES

Diverse models of HIV counselling and testing services are available to increase access to HIV diagnosis, these include testing services in health care facilities, standalone sites and community-based approaches at various levels of public health systems in India from state, district, sub-district and village/community levels as depicted in Fig. 8.

Types of facilities for HIV counselling and testing services

Integrated Counselling and Testing Centres (ICTC): A person is counselled and tested for HIV at ICTC, either of his own free will (client initiated) or as advised by a medical provider (provider initiated). Functions of ICTC include early detection of HIV, provision of basic information on modes of transmission and prevention of HIV/AIDS for promoting behavioural change and reducing vulnerability, and linking PLHIV with other HIV prevention, care and treatment services. The ICTC have been classified into two types: Fixed facility ICTC and Mobile ICTC.

TABLE 6

HIV sentinel surveillence round 2016–2017

	High risk groups: IDU/MSM/FSW/TG	Bridge population: SMM/LDT	General population: Pregnant women attending ANC clinics
Sentinel site	Targeted interventions (TI) projects	STD clinic, TI projects	Antenatal clinic
Sample size	250	250	400
Duration	3 months	3 months	3 months
Frequency	Once in 2 years	Once in 2 years	Once in 2 years
Sampling method	Consecutive/random	Consecutive	Consecutive
Age group	15–49 years	15–49 years	15–49 years
Testing strategy	Unlinked anonymous with informed consent	Unlinked anonymous at STD, with informed consent at TI sites	Unlinked anonymous
Blood specimen	Dried blood spot	Serum at STD, DBS at TI sites	Serum
Testing protocol	Two test protocol	Two test protocol	Two test protocol

SMM – Single male migrants, LDT – Long distance truckers

Source : *(35)*

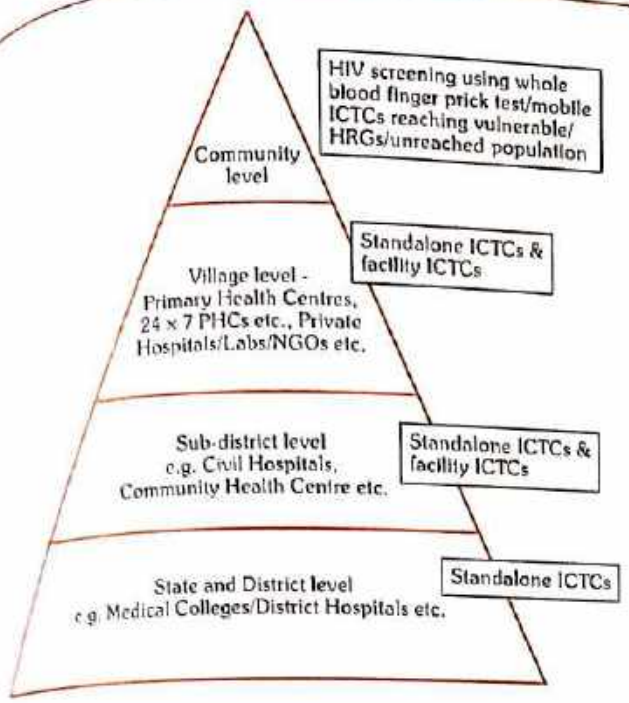


FIG. 8

Level of HIV counselling and testing services in India

Source : (36)

Fixed facility ICTCs are located within an existing healthcare facility/hospital/health centre, and are of two types – Standalone ICTC and Facility-integrated counselling and testing centres.

a. *Standalone ICTC (SA-ICTC):* The client load is high in these centres, with full-time counsellor and laboratory technician who provide HIV counselling and testing services. SA-ICTC are located in medical colleges, district hospitals, sub-district hospitals, CHCs etc.

b. *Facility-integrated counselling and testing centres (F-ICTCs):* Considering the need for rapid scale-up and sustainability of HIV counselling and testing services, the F-ICTCs have been set up below the block levels at 24 × 7 PHC, etc. Staff of the existing health facilities are trained in counselling and testing services of HIV. The HIV service delivery is ensured with logistic support from DAC. Similar to F-ICTC at 24 × 7 PHC, the Public Private Partnership (PPP)-ICTCs were established in private facilities (for profit/ not-for-profit hospitals, laboratories, non-governmental organizations etc.), and have been supported by DAC/SACs in supply of rapid HIV testing kits, training of existing staff, quality assurance, supply of protective kits and prophylactic drugs for post-exposure prophylaxis for staff, supply of IEC materials such as flip charts, posters etc. required for ICTC.

2. Mobile ICTC: Mobile counselling and testing centre is a van with a room to conduct general examination, counselling and space for collection and processing blood samples by a team of paramedical healthcare providers (a health educator/ANM, counsellor and laboratory technician). Mobile ICTC are set up as temporary clinics in hard-to-reach areas with flexible working hours and provide a wide range of services like counselling and testing services for HIV, syndromic management of STI/RTI and other minor ailments, along with regular health check-ups, antenatal, immunization services etc.

Community based HIV screening: In order to offer HIV testing to every pregnant woman in the country, so as to detect all HIV positive pregnant women and eliminate transmission of HIV from parent to child, the community-based HIV screening is conducted by frontline health workers (Auxiliary Nurse Midwives) at the sub-centre level.

PREVENTION OF PARENT-TO-CHILD TRANSMISSION OF HIV

The prevention of parent-to-child transmission of HIV/ AIDS (PPTCT) programme was started in the country in the year 2002. Currently there are more than 15,000 ICTCs in the country which offer PPTCT services to pregnant women. The aim of the PPTCT programme is to offer HIV testing to every pregnant woman (universal coverage) in the country, so as to cover all estimated HIV positive pregnant women and eliminate transmission of HIV from mother-to-child.

In India, PPTCT interventions under NACP was started in 2002, using SD-NVP prophylaxis for HIV positive pregnant women during labour and also for her new born child immediately after birth. With the department of AIDS control adopting "Option B" of the World Health Organization recommendations (2010), India has also transitioned from the single dose Nevirapine strategy to that of multi-drug ARV prophylaxis from September 2012. This strategy was executed in the three southern high HIV prevalence states of Andhra Pradesh, Karnataka and Tamil Nadu. The national strategic plan for PPTCT services using multi-drug ARVs in India was developed in May-June 2013 for nationwide implementation in a phased manner. Based on the new WHO guidelines (June 2013) and on the suggestions from the technical resource groups during December 2013, department of AIDS control has decided to initiate lifelong ART (using the triple drug regimen) for all pregnant and breast-feeding women living with HIV, regardless of CD4 count or WHO clinical stage, both for their own health and to prevent vertical HIV transmission, and for additional HIV prevention benefits.

The PPTCT services provide access to all pregnant women for HIV diagnostic, prevention, care and treatment services. As such, the key goal is to ensure the integrated PPTCT service delivery with the existing Reproductive and Child Health (RCH) programme.

The essential package of PPTCT services in India are as follows *(36)* :

1. Routine offer of HIV counselling and testing to all pregnant women enrolled into antenatal care, with an 'opt out'option.
2. Ensuring involvement of spouse and other family members, and move from an "ANC-Centric" to a "Family-Centric" approach.
3. Provision of life-long ART (TDF+3TC+EFV) to all pregnant and breast-feeding HIV infected women, regardless of CD4 count and clinical stage of HIV progression.
4. Promotion of institutional deliveries of all HIV infected pregnant women.
5. Provision of care for associated conditions (STI/RTI, TB and other opportunistic infections).

6. Provision of nutrition, counselling and psychosocial support for HIV infected pregnant women.
7. Provision of counselling and support for initiation of exclusive breast-feeds within an hour of delivery as the preferred option and continued for 6 months.
8. Provision of ARV prophylaxis to infants from birth upto a minimum of 6 months.
9. Integrating follow-up of HIV-exposed infants into routine healthcare services including immunization.
10. Ensuring initiation of Co-trimoxazole Prophylactic Therapy (CPT) and Early Infant Diagnosis (EID) using HIV-DNA PCR at 6 weeks of age onwards, as per the EID guidelines.
11. Strengthening community follow-up and outreach through local community networks to support HIV-positive pregnant women and their families.

HIV TESTING OF TB PATIENTS

Detection of HIV by offering HIV tests to diagnosed TB patients is being implemented by NACP and RNTCP jointly since 2007–08. States with high HIV prevalence cover about 90% TB patients for HIV testing, but case fatality rate among HIV infected TB cases remains 13–14%, as compared to less than 4% in HIV negative TB cases, indicating delayed detection of HIV/TB inspite of good coverage. Therefore, NACP and RNTCP have jointly decided to offer HIV testing upstream during evaluation of patients for TB when they present with TB symptoms. This activity is expected to expedite detection of HIV within 2–4 weeks of TB positivity, leading to early linkage to HIV treatment and hence reduction in mortality. HIV testing in presumptive TB cases was rolled-out in India in October 2012 in Karnataka, followed by Maharashtra, Andhra Pradesh and Tamil Nadu. It is planned to extend this strategy to high HIV prevalence districts i.e. A and B category districts. Further the NTWG has recommended implementation of this strategy among 25–54 years age group in the rest of the country.

The four pronged strategy for HIV–TB coordination activity to reduce mortality are summarized in Fig. 9.

Care, support and treatment

The care, support and treatment (CST) component of NACP aims to provide comprehensive services to people living with HIV (PLHIV) to improve the survival and quality of life. The policy package includes the following *(16)*:

- Free universal access to life long standardized antiretroviral therapy (ART);
- Free laboratory diagnostic and monitoring services (baseline tests, CD4 testing, targeted viral load);
- Facilitating long term retention in care;
- Prevention, diagnosis and management of opportunistic infection; and
- Linkage to care and support services and linkage to social protection scheme.

The country has adopted fast track target of 90–90–90 and more recently 95–95–95 target which aims at ending AIDS as public health threat by 2030 by achieving fast track targets by 2020. They are as follows:

1. 95 per cent of PLHIV know their status, of which
2. 95 per cent of PLHIV are on ART, of which
3. 95 per cent of PLHIV have viral suppression.

A significant step of rolling out "test and treat" policy has been taken towards achieving these targets.

CST services are provided through ART centres established by DAC in health facilities across the country. These are linked to Centres of Excellence (CoE) and ART-Plus centres at selected institutions, while some of the services have been decentralized through Link ART Centres (LAC). ART centres are also linked to ICTCs, STI clinics, PPTCT services and other clinical departments in the institutions of their location, as well as with the Revised National Tuberculosis Programme (RNTCP), in order to ensure proper management of TB–HIV co-infected patients. Fig. 10 gives a graphic view of this service delivery model.

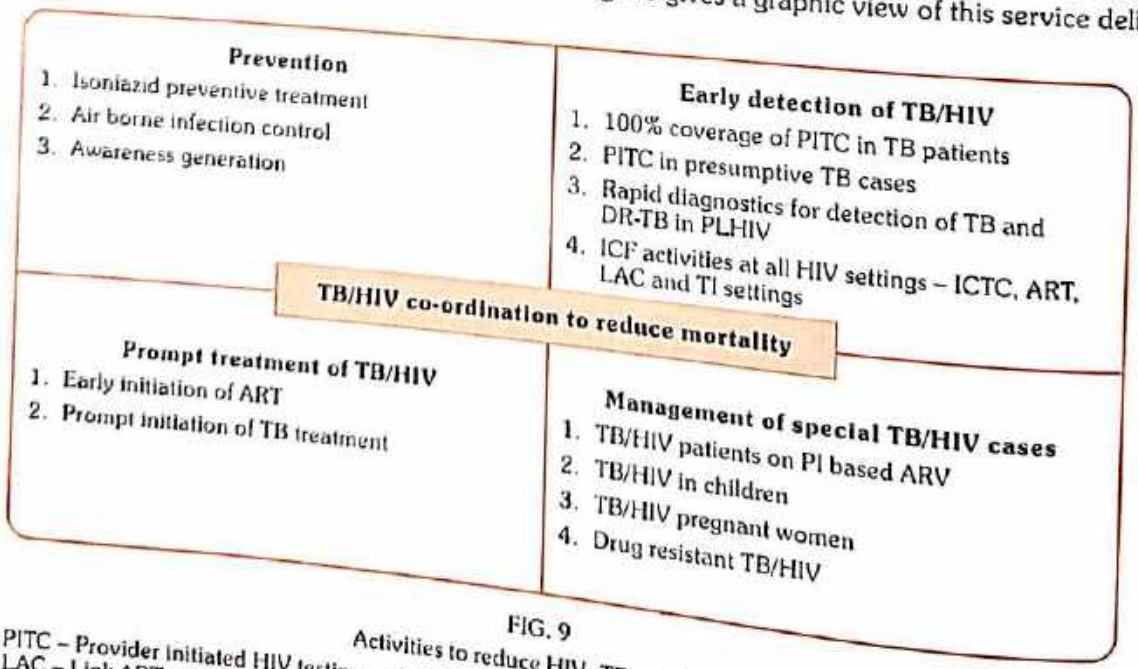


FIG. 9
Activities to reduce HIV–TB mortality

PITC – Provider initiated HIV testing and counselling; ICF – Intensified case finding; LAC – Link ART centres; TI – Targeted interventions

Source : *(21)*

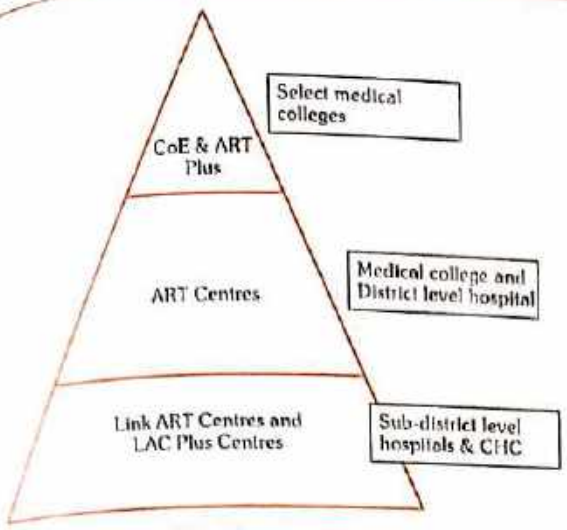


FIG. 10

Model of HIV treatment services

Source : (36)

As of September 2021, about 645 ART centres, 1,261 link ART centres, 17 centres of excellence, 7 paediatric centres of excellence, 86 ART Plus centres and 319 care and support centres are functioning in the country (7).

Services provided

1. *First-line ART :* First-line ART is provided free of cost to all eligible PLHIV through ART centres. Positive cases referred by ICTCs are registered in ART centres for pre-ART and ART services. The assessment for eligibility for ART is done through clinical examination and CD4 count. Patients are also provided counselling on treatment adherence, nutrition, positive prevention and positive living. Follow-up of patients on ART is done by assessing drug adherence, regularity of visits, periodic examination and CD4 count (every six months). Treatment for opportunistic infections is also provided through ART centres. Till Sept. 2022, 15,18,149 lakh PLHIV were on first-line ART.
2. *Alternative first-line ART :* It has been observed that a small number of patients initiated on first-line ART experience acute/chronic toxicity/intolerance to first-line ARV drugs, thus necessitating change of ARV drugs to alternative first-line drugs. Presently, the provision of alternative first-line ART is done through the Centres of Excellence and ART-Plus centres across the country.
3. *Second-line ART :* The second-line ART began in January 2008 at two sites – GHTM, Tambaram, Chennai and JJ Hospital, Mumbai on a pilot basis, and was then further expanded to the other CoEs in January 2009. Further decentralization of second-line ART was done through capacitating and upgrading some well-functioning ART centres as 'ART-Plus Centres'. Till Sept. 2022, 1,10,865 patients were receiving second-line drugs at CoEs and ART-Plus centres. All ART centres are linked to CoE/ART-Plus centres. For the evaluation of patients for initiation on second-line and alternate first-line ART, a State AIDS Clinical Expert Panel (SACEP) has been constituted by DAC at all CoEs and ART-Plus centres. This panel meets once in a week for taking decisions on patients referred to them with treatment failure/major side effects.
4. *Third-Line ART :* Some patients on second-line ART also experience treatment failure. National programme rolled out third-line regimen for them in 2015. Currently Raltegravir and Darunavir are used for third-line regimen *(16)* as on Sept. 2022, 3,315 patients were on 3rd line treatment *(8)*.

National paediatric HIV/AIDS initiative : The national paediatric HIV/AIDS initiative was launched on 30 November 2006. Till March 2014, nearly 1,06,824 children living with HIV/AIDS (CLHIV) were registered in HIV care at ART centres, of whom 42,015 were receiving free ART. Paediatric formulations of ARV drugs are available at all ART centres.

Paediatric second-line ART: While the first-line therapy is efficacious, certain proportion of children do show evidence of failure. There is not much data available on the failure rate of Nevirapine-based ART in children. However, WHO estimates that the average switch rate from first to second-line ART is 2–3% per year for adults. It is likely that similar rates are applicable for children as well. Currently, second-line ART for children has been made available at all CoE and ART-Plus centres.

Early Infant diagnosis : In order to promote confirmatory diagnosis for HIV exposed children, a programme on Early Infant Diagnosis (EID) was launched by DAC. All children with HIV infection confirmed through EID have been linked to ART services.

Follow-up and monitoring : Patients initiated on ART are regularly followed up on monthly basis. The basic examination including weight measurement, clinical evaluation, and screening for opportunistic infections is done on every visit. Assessment of adherence is done by counsellor on every visit and necessary support is provided as per requirement. CD4 testing is done every six months to monitor the response of ART. During each visit, patients are encouraged to visit care and support centers for psycho-social support and availing various social beneficiary scheme *(16)*.

Management of Opportunistic infection (16) : Screening prophylaxis and management of various opportunistic infections is an important part of comprehensive HIV care. Following intervention are done at ART centers for this:

a. HIV-TB : TB is the most common opportunistic infection among PLHIVs. All patients attending ART centers including new registrations, pre-ART and on ART patients are screened verbally for 4 symptom complex. In case any one of the symptom is present, patients are referred for TB testing. Those diagnosed with co-infection are initiated on Anti TB treatment from ART center followed by ART. When TB is ruled out, Isoniazid prophylaxis is offered. NACP works in close coordination with RNTCP for managing co-infections.
b. HIV-Hepatitis B and Hepatitis C : The PLHIV are at high risk of co-morbidity with hepatitis B and C. It is important to ensure timely detection and initiation of hepatitis B or C treatment in HIV/viral hepatitis co-infected patients to minimize hepatitis-related liver disease and its long-term negative impact on HIV outcomes. Hepatitis B and C detection and treatment for PLHIV will be provided at ART centers. Hepatitis B treatment is available as part of ART programme since ART regimens containing tenofovir (TDF) plus a second NRTI active against HBV (3TC/FTC) have been shown to suppress both HIV and HBV viral replication. Treatment for Hepatitis C needs direct acting antivirals (DAAs) such as sofosbuvir, grazoprevir, glecaprevir etc. *(32)*.
c. HIV - Kala-azar: Kala-azar or Visceral Leishmaniasis is endemic in some districts of states like UP, Bihar and

Jharkhand. All PLHIVs with symptoms suggestive of Kala-azar are screened for Kala-azar and those found infected are referred for appropriate treatment.

d. Other opportunistic infection: PLHIVs are regularly screened for co-infection and co-morbidities. Those diagnosed having these are treated appropriately at ART center or are referred to concerned facility. Those who are vulnerable to opportunistic infections due to low CD4 count or any other reasons are provided with prophylaxis, for eg. Co-trimoxazole.

TARGETTED INTERVENTIONS FOR HIGH RISK GROUPS: The main objective of targeted interventions (TI) is to improve health-seeking behaviour of high risk groups (HRG) and reduce their risk of acquiring sexually transmitted infections (STI) and HIV infections. High risk groups under TI include female sex workers (FSW), men who have sex with men (MSM), transgenders (TG)/hijras and injecting drug users (IDU), and bridge populations include high risk behaviour migrants and long distance truckers. Targeted interventions provide the information, means and skills needed to prevent HIV transmission and improve their access to care, support and treatment services. These programmes also focus on improving sexual and reproductive health and general health of high-risk population.

The services offered through targeted interventions include:

- Detection and treatment for sexually transmitted infections.
- Condom distribution (except in TIs for bridge population).
- Condom promotion through social marketing (for HRG and bridge population).
- Behaviour change communication.
- Creating an enabling environment with community involvement and participation.
- Linkages to integrated counselling and testing centres.
- Linkages with care and support services for HIV positive HRGs.
- Community organization and ownership building.
- Specific interventions for IDUs.
  - Distribution of clean needles and syringes.
  - Abscess prevention and management.
  - Opioid substitution therapy.
  - Linkage with detoxification/rehabilitation services.
- Specific interventions for MSM/TGs.
  - Provision of lubricants.
  - Specific interventions for TG/hijra populations.
  - Provision of project-based STI clinics.

The targeted interventions (TIs) supported by NACO as on September 2021 are as follows *(7)* :

FSW	–	313
MSM	–	94
IDU	–	200
Transgender/Hijaras	–	40
Migrants	–	210
Truckers	–	70

Link worker scheme: The Link worker scheme is a community-based outreach strategy to address HIV prevention and care needs of HRG and vulnerable population in rural areas. The specific objectives of the scheme include reaching out to these groups with information and knowledge on prevention and risk reduction of HIV and STI, condom promotion and distribution, providing referral and follow-up linkages for various services. It includes counselling, testing and treatment of STI and opportunistic infections through link workers, creating an enabling environment for PLHIV and their families, and reducing stigma and discrimination against them. In partnership with various development partners, the link worker scheme has been expanded and as on September 2021, it is being implemented in 16 states covering 143 highly vulnerable districts covering 1500 villages.

The population covered under the link worker scheme from January to September 2021 are as follows *(7)* :

Population	Line Listed	Covered
FSW	55,448	49,990
IDU	8,573	7,573
MSM	8,543	7,675
TG	554	456
Migrant	4,38,043	2,10,368
Trucker	75,170	48,628
Other-Vul. Pop	5,85,151	3,34,107
TB cases	23,081	9,135
ANC	88,517	65,181
PLHIV	34,265	25,788

Blood transfusion services: The division of blood safety has been renamed as the division of blood transfusion services. The change in nomenclature is to broaden the horizon of blood safety to include transfusion transmitted infections, immuno-hematology, quality management systems, logistics and other processes involved to improve confidence in the "safe blood".

Blood transfusion services have been considered as an integral part of the health care system. Blood Transfusion Councils have been set-up at national and state levels. Professional blood donation has been prohibited in the country since 1st January 1998. Only licensed blood banks are permitted to operate in the country and voluntary blood donation is encouraged. The strategy is to ensure safe collection, processing, storage and distribution of blood and blood products. Zonal blood testing centres have been established to provide linkage with other blood banks affiliated to public, private and voluntary sectors. As per national blood safety policy, testing of every unit of blood is mandatory for detecting infections like HIV, hepatitis B, hepatitis C, malaria and syphilis.

Access to safe blood for the needy is the primary responsibility of NACO. It is supporting a network of 1,131 blood banks, including 590 Blood Component Separation Units (BCSU) and 34 Model Blood Banks, 108 major blood banks and 591 district level blood banks *(16)*. NACO supported the installation of BCSU and has given funds for modernization of all major blood banks at state and district levels. Besides enhancing awareness about the need to procure safe blood and blood products, NACO has supported the procurement of equipment, test kits and reagents, and is helping in the recurring expenditure of government blood banks and those run by voluntary/ charitable organizations, that were modernized.

In order to ease the situation of shortage of availability of blood in the rural areas, where it is not feasible to operate a blood bank, Govt. has decided to establish blood storage centres at First Referral Units (FRUs), at sub-district levels, for wider availability of safe blood, particularly for emergency obstetric care and trauma care services.

Condom promotion: Condom promotion strategies will be strengthened through free distribution and social marketing channels, non-traditional outlets, female condoms, etc. aided by an effective communication strategy. The programme will continue to link prevention with care, support and treatment. This will promote positive prevention.

On the basis of HIV prevalence and family planning needs, the districts have been mapped and classified into four categories: (a) High prevalence of HIV and high fertility (HPHF); (b) High prevalence of HIV and low fertility (HPLF); (c) Low prevalence of HIV and low fertility (LPLF); and (d) Low prevalence of HIV and high fertility (LPHF). During 2014 the coverage of condom social marketing programme implementation was spread across 395 districts, i.e. 141 HPHF, 84 HPLF and 170 LPHF districts in 11 states *(35)*.

STD CONTROL PROGRAMME : STD control is linked to HIV/AIDS control as behaviour resulting in the transmission of STD and HIV are same. HIV is transmitted more easily in the presence of another STD. Hence, early diagnosis and treatment of STD is now recognized as one of the major strategies to control spread of HIV infection. The following approach is adopted for the STD control *(37)* :

a. Management of STDs through syndromic approach (management of sexually transmitted diseases based on specific symptoms and signs and not dependent on laboratory investigations). Please refer to page 389 chapter 5 for details.

b. STDs among women, though highly prevalent, are suppressed because of the social stigma attached to the disease. It has, therefore, been decided to integrate services for treatment of reproductive tract infections (RTIs) and sexually transmitted diseases (STDs) at all levels of health care. Department of Family Welfare and NACO will coordinate their activities for an effective implementation of such integration. STDs Clinics at district / block/ First Referral Unit (FRU) level would function as referral centres for treatment of STDs referred from peripheries. STDs clinics in all district hospitals, medical colleges and other centres would be strengthened by providing technical support, equipment, reagents and drugs. A massive orientation-training programme would be undertaken to train all the medical and paramedical workers engaged in providing STDs/RTIs services through a syndromic approach. All STDs clinics would also provide counselling services and good quality condoms to the STD patients. Services of NGOs would be utilised for providing such counselling services at the STDs clinics.

NACO has branded the STI/RTI services as **"Suraksha Clinic"**, and has developed a communication strategy for generating demand for these services *(3)*.

PRE-PACKED STI/RTI COLOUR CODED KITS : Pre-packed colour coded STI/RTI kits have been provided for free supply to all designated STI/RTI clinics. These kits are being procured centrally and supplied to all State AIDS Control Societies.

The colour code is as follows *(38)* :

Kit 1 – grey, for urethral discharge, ano-rectal discharge and cervicitis.
Kit 2 – green, for vaginitis.
Kit 3 – white, for genital ulcers.
Kit 4 – blue, for genital ulcers.
Kit 5 – red, for genital ulcers.
Kit 6 – yellow, for lower abdominal pain.
Kit 7 – black, for inguinal bubo.

National Strategic Plan for HIV/AIDS and STI 2017–2024 *(28)*

The National Strategic Plan for HIV/AIDS and STI (2017–2024) is developed with a vision of an AIDS free India. The mission is to attain universal coverage of HIV prevention, testing, treatment to care continuum that is effective, inclusive, equitable and adapted to population and local needs.

Goal : The goal is to achieve zero new infection, zero AIDS-related deaths and zero AIDS related stigma and discrimination.

Strategic framework: The NSP is designed around a results-based framework that reflects the fast-track targets and the 'ending of AIDS' commitment. The framework is based on a causal relationship between the vision, mission, goal and the outcomes. This will be articulated in terms of inputs, outputs and costs in the implementation plan. While there are several external and internal risks that may positively or adversely affect results, the combination of strategies adopted will be calibrated according to the epidemiological, health priorities and resource scenarios of different State/UTs and in cognisance of needs of people living with HIV and the communities.

Based on this strategic framework, a specific planning approach is required which helps differentiate States and Union Territories (UT) according to three predominant epidemiological contexts *(32)* :

(i) States/UT with a 'mature' epidemic where HIV incidence and prevalence are high in key, bridge and other at-risk populations and, in some cases, in other segments of the general population.
(ii) Those States/UT where there are 'emerging' epidemics with relatively new and rising rates of infection among key, bridge and other at-risk populations.
(iii) States/UT with 'low' or stable epidemics where there is still a need to focus on potential risks among key, bridge and other at-risk populations, to maintain the low infection rates and eliminate HIV transmission.

While a range of services is needed in all the three case scenarios, the mix and relative weight of each set of interventions and service-delivery models may need to vary accordingly. The most critical interventions include prevention, outreach, testing and counselling, treatment, PPTCT, viral load suppression, care and support, as well as social protection. Programmatic support components (e.g. monitoring and evaluation, surveillance, research, laboratory services, procurement etc.) remain relevant across all three contexts. However, the service delivery modality, the level of integration into health systems and corresponding budget requirements will vary according to the epidemiological, social and demographic characteristics of the above three contexts.

Objectives: This NSP proposes six objectives towards fulfilling its vision of an AIDS free India. These are:

Objective 1 : Reduce 80% new infections by 2024 (Baseline 2010)
Objective 2 : Ensure 95% of estimated PLHIV know their status by 2024
Objective 3 : Ensure 95% PLHIV have ART initiation and retention by 2024, for sustained viral suppression
Objective 4 : Eliminate mother-to-child transmission of HIV and syphilis by 2020.
Objective 5 : Eliminate HIV/AIDS related stigma and discrimination by 2020

Objective 6 : Facilitate sustainable NACP service delivery by 2024

Achievement of these objectives by 2024 would result in the following: *(32)* :

1. Estimated new infections will reduce from 102,226 (2010) to < 21,000 per year
2. 2.14 million PLHIV of the total estimated PLHIV (2.25 million) would know their status
3. 2.03 million PLHIV would be put on ART
4. 1.93 million PLHIV would be retained on treatment and have HIV VL < 1000 copies/ml
5. Attainment of <50 cases of new paediatric HIV infections per 100,000 live births with a mother-to-child transmission rate <5% by 2020 and maintenance of same thereof
6. Attainment of <50 cases of congenital syphilis per 100,000 live births and maintenance of same thereof
7. HIV/AIDS will be perceived as chronic manageable disease with no stigma and discrimination attached to it.
8. Key components of the NACP such as prevention outreach, testing, treatment, prevention of mother-to-child transmission, viral load suppression, care and support, as well as social protection schemes will continue through 100% domestic funding.

Information, education and communication

Communication is the key to generating awareness on prevention as well as motivating access to testing, treatment, care and support. Communication in NACP-IV is directed at:

a. To increase knowledge among general population (especially youth and women) on safe sexual behaviour;
b. To sustain behaviour change in high risk groups and bridge populations;
c. To generate demand for care, support and treatment services; and
d. To make appropriate changes in societal norms that reinforce positive attitude, beliefs and practices to reduce stigma and discrimination.

Adolescence Education Programme: This programme runs in secondary and senior secondary schools to built up life skills of adolescents to cope with the physical and psychological changes associated with growing up. Under the programme, 16 hour sessions are scheduled during the academic terms of class IX and XI. State AIDS control society have further adapted the modules after state level consultations with NGOs, academicians, psychologists and parent-teacher bodies. This programme is being implemented in 23 states and currently 50,000 schools have been covered.

Red Ribbon Clubs: The purpose of Red Ribbon Club formation in colleges is to encourage peer-to-peer messaging on HIV prevention and to provide a safe space for young people to seek clarifications of their doubts and myths surrounding HIV/AIDS. The RRCs also promote voluntary blood donation among youth. Currently, 12,546 Red Ribbon Clubs are functioning under the programme.

Achievement on Key Indicators under NACP during FY 2021–22 :

The key indicators across the domain of Output, Outcome and Impact have been summarised below. These indicators are used to report to various forums including NITI Aayog's Output Outcome Monitoring Framework.

Achievement on Key Indicators under NACP during FY 2021–22 (April to November 2021)

Indicator(s)	Annual Target (2021–22)	Achievement (April- Nov. 2021)
No. of High-Risk Group and Bridge Population covered through Targeted Interventions	83.87 lakh	41.17 Lakh
No. of High-Risk Groups & Vulnerable Population covered through LWS	18.53 lakh	7.59 lakh
No. of STI/RTI patients managed as per national protocol	100.16 lakh	53.94 lakhs
No. of persons trained under mainstreaming training programmes	1.49 lakh	1.44 lakh
No. of condoms free distributed (in pieces)	30.19 crore pieces	17.02 crore pieces
No. of General Clients tested for HIV	252 lakh	145.0 lakhs
No. of Pregnant Women tested for HIV	252 lakh	162.2 lakhs
No. of HIV-TB cross referrals	35 lakh	18.32 lakh
No. of PLHIV on ART* (Cumulative)	15.30 lakh	15.21 lakh
No. of opportunistic infections treated	3.5 lakh	2.00 lakh
No. of viral load test conducted among PLHIV on ART	11.00 lakh	6.55 lakh

*Inclusive of 1.06 lakh PLHIV on ART in private sector

Progress on Output and Impact Indicators during 2020

Indicator(s)	Target	National Achievement	Global Achievement
Decline in annual new HIV infections (%)	75%	48%	31%
People living with HIV (PLHIV) who know their HIV status (%)	90%	78%	84%
PLHIV who know their HIV Positive status and are on Antiretroviral Therapy (%)	90%	83%	87%
PLHIV on Antiretroviral Therapy and virally suppressed (%)	90%	85%	90%
Decline in annual AIDS-related deaths (%)	75%	82%	42%
HIV positive mother on Antiretroviral Therapy (%)	95%	52%	85%

Source : *(7)*

NATIONAL PROGRAMME FOR CONTROL OF BLINDNESS

The National Programme for Control of Blindness was launched in the year 1976 as a 100 per cent centrally sponsored programme and incorporates the earlier trachoma control programme started in the year 1968. The programme was launched with the goal to reduce the prevalence of blindness from 1.4 to 0.3 per cent. More recently, the goal is set to reduce the prevalence to 0.25 per

...ent. As per 2015–19 survey the prevalence of blindness ...was 0.36 per cent *(11)*.

Main objectives of the programme are as follows : *(8)*

1. To continue three ongoing signature activities, i.e., performance of 66 lacs cataract operations per year; school eye screening and distribution of 9 lacs free spectacles per year to school children suffering from refractive errors; and collection of 50,000 donated eyes per year for keratoplasty *(7)*.
2. To reduce the backlog of avoidable blindness through identification and treatment of curable blind at primary, secondary and tertiary levels, based on assessment of the overall burden of visual impairment in the country;
3. Develop and strengthen the strategy of NPCB for "Eye Health for All" and prevention of visual impairment, through provision of comprehensive universal eye-care services and quality service delivery;
4. Strengthening and upgradation of Regional Institutes of Ophthalmology (RIOs) to become centre of excellence in various sub-specialities of ophthalmology and also other partners like Medical Colleges, District Hospitals, Sub-district Hospitals, Vision Centres, NGO Eye Hospitals;
5. Strengthening the existing infrastructure facilities and developing additional human resources for providing high quality comprehensive eye care in all districts of the country;
6. To enhance community awareness on eye care and lay stress on preventive measures;
7. Increase and expand research for prevention of blindness and visual impairment; and
8. To secure participation of voluntary organizations/ private practitioners in delivering eye care.

Major activities under the Programme *(8)*

1. Primary eye care services :

- Preventive and promotive eye care services : under comprehensive primary health care, Health and Wellness Centres (HWC) are providing preventive and promotive eye care services.
- IEC activities for promotion and preventive eye care and eye donation.

2. Secondary eye care services

- Cataract surgeries : Reduction in the backlog of cataract by performing cataract surgeries in Governmental/Non-Governmental Eye Hospitals and private practitioners.
- Screening for refractive errors and distribution of free spectacles : Screening of children for identification and treatment refractive errors and distribution of spectacles to those who are suffering from refractive errors through school eye screening programme.
- Distribution of free spectacles to old persons suffering from presbyopia to enable them for undertaking near work as a new initiative under the programme.
- Management of visual impairment : The programme is now geared to take care of all categories of visual impairment including low vision cases. Apart from cataract, now the focus of the programme is on treatment and management of other eye diseases like glaucoma, diabetic retinopathy, vitreo retinal diseases, corneal blindness and childhood blindness.
- Use of mobile ophthalmic units and tele-ophthalmology network to expand coverage and reach of the programme in disadvantaged and hard to reach areas.
- Eye banking services : Strengthening of eye banking services and collection of donated eyes.

3. Tertiary eye care services

- Grant in aid for strengthening of regional institute of ophthalmology and medical colleges.
- Superspeciality eye care services.
- Training for up gradation of skills of eye care personnel.

4. Infrastructure development and capacity building

- Grant in aid for strengthening of eye care units at primary and secondary level.
- Training of eye surgeons and paramedical ophthalmic assistants.

5. Research, surveys and studies

- National blindness and visual impairment survey.
- National trachoma prevalence survey.
- Research on eye care at tertiary level hospital.

To avoid duplicity of work, State Ophthalmic Cell has been merged with State Blindness Control Society, and after the launch of NRHM, State Blindness Control Societies have been further merged with State Health Society. Likewise, District Blindness Control Societies have also been merged with District Health Societies. Facilities for intra-ocular lense implantation have been expanded to taluka level.

The problem of blindness is acute in rural areas, and hence the programme has tried to expand the accessibility of eye services in these areas. At present there are 80 central mobile units attached to medical colleges and 341 district mobile units to provide eye care in mobile eye camps. These units have a vehicle, ophthalmic surgeon and other paramedical staff. Most of the cataract surgeries in rural population are conducted through these mobile camps. Primary health centres are the basic units in the rural areas.

The findings of the survey conducted during 2001–2002, in randomly selected districts of the states covered by World Bank Project shows that dependence on eye camps has reduced, except in remote and tribal areas; involvement of PHC/CHC doctor in the programme has increased; higher percentage of cataract operated persons consult the doctor at an early stage; there is an increase in demand for modern techniques like intra-ocular lenses and suture-less surgeries; and about 84 per cent of cataract operated persons receive free spectacles from the health facilities.

The organizational structure for the national programme for control of blindness is as shown in Fig. 11.

SCHOOL EYE SCREENING PROGRAMME : 6–7 per cent of children aged 10–14 years have problem with their eye sight affecting their learning at school. Children are being first screened by trained teachers. Children suspected to have refractive error are seen by ophthalmic assistants and corrective spectacles are prescribed or given free for persons below poverty line.

COLLECTION AND UTILIZATION OF DONATED EYES : During 2022–23 nearly 66,395 donated eyes were collected for corneal implantation *(8)*. Hospital retrieval programme is the major strategy for collection of donated eyes, which envisage motivation of relatives of terminally ill patients, accident victims and others with grave diseases to donate eyes. Eye donation fortnight is organized from 25th August to 8th September every year to promote eye donation/eye banking. Gujarat, Tamil Nadu, Maharashtra and Andhra Pradesh are leading states in this activity *(1)*.

FIG. 11
Organizational structure for national programme for control of blindness

Source : *(39)*

New Initiative : under National Programme for Control of Blindness & Visual impairment

1. On an average 65 lakhs (approx.) cataract surgeries were performed annually in the country. However, due to Covid-19 pandemic in past 21/2 years, the number of surgeries declined drastically. Therefore, the number of surgeries got piled up. So there is felt need to launching the programme in a campaign mode to take care of the pending cases.
2. The administrative districts to be the planning and implementation units, and District Collectors to lead the campaign in their respective districts.
3. The district-wise target to be worked out, and every district should aspire to achieve the 'Cataract Backlog Free' status by 2024–25. The districts to plan for self-sufficiency in surgical capacities.
4. Capacities available in the private sector to be taken into account.
5. Cataract surgery packages to be included in AB-PMJAY/ State Insurance Schemes.

The voluntary organizations such as Lions International and its branches, Rotary International and its branches, NSPB India etc. are encouraged to organize eye camps in remote rural and urban areas as per guidelines, with the permission from the state authorities. They have been active in providing eye health education, preventive, rehabilitative and surgical services for control of blindness.

Community health education is a built-in component at all levels of implementation of National Blindness Control Programme. The programme also includes regular eye check-up and provision of vitamin A prophylaxis and service facilities in rural areas.

WHO assistance for prevention of blindness : This includes intra-country fellowships in corneal transplantation, vitreo-retinal surgery, lasers in ophthalmology and paediatric ophthalmology; pilot survey on childhood blindness in Delhi; training in district programme management; study on situational analysis of eye care infrastructure and human resources in India; high quality workshops in eye care for faculty of medical colleges; and developement of plan of action for "Vision 2020 : The Right to Sight" initiative.

Vision 2020 : The Right to Sight

It is a global initiative to reduce avoidable (preventable and curable) blindness by the year 2020. India is also committed to this initiative. The plan of action for the country was developed with following main features :

1. Target diseases are cataract, refractive errors, childhood blindness, corneal blindness, glaucoma, diabetic retinopathy.
2. Human resource development as well as infrastructure and technology development at various levels of health system. The proposed four tier structure includes Centres of Excellence (20), Training Centres (200), Service Centres (2000), and Vision Centres (20,000).

IODINE DEFICIENCY DISORDERS (IDD) PROGRAMME

India commenced a goitre control programme in 1962, based on iodized salt. At the end of three decades, the prevalence of the disease still remained high.

As a result, a major national programme – "The IDD Control Programme" was initiated in which nation-wide, rather than area-specific use of iodized salt is being promoted. It was decided as a national policy to fortify all edible salt in a phased manner by end of 8th Plan. The essential components of a national IDD programme are use of iodized salt in place of common salt, monitoring and surveillance, manpower training and mass communication.

The objectives of the programme are *(1)* :

1. Surveys to assess the magnitude of the Iodine Deficiency Disorders in districts.
2. Supply of iodized salt in place of common salt.
3. Resurveys to assess iodine deficiency disorders and the impact of iodized salt after every 5 years in districts.
4. Laboratory monitoring of iodized salt and urinary iodine excretion.
5. Health education and publicity.

Significant achievements

Consequent upon liberalization of iodized salt production, Salt Commissioner has issued licenses to 824 salt manufacturers out of which 777 units have commenced production. These units have an annual production capacity of 222 lakh metric tonnes of iodized salt.

The production/supply of iodized salt from April 2015 to August 2015 was 26.44 lakh tonnes and 25.12 lakh tonnes.

Notification banning the sale of non-iodized salt for different human consumption in the entire country is already issued under "Food Safety & Standards Act 2006 and Regulations 2011".

For effective implementation of National Iodine Deficiency Disorders Control Programme 34 States/UTs have established Iodine Deficiency Disorders Control Cells in their State Health Directorate.

UNIVERSAL IMMUNIZATION PROGRAMME

Experience with smallpox eradication programme showed the world that immunization was the most powerful and cost-effective weapon against vaccine preventable diseases. In 1974, the WHO launched its "Expanded Programme on Immunization" (EPI) against six, most common, preventable childhood diseases, viz. diphtheria, pertussis (whooping cough), tetanus, polio, tuberculosis and measles. From the beginning of the programme UNICEF has been providing significant support to EPI.

"Expanded" in the WHO definition meant adding more disease controlling antigens of vaccination schedules, extending coverage to all corners of a country and spreading services to reach the less privileged sectors of the society *(40)*.

The primary health care concept as enunciated in the 1978 Alma-Ata Declaration included immunization as one of the strategies for reaching the goal of "Health For All" by the year 2000. While the WHO's programme is called EPI, the UNICEF in 1985 renamed it as "Universal Child Immunization" (UCI). There was absolutely no difference between these two. The goal was the same, i.e., to achieve universal immunization by 1990. EPI is regarded as the instrument of UCI *(42)*.

The first vaccine to be introduced in India was BCG in 1952 as part of the National Tuberculosis Programme. Over the years, various new vaccines have been introduced and many milestones achieved. Table 7 gives a chronological listing of some important milestones in India's immunization programme.

The Government of India launched its EPI in 1978 with the objective of reducing the mortality and morbidity resulting from vaccine-preventable diseases of childhood, and to achieve self-sufficiency in the production of vaccines. Universal Immunization Programme was started in India in 1985. It has two vital components: immunization of pregnant women against tetanus, and immunization of children in their first year of life against the six EPI target diseases. The aim was to achieve 100 per cent coverage of pregnant women with 2 doses of tetanus toxoid (or a booster dose), and at least 85 per cent coverage of infants with 3 doses each of DPT, OPV, one dose of BCG and one dose of measles vaccine by 1990. Universal immunization was first taken up in 30 selected districts and catchment areas of 50 Medical Colleges in November 1985. The programme now covers entire country and practice areas of all the 242 Medical colleges, thus creating a base for wider coverage *(43)*. A "Technology Mission on Vaccination and Immunization of Vulnerable Population, specially Children" was set up to cover all aspects of the immunization activity from research and development to actual delivery of services to the target population *(44)*.

The immunization services are being provided through the existing health care delivery system (i.e., MCH centres, primary health centres and subcentres, hospitals, dispensaries and ICD units). There is no separate cadre of staff for EPI. The recommended immunization schedule is on page 135.

Although the target was "universal" immunization by 1990, in practice, no country, even in the industrialized world, has ever achieved 100 per cent immunization in children. 'Universal' immunization is, therefore, best

TABLE 7

Immunization milestones - India

1978	Expanded programme of immunization BCG,DPT,OPV, typhoid (urban areas)
1983	TT vaccine for pregnant women
1985	Universal Immunization Programme - measles added, typhoid removed. Focus on children less than 1 yr of age
1990	Vitamin-A supplementation
1995	Polio National Immunization Days
1997	VVM introduced on vaccines in UIP
2002	Hep B introduced as pilot in 33 districts and cities of 10 states
2005	• National Rural Health Mission Launched • Auto disable (AD) syringes introduced into UIP
2006	JE vaccine introduced after campaigns in endemic districts
2007–08	Hep B expanded to all districts in 10 states and schedule revised to 4 dose from 3 dose
2010	Measles 2nd dose introduced in RI and MCUP (14 states)
2011	• Hepatitis B universalized and Haemophilus influenza type b introduced as pentavalent in 2 states • Open Vial Policy for vaccines in UIP
2013	• Pentavalent expanded to 9 states • Second dose of JE vaccine
2014	India and South East Asia Region certified POLIO-FREE
2015	• India validated for Maternal and Neonatal Tetanus elimination • Pentavalent expanded to all states • IPV Introduced
2016	• Rotavirus vaccine introduced in 4 states in Phase 1 • tOPV to bOPV Switch. • Switch to fractional IPV (Phased)
2017	• MR Vaccine introduced • PCV (Phased launch) • Use of adrenaline IM by ANM in AEFI (Adverse event following immunization)
2020	Covishield and Covaxin against COVID-19 introduced

Source : *(41)*

interpreted as implying the ideal that no child should be denied immunization against tuberculosis, diphtheria, whooping cough, tetanus, polio and measles. It is, however, generally agreed that when immunization coverage reaches a figure of 80 per cent or more, then disease transmission patterns are so severely disrupted as to provide a degree of protection even for the remaining children who have not been immunized, because of "herd immunity" *(45)*. It is also important that children are immunized during the first year of life and that levels of immunization are sustained so that each new generation is protected.

Significant achievements have been made in India. At the beginning of the programme in 1985–86, vaccine coverage ranged between 29 per cent for BCG and 41 per cent for DPT. By the end of 2021, coverage levels had gone up significantly to about 85 per cent for tetanus toxoid for pregnant women, about 85 per cent for BCG, 85 per cent for DPT 3 doses, 85 per cent for OPV 3 doses, 85 per cent for $HepB_3$, 85 per cent for Hib_3 and 81 per cent for MCV_2. Since then, there is a significant decline in the reported incidence of the vaccine preventable diseases as compared to their incidence in 1987, as shown in Table 8.

TABLE 8
Decline in reported vaccine preventable diseases from year 1987 to 2020

Disease	1987	2020
Poliomyelitis	28,257	0
Diphtheria	12,952	1,989
Pertussis	163,786	19,642
NNT	11,849	5,182
Measles	247,519	7,434

To strengthen routine immunization, Government of India has planned the State Programme Implementation Plan (PIP) part C. It consists of : (a) Support for alternate vaccine delivery from PHC to sub-centre and outreach sessions; (b) Deploying retired manpower to carry out immunization activities in urban slums and underserved areas, where services are deficient; (c) Mobility support to district immunization officer as per state plan for monitoring and supportive supervision; (d) Review meeting at the state level with the districts at 6 monthly intervals; (e) Training of ANM, cold chain handlers, mid-level managers, refrigerator mechanics etc.; (f) Support for mobilization of children to immunization session sites by ASHA, women self-help groups etc.; (g) Printing of immunization cards, monitoring sheet, cold chain chart vaccine inventory charts etc.

In addition, central government is supporting in supplies of auto-disable syringes, downsizing the BCG vial from 20 doses to 10 doses to ensure that BCG vaccine is available in all immunization session sites, strengthening and maintenance of the cold chain system in the states, and supply of vaccines and vaccine van.

PULSE POLIO IMMUNIZATION PROGRAMME

Pulse Polio Immunization Programme was launched in the country in the year 1995. Under this programme children under five years of age are given additional oral polio drops in December and January every year on fixed days. From 1999–2000, house to house vaccination of missed children was also introduced. The NIDs rounds cover approximately 172 million children and SNIDs rounds cover 40–80 million children. In addition, large scale multi-district mop-ups have been conducted *(47)*. As a result only one case of polio was reported in 2011 in the month of January. As on 25th February 2012, India was removed from the list of polio endemic countries, and on 27th March 2014, India was certified as polio-free country. Please see page 242 for more details.

INTRODUCTION OF INACTIVATED POLIO VACCINE (IPV)

The last global case due to WPV type-2 was reported at Aligarh in India in 1999. Most of the global cases due to VDPVs (97%) as well as VAPP (40%) are due to type-2 virus. This necessitates the discontinuation of the use of type-2 component from OPV. Polio Endgame Strategic Plan thus recommends replacing tOPV with bOPV. However, this puts the recent birth cohort at the time of switch at risk of VDPV and wild polio virus type 2 due to silent/ongoing transmission of VDPV type-2 and also to potential leakage of wild polio virus type-2 in case of accidental/intended leakage of the virus from a laboratory. To mitigate this risk, inactivated polio virus vaccine was introduced prior to the tOPV–bOPV switch in April 2016. As part of this Polio Endgame Strategy, India has introduced Inactivated Polio Vaccine (IPV) from 30 November 2015. It is given as fractional IPV of 0.1 ml dose as intradermal injection at 6 and 14 weeks of life *(46)*.

INTRODUCTION OF MEASLES VACCINE SECOND OPPORTUNITY

In order to accelerate the reduction of measles related morbidity and mortality, second opportunity for measles vaccination is being implemented. The National Technical Advisory Group on immunization recommended introduction of 2nd dose of measles vaccine to children between 9 months and 10 years of age through supplementary immunization activity (SIA) for states where evaluated coverage of first dose of measles vaccination is less than 80 per cent. In states, with coverage of measles vaccination more than 80 per cent, the second dose of vaccine will be given through routine immunization at 16–24 months *(1)*.

INTRODUCTION OF PENTAVALENT VACCINE (DPT + Hep B + Hib)

The pentavalent vaccine contains five antigens i.e., hepatitis B, diphtheria, pertusis, tetanus and haemophilus influenza b (Hib) vaccine. Pentavalent vaccine is given at 6th, 10th and 14th weeks as primary dose. The vaccine has replaced DPT and hepatitis B vaccines in the immunization schedule. However, birth dose of hepatitis B and two booster doses of DPT will continue as before *(46)*.

Initially, India introduced pentavalent vaccine in two states – Kerala and Tamil Nadu. Presently it covers the whole country.

INTRODUCTION OF JAPANESE ENCEPHALITIS VACCINE

The programme was introduced in 2006 to cover 104 endemic districts in phased manner, using SA 14-14-2 vaccine, imported from China. Single dose of JE vaccine was given to all children between 1 to 15 years of age through campaigns *(3)*. The JE vaccine is being integrated into routine immunization in the districts where campaign had already been conducted to immunize the new cohort of children by vaccinating with two doses at 9–12 months and 16–24 months *(1)*.

21 high burden districts have been identified in Assam, Uttar Pradesh and West Bengal for adult JE vaccination in the age group of 15–65 years. This will cut down deaths and morbidity due to JE in adults as well *(46)*.

INTRODUCTION OF ROTA VIRUS VACCINE

Rota virus vaccine was introduced in 2016 in Odisha, Himachal Pradesh, Haryana and Andhra Pradesh, and now it covers the whole country. It is given under universal immunization programme as a 3 dose vaccine along with pentavalent 1st, 2nd and 3rd dose *(46)*.

RUBELLA VACCINE

To be initiated as Measles Rubella (MR) campaign targeting 9 months to 15 years of age in a phased manner over a period of three years. Subsequently, the Rubella vaccine will be introduced as MR vaccine as two doses in the place of measles containing vaccine 1 and 2 at 9–12 months and 16–24 months as per NTAGI recommendations *(46)*.

MISSION INDRADHANUSH

The Ministry of Health & Family Welfare has launched "Mission Indradhanush", depicting seven colours of the rainbow, in December 2014, to fully immunize 90 per cent of children who are either unvaccinated or partially vaccinated; those that have not been covered during the rounds of routine immunization for various reasons, by 2020. The target has now been pre-poned to 2018 *(16)*.

Mission Indradhanush has completed six phases (from April 2015 to Dec. 2018) covering 681 districts wherein 3.39 crore children were reached; 81.79 lakh children were immunized; and 87.18 lakh pregnant women were immunized. The first two phases of Mission Indradhanush have led to an increase of 6.7 per cent in full immunization coverage in one year, as compared to 1 per cent in the past. This increase was more in rural areas (7.9 per cent) as compared to urban areas (3.1 per cent), hence shifting the focus of the programme towards urban areas *(11)*.

Intensified Mission Indradhanush: A total of 190 districts/urban areas across 24 states have been identified where intensified mission indradhanush has started. It was launched in Oct 2017. It involves intensive preparation, implementation and integration of sessions into regular immunization microplans. The focus is an urban slum areas and districts with slowest progress and completion of due-list of beneficiaries on the basis of head count surveys. As on 15th Jan, 2018, number of children vaccinated were 49.30 lakh; number of children fully vaccinated was 12.02 lakh; and number of pregnant women vaccinated was 10.05 lakh *(16)*.

MEASLES–RUBELLA (MR) VACCINE

The WHO regional goal for SEAR is measles elimination and rubella/congenital rubella syndrome control by 2020. The MR vaccine is being introduced through campaign, targeting around 41 crore children in the age group of 9 months to 15 years in phased manner (covering 1/3rd of the total population of the country), followed by 2 doses in routine immunization at 9–12 months and 16–24 months, replacing the measles vaccine *(16)*.

MR campaign was launched in February 2017 from 5 States/UTs (Karnataka, Tamil Nadu, Goa, Lakshadweep and Puducherry) where 3.34 crore children were vaccinated against the target of 3.43 crore, with a coverage of 97 per cent. Campaign has completed 33 states and immunized 32.36 crore children (97.04 per cent of the target) *(11)*.

PNEUMOCOCCAL VACCINE (PCV)

PCV was launched in May 2017 for reducing infant mortality and morbidity caused by pneumococcal pneumonia. The vaccine was introduced in Himachal Pradesh, 6 districts of Uttar Pradesh and 17 districts of Bihar, Madhya Pradesh, and Haryana, in 2021 it covers whole country. Till September 2021, around 6.05 crore children were vaccinated *(7)*.

Very frequently queries come up about the vaccines and the vaccination schedule. It is important to have the exact answer to these questions.

Questions about all vaccines *(48)*

Q. If the mother/caregiver permits administration of only one injection during an infant's first visit at 9 months of age, which vaccine should be given ?

A. At 9 months of age, the priority is to give measles vaccine with OPV and Vitamin-A.

Q. Which vaccines can be given to a child between 1–5 years of age, who has never been vaccinated ?

A. The child should be given DPT1, OPV-1, measles and 2 ml of vitamin A solution. It should then be given the second and third doses of DPT and OPV at one month intervals. Measles second dose is also to be given as per the schedule. The booster dose of OPV/DPT can be given at a minimum of 6 months after administering OPV3/DPT3.

Q. Which vaccines can be given to a child between 5–7 years of age, who has never been vaccinated ?

A. The child should be given first, second and third doses of DPT at one month intervals. The booster dose of DPT can be given at a minimum of 6 months after administering DPT3 upto 7 years of age.

Q. Should one re-start with the first dose of a vaccine if a child is brought late for a dose ?

A. Do not start the schedule all over again even if the child is brought late for a dose. Pick up where the schedule was left off. For example: If a child who has received BCG, HepB-1, DPT-1 and OPV-1 at 5 months of age, returns at 11 months of age, vaccinate the child with DPT-2, HepB-2, OPV-2 and measles and do not start from DPT-1, HepB-1 again.

Q. Why it is not advisable to clean the injection site with a spirit swab before vaccination ?

A. This is because some of the live components of the vaccine are killed if they come in contact with spirit.

DPT vaccine

Q. If a child could not receive DPT1, 2, 3 and OPV 1, 2, 3 according to the schedule, upto what age can the vaccine be given ?

A. The DPT vaccine can be given upto 7 years of age and OPV can be given upto 5 years of age. If a child has received previous doses but not completed the schedule, do not restart the schedule and instead administer the remaining doses needed to complete the series.

Q. Why should there be a minimum gap of 4 weeks between two doses of DPT ?

A. This is because decreasing the interval between two doses may not obtain optimal antibody production for protection.

Q. Why give the DPT vaccine in the antero-lateral mid thigh and not the gluteal region ?

A. DPT is given in the antero-lateral mid-thigh and not the gluteal region to prevent damage to the sciatic nerve. Moreover, the vaccine deposited in the fat of gluteal region does not invoke the appropriate immune response.

Q. What should one do if the child is found allergic to DPT or develops encephalopathy after DPT ?

A. A child who is allergic to DPT or develops encephalopathy after DPT should be given the DTaP/DT vaccine instead of DPT for the remaining doses, as it is usually the P (whole cell Pertussis) component of the vaccine which causes the allergy/encephalopathy. It may be purchased with locally available resources.

Q. Why DT is replaced by DPT vaccine for children above 2 years of age ?

A. As pertussis cases were reported in higher age group children and the risk of AEFIs were not found to be more after DPT vaccine as compared to DT vaccine.

Measles vaccine

Q. Why give the measles vaccine only on the right upper arm ?

A. The measles vaccine is given on the right upper arm to maintain uniformity and to help surveyors in verifying the receipt of the vaccine.

Q. If a child has received the measles vaccine before 9 months of age, is it necessary to repeat the vaccine later ?

A. Yes, the measles vaccine needs to be administered, according to the National Immunization Schedule i.e. after the completion of 9 months until 12 months of age and at 16–24 months. If not administered in the ideal age for measles vaccine, it can be administered upto 5 years of age.

Q. What is measles catch-up campaign ?

A. A measles catch-up campaign is a special campaign to vaccinate all children in a wide age group in a state or a district with one dose of measles vaccine. The catch-up campaign dose is given to all children, both immunized and un-immunized, who belong to the target age group of 9 months to 10 years. The goal of a catch-up campaign is to quickly make the population immune from measles and reduce deaths from measles. A catch-up campaign must immunize nearly 100% of target age group children.

Q. Why 2nd dose of measles vaccine is introduced in the National Immunization Programme ?

A. Measles is highly infectious disease causing illness and death due to complications such as diarrhoea, pneumonia or brain infection. One dose of measles vaccine at 9 months of age protects 85% of infants. With 2nd dose the aim is to protect all the children who remain unprotected after first dose.

Q. If a child comes late for the first dose, then can it get the second dose ?

A. All efforts should be made to immunize the children at the right age i.e. first dose at completed 9 months to 12 months and second dose at 16–24 months. However if a child comes late then give two doses of measles vaccine at one month interval until 5 years of age.

Q. If a child received one dose of measles vaccine during an SIA campaign, should it receive the routine dose of measles vaccine ?

A. Yes, the child should receive routine doses of measles vaccine according to the Immunization Schedule irrespective of the measles SIA dose.

BCG vaccine

Q. Why give BCG vaccine only on the left upper arm ?

A. BCG is given on the left upper arm to maintain uniformity and for helping surveyors in verifying the receipt of the vaccine.

Q. Why do we give 0.05 ml dose of BCG to newborns (below 1 month of age) ?

A. This is because the skin of newborns is thin and an intra dermal injection of 0.1 ml may break the skin, to penetrate into the deeper tissue and cause local abscess and enlarged axillary lymph nodes. Dose of 0.05 ml is sufficient to elicit adequate protection.

Q. Why is BCG given only upto one year of age ?

A. Most children acquire natural clinical/sub-clinical tuberculosis infection by the age of one year. This vaccine protects against severe forms of childhood tuberculosis e.g. TB meningitis and miliary disease.

Q. If no scar appears after administering BCG, should one re-vaccinate the child ?

A. There is no need to re-vaccinate the child, even if there is no scar.

OPV

Q. Till what age can a child be given OPV ?

A. OPV can be given to children till 5 years of age.

Q. Can OPV and vitamin A be given together with DPT booster dose ?

A. Yes.

Q. Can an infant be breast-fed immediately after OPV ?

A. Yes.

TT vaccine

Q. If a girl has received all doses of DPT and TT as per the NIS till 16 years of age and she gets pregnant at 20 years, should she get one dose of TT during pregnancy?

A. Give 2 doses of TT during the pregnancy as per the schedule.

Q. Is TT at 10 years and 16 years meant only for girls ?

A. No, it is to be given to both boys and girls.

Q. Can TT be given in the first trimester of pregnancy ?

A. Yes, it should be given as soon as pregnancy is diagnosed.

Hepatitis B vaccine

Q. Up to what age can hepatitis B vaccine be given ?

A. According to the National Immunization Schedule, Hepatitis B vaccine should be given with the first, second and third doses of DPT till one year of age.

Q. Why give the birth dose of hepatitis B vaccine only within 24 hours of birth ?

A. The birth dose of Hepatitis B vaccine is effective in preventing perinatal transmission of Hepatitis B if given within the first 24 hours.

JE vaccine

Q. If a child 16–24 months of age has been immunized with JE vaccine during an SIA, can it receive the JE vaccine again, as part of routine immunization ?

A. No, currently this is a single dose vaccine and should not be repeated.

Q. If a child above 2 years (24 months) of age has not received the JE vaccine through either RI or an SIA, should she/he be given the JE vaccine ?

A. Yes, the child is eligible to receive a dose of the JE vaccine, through RI, till the age of 15 years.

Following are some Do's and Don'ts during immunization sessions *(48)* :

Do's and Don'ts during immunization sessions

Do's	Don'ts
Vaccination schedule	
- It is safe and effective to give BCG, DPT, OPV and Measles vaccines at the same time to a child who has completed 9 months and never been vaccinated. - Give BCG to infants less than 1 year of age (never give BCG to children above 1 year of age). - If a child is brought late for a dose, pick up where the schedule was left off. For example, if a child left with DPT-2 and comes after 3 months give DPT-3.	- Withhold the vaccine in case of illness such as cold, cough, diarrhoea or fever.
Cold chain	
- Check expiry date and VVM label of vaccine vial before immunizing every child. - Keep the vaccines and diluents in a plastic bag/zipper bag in the centre of vaccine carrier with 4 conditioned ice-packs. Make sure that the diluents are also at +2 to +8 centigrade before reconstitution. - Take one ice pack from vaccine carrier and keep reconstituted BCG & Measles vaccines only on the top of the ice pack.	- Leave vaccine carrier in sunlight: this spoils vaccines that are sensitive to heat and light. - Leave the lid open, this can allow heat and light into the carrier, which can spoil vaccine. - Drop or sit on the vaccine carrier: this can damage the carrier. - Carry vaccines in handbag as this can spoil vaccines that are sensitive to heat. - Keep the DPT, DT, TT and Hep. B vaccines on the ice pack during the session.
Vaccine handling and administration	
- Welcome beneficiaries. - Wash hands before conducting the session. - Verify beneficiary's record and age of the child. - Screen for contraindications. - Check label of the vial and expiry date. - Lightly shake the vial of T-Series Vaccine before drawing the dose. - Use a new AD syringe for each injection and new disposable syringe for each reconstitution. - Use correct diluent for reconstitution of vaccine. - Give appropriate vaccine. - Inject vaccine using the correct site and route for the vaccine e.g. Intradermal in left arm for BCG; subcutaneous in right arm for Measles; intramuscular in anterolateral aspect of mid thigh for DPT and Hepatitis B. - Allow dose to self-disperse instead of massaging. - Explain potential adverse events following immunization and what to do. - Discuss with beneficiaries/parents about next visit.	- Use un-sterile syringe or needle for immunization. - Draw air into AD syringes. - Touch any part of the needle. - Recap the needle. - Leave the needle inside the vial. - Ever inject in the buttock, never do that. - Massage the vaccination site after vaccination. - Use reconstituted measles and BCG vaccine after 4hrs and JE after 2 hrs. - Use vaccine with VVM in unusable stage or with expiry date.
Recording and reporting	
- Fully document each immunization in the immunization card, tally sheet and immunization register. Ask parents/guardians to bring the card on next visit. - Retain the counterfoil.	- Turn away beneficiaries for not bringing the card. - Leave any cell blank in immunization card.
Adverse events following immunization (AEFI)	
- In case of serious AEFI refer the patient to appropriate health facility, inform your supervisor immediately – document the type of vaccine(s), batch number, expiry date, and full address of the child. - Report all serious AEFIs to the MOI/C.	- Report minor reaction following vaccination (mild fever of less than three days, redness and pain).
Social mobilization	
- Use vaccination card to remind parents when to return with their child. - Enlist community team like AWW, ASHA, NGOs and other community-based workers to remind parents of the importance of full immunization.	- Leave any community meeting without communicating about immunization session days.

Source : (48)

NATIONAL HEALTH MISSION

The Ministry of Health and Family Welfare is implementing various schemes and programmes and national initiatives to provide universal access to quality health care. The approach is to increase access to the decentralized health system by establishing new infrastructure in deficient areas and by upgrading the infrastructure in existing institutions. As part of the plan process, many different programmes have been brought together under the overarching umbrella of National Health Mission (NHM), with National Rural Health Mission (NRHM) and National Urban Health Mission (NUHM) as its two sub-Missions. The National Health Mission was approved in May 2013. The main programmatic components include health system strengthening in rural and urban areas; Reproductive – Maternal – Newborn – Child and Adolescent Health (RMNCH+A); and control of communicable and non-communicable diseases. An important achievement of NHM has been considerable reduction in out of pocket expense from 72 per cent to 60 per cent *(1)*.

The Government of India has introduced a series of programmes over the past two decades to address maternal and newborn health. The major milestones so far include *(48)*

a. 1992 – Child Survival and Safe Motherhood Programme (CSSM)
b. 1997 – RCH I
c. 2005 – RCH II
d. 2005 – National Rural Health Mission
e. 2013 – RMNCH+A Strategy
f. 2013 – National Health Mission
g. 2014 – India Newborn Action Plan (INAP)
h. 2018 – Ayushman Bharat Programme
i. 2018 – Midwifery Initiative
j. 2018 – RMNACH+N Strategy
k. 2021 – Pradhan Mantri Ayushman Bharat Infrastructure Mission

Under NHM, health interventions/ initiatives are regularly designed and implemented to address the healthcare needs of the country. A list of interventions currently being implemented under NHM to reduce IMR and MMR is given below *(50)* :

- Promotion of institutional deliveries through Janani Suraksha Yojana.
- Capacity building of health care providers in basic and comprehensive obstetric care.
- Operationalization of sub-centres, primary health centres, community health centres and district hospitals for providing 24 × 7 basic and comprehensive obstetric care services.
- Name based web enabled tracking of pregnant women to ensure antenatal, intranatal and postnatal care.
- Mother and child protection card in collaboration with the Ministry of Women and Child Development to monitor service delivery for mothers and children.
- Antenatal, intranatal and postnatal care including iron and folic acid supplementation to pregnant & lactating women for prevention and treatment of anaemia.
- Village health and nutrition days in rural areas as an outreach activity, for provision of maternal and child health services.
- Health and nutrition education to promote dietary diversification, inclusion of iron and folate rich food as well as food items that promote iron absorption.
- Janani Shishu Suraksha Karyakram (JSSK) entitles all pregnant women delivering in public health institutions to absolutely free and no expense delivery including caesarean section. The initiative stipulates free drugs, diagnostics, blood and diet, besides free transport from home to institution, between facilities in case of a referral, and drop back home. Similar entitlements have been put in place for all sick infants accessing public health institutions for treatment.
- To sharpen the focus on the low performing districts, 184 high priority districts have been prioritized for Reproductive Maternal Newborn Child Health+ Adolescent (RMNCH+A) interventions for achieving improved maternal and child health outcomes.
- Emphasis on facility based newborn care at different levels to reduce child morbidity and mortality: Setting up of facilities for care of sick newborn such as Special New Born Care Units (SNCUs), Newborn Stabilization Units (NBSUs) and Newborn Care Corners (NBCCs) at different levels is a thrust area under NHM.
- Capacity building of health care providers: Various trainings are being conducted under NHM to train doctors, nurses and ANMs for essential newborn care, early diagnosis and case management of common ailments of children. These trainings are on Navjaat Shishu Suraksha Karyakram (NSSK), Integrated Management of Neonatal and Childhood Illnesses (IMNCI), Facility Based Newborn Care (FBNC), Infant and Young Child Feeding practices (IYCF), etc.
- India Newborn Action Plan (INAP) has been launched with an aim to reduce neonatal mortality and stillbirths.
- Newer interventions to reduce newborn mortality - vitamin K injection at birth, antenatal corticosteroids for preterm labour, kangaroo mother care and injection gentamicin to young infants in cases of suspected sepsis.
- Home Based New Born Care (HBNC): Home based newborn care through ASHAs has been initiated to improve new born practices at the community level and early detection and referral of sick new born babies.
- Intensified Diarrhoea Control Fortnight (IDCF) to be observed in July-August focusing on ORS and Zinc distribution for management of diarrhoea and feeding practices.
- Integrated Action Plan for Pneumonia and Diarrhoea (IAPPD) launched in four states with highest infant mortality (Uttar Pradesh, Madhya Pradesh, Bihar and Rajasthan).
- Management of malnutrition: Nutritional Rehabilitation Centres (NRCs) have been established for management of severe acute malnutrition in children.
- Appropriate infant and young child feeding practices are being promoted in convergence with Ministry of Woman and Child Development.
- Some programmes for control of communicable and non-communicable diseases are now under NHM.
- Universal Immunization Programme (UIP): Vaccination protects children against many life threatening diseases such as tuberculosis, diptheria, pertussis, polio, tetanus, hepatitis B, Hib, measles and Japanese encephalitis in endemic districts. Infants are thus immunized against nine vaccine preventable diseases every year. The Government of India supports the vaccine programme by supply of vaccines and syringes, cold chain equipment and provision of operational costs.
- Mission Indradhanush has been launched in 528 high focus districts to reach more than 2.5 crore children who are either unvaccinated or partially vaccinated; those that have not been covered during the rounds of routine immunization for various reasons. They will be fully immunized against eight life-threatening but vaccine preventable diseases which include diphtheria, whooping cough, tetanus, polio, tuberculosis, measles, haemophilus influenza type B and hepatitis-B. In addition, vaccination against japanese encephalitis will be provided in selected districts/states of the country. Pregnant women will also be immunized against tetanus.
- Mother and Child Tracking System (MCTS): A name based mother and child tracking system has been put in place which is web based to ensure registration and tracking of all pregnant women and new born babies so that provision of regular and complete services to them can be ensured.
- Rashtriya Bal Swasthya Karyakram (RBSK) for health screening and early intervention services has been launched to provide comprehensive care to all the

children in the age group of 0–18 years in the community. The purpose of these services is to improve the overall quality of life of children through early detection of birth defects, diseases, deficiencies, development delays including disability.

Under National Iron Plus Initiative (NIPI), through life cycle approach, age and dose specific IFA supplementation programme is being implemented for the prevention of anaemia among the vulnerable age groups like under-5 children, children of 6–10 years of age group, adolescents, pregnant and lactating women and women in reproductive age along with treatment of anaemic children and pregnant mothers at health facilities.

Comprehensive primary health care through Ayushman Bharat - Health and Wellness Centres (now renamed as Ayushman Arogya Mandir) : Launched in 2018, Ayushman Bharat works a paradigm shift to move from sectoral and selective approach of health service delivery to a comprehensive range of health care service. Ayushman Bharat aims to cover preventive, promotive and ambulatory care at primary, secondary and tertiary level by adopting a continuum of care approach. Since the screening, prevention and management of chronic illnesses including non-communicable diseases, tuberculosis, and leprosy have been introduced at these centres, training skill upgradation of the primary health team in all functional Health and Wellness Centres on NCDs and use of information technology application is being done. For details, please refer to page 558.

The targets of National Health Mission

The National Health Mission was launched with targets as shown in Table 9.

TABLE 9
Targets for NHM

Targets (2012–17)
Reduce IMR to 25/1000 live births.
Reduce MMR to 1/1000 live births.
Reduce TFR to 2.1
Reduce annual incidence and mortality from tuberculosis by half.
Reduce prevalence of leprosy to <1/10,000 population and incidence to zero in all districts.
Annual malaria incidence to be <1/1000.
Less than 1% microfilaria prevalence in all districts.
Kala-azar elimination by 2015, <1 case per 10,000 population in all blocks.

NATIONAL URBAN HEALTH MISSION

NUHM seeks to improve the health status of the urban population particularly slum dwellers and other vulnerable section by facilitating their access to quality health care. NUHM would cover all state capitals, district headquarters and about 779 other cities/towns with a population of 50,000 and above (as per census 2011) in a phased manner. Cities and towns below 50,000 population will be covered by NRHM. The NUHM will focus on *(40)* :

1. Urban poor population living in listed and unlisted slums;
2. All other vulnerable population such as homeless, rag-pickers, street children, rickshaw pullers, construction and brick and lime-kiln workers, sex workers and other temporary migrants;
3. Public health thrust on sanitation, clean drinking water, vector control etc.; and
4. Strengthening public health capacity of urban local bodies.

The treatment of seven metropolitan cities, viz., Mumbai, New Delhi, Chennai, Kolkata, Hyderabad, Bengaluru and Ahmedabad will be different. These cities are expected to manage NUHM through their Municipal Corporation directly.

The NUHM will provide flexibility to the states to choose which model suits the needs and capacities of the states to best address the healthcare needs of the urban poor. Models will be decided through community led action. All the services delivered under the urban health delivery system through the urban PHCs and urban CHCs will be universal in nature, whereas the outreach services will be targetted to the target group (slum dwellers and other vulnerable groups). Outreach services will be provided through the Female Health Workers (FHWs), essentially ANMs with an induction training of three to six months, who will be placed at the Urban PHCs. These ANMs will report at the U-PHC and then move to their respective areas for outreach services on designated days. On other days, they will conduct immunization and ANC clinics etc. at the U-PHC itself.

The NUHM would encourage the effective participation of the community in planning and management of health care services. It would promote a community health volunteer – Accredited Social Health Activist (ASHA) or Link Worker (LW) in urban poor settlement (one ASHA for 1000–2500 urban poor population covering about 200 to 500 households); ensure the participation by creation of community based institutions like Mahila Arogya Samiti (MAS) (50–100 households) and Rogi Kalyan Samitis. However, the states will have the flexibility to either engage ASHA or entrust her responsibilities to MAS. In that case, the incentives accruing to ASHA would accrue to MAS *(51)*. The NUHM would provide annual grant of Rs. 5000/- to MAS every year.

Essential services to be rendered by the ASHA may be as follows *(51)* :

(i) Active promoter of good health practices and enjoying community support.

(ii) Facilitate awareness on essential RCH services, sexuality, gender equality, age at marriage/pregnancy; motivation on contraception adoption, medical termination of pregnancy, sterilization, spacing methods. Early registration of pregnancies, pregnancy care, clean and safe delivery, nutritional care during pregnancy, identification of danger signs during pregnancy; counselling on immunization, ANC, PNC etc., act as a depot holder for essential provisions like oral re-hydration therapy (ORS), Iron Folic Acid Tablet (IFA), chloroquine, oral pills and condoms, etc.; identification of target beneficiaries and support the ANM in conducting regular monthly outreach sessions and tracking service coverage.

(iii) Facilitate access to health related services available at the Anganwadi/Primary Urban Health Centres/Urban Local Body (ULBs) and other services being provided by the ULB/State/Central Government.

(iv) Formation and promotion of Mahila Arogya Samitis in her community.

(v) Arrange escort/accompany pregnant women and children requiring treatment to the nearest Urban Primary Health Centre, secondary/tertiary level health care facility.

(vi) Reinforcement of community action for immunization, prevention of water borne and other communicable diseases like TB (DOTS), Malaria, Chikungunya and Japanese Encephalitis.

(vii) Carrying out preventive and promotive health activities with AWW/Mahila Arogya Samiti.

(viii) Maintenance of necessary information and records about births and deaths, immunization, antenatal services in her assigned locality as also about any unusual health problem or disease outbreak in the slum, and share it with the ANM in charge of the area.

In return for the services rendered, she would receive a performance based incentive. For this purpose a revolving fund would be kept with the ANM at the U-PHC (in the PHC account), which would be replenished from time to time.

The urban health care facilities are as shown in Fig. 12.

Components of NUHM

Urban Primary Health Centre

Functional for a population of around approximately 30,000–50,000, the U-PHC may be located preferably within a slum or near a slum within half a kilometer radius, catering to a slum population of approximately 25,000–30,000, with provision for OPD. The cities, based upon the local situation may establish a U-PHC for 75,000 for areas with very high density and can also establish one for around 5,000–10,000, slum population for isolated slum clusters.

At the U-PHC level services provided will include OPD (consultation), basic laboratory diagnosis, drug/ contraceptive dispensing, apart from distribution of health education material delivering RCH services and counselling for all communicable and non-communicable diseases. In order to ensure access to the urban slum population at convenient timings, the U-PHC may provide services from 12 noon to 8 pm. It will not include in-patient care. The staff pattern will be as shown in Fig. 12.

As a part of Ayushman Bharat, the existing UPHCs are being strengthened as Ayushman Arogya Mandirs (AAM) to provide preventive, promotive and curative services in cities closer to the communities. Also below UPHC, Urban-Ayushman Arogya Mandirs (U-AAM) on the population of 15,000–20,000 have been approved under 15th Finance Commission Health grants and PM-ABHIM. These U-AAMs are linked to the nearest UPHCs for administrative, financial, reporting, and supervisory purpose. The remaining cities/ towns are covered under National Rural Health Mission (NRHM) *(9)*.

Referral unit

Urban Community Health Centre (U-CHC) may be set up as a satellite hospital for every 4–5 U-PHCs. The U-CHC would cater to a population of 2,50,000. It would provide in-patient services and would be a 30–50 bedded facility. U-CHCs would be set up in cities with a population of above 5 lakhs, wherever required. These facilities would be in addition to the existing facilities (SDH/DH) to cater to the urban population in the locality.

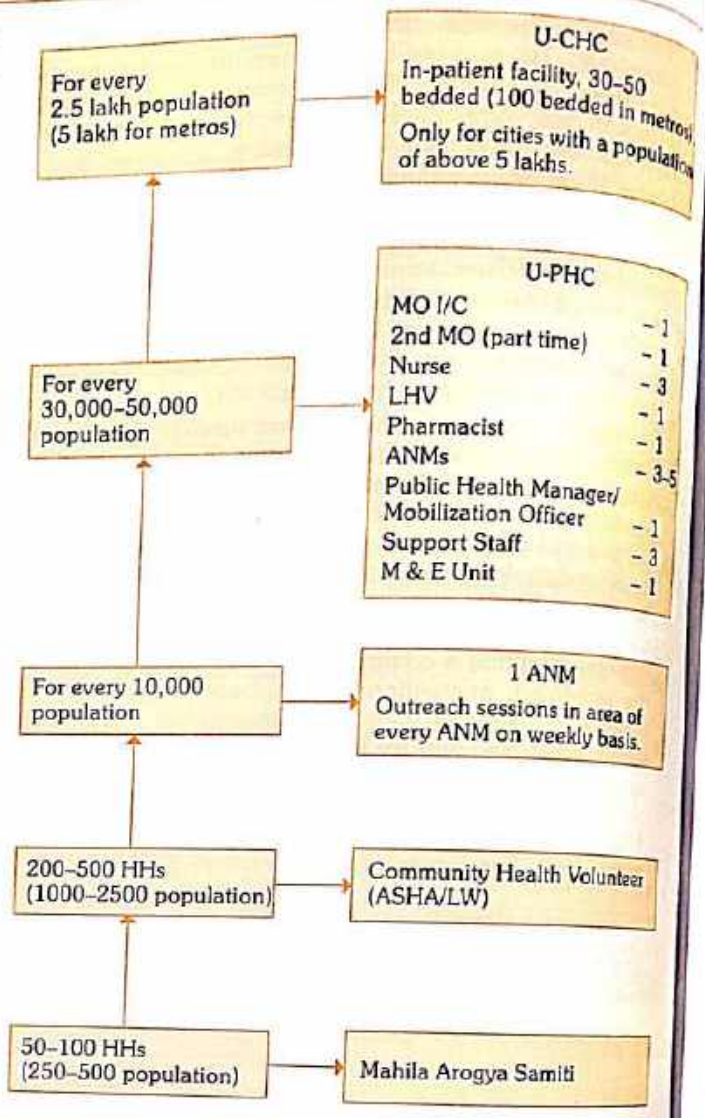


FIG. 12
Urban Health Care Facilities

Source : *(52)*

For the metro cities, the U-CHCs may be established for every 5 lakh population with 100 beds.

For setting up the U-CHCs the Central Government would provide only a one time capital cost, and the recurrent costs including the salary of the staff would be borne by the respective state governments.

The U-CHC would provide medical care, minor surgical facilities and facilities for institutional delivery.

Referral linkages

Existing hospitals, including ULB maternity homes, state government hospitals and medical colleges, apart from private hospitals will be empanelled/accredited to act as referral points for different types of healthcare services like maternal health, child health, diabetes, trauma care, orthopaedic complications, dental surgeries, mental health, critical illness, deafness control, cancer management, tobacco counselling/cessation, critical illness, surgical cases etc.

The services provided at different levels are as shown in Table 10 *(52)*.

TABLE 10

Service norm by level of care facility

Services	Community (Outreach)	Levels of service delivery First point of service delivery (U-PHC)	Referral Centre - U-CHC (specialist services)
A. *Essential Health Services*			
A1. Maternal health	Registration, ANC, identification of danger signs, referral for institutional delivery, follow-up counselling and behaviour promotion.	ANC, PNC, initial management of complicated delivery cases and referral, management of regular maternal health conditions, referral of complicated cases.	Delivery (normal and complicated) management of complicated gynae/maternal health condition, hospitalization and surgical interventions, including blood transfusion.
A2. Family welfare	Counselling, distribution of OCP/CC, referral for sterilization, follow-up of contraceptive related complications.	Distribution of OCP/CC, IUD Insertion, referral for sterilization, management of contraceptive related complications.	Sterilization operations, fertility treatment.
A3. Child health and nutrition	Immunization, identification of danger signs, referral, follow-up, distribution of ORS, paediatric cotrimoxazole, post-natal visits/counselling for newborn care.	Diagnosis and treatment of childhood illnesses, referral of acute cases/chronic illness, identification and referral of neonatal sickness.	Management of complicated paediatric/neo-natal cases, hospitalization, surgical interventions, blood transfusion.
A4. RTI/STI (including HIV/AIDS)	referral, community level follow-up for ensuring adherence to treatment regime of cases undergoing treatment.	Symptomatic diagnosis and primary treatment and referral of complicated cases.	Management of complicated cases, hospitalization (if needed).
A5. Nutrition deficiency disorders	Height/weight measurement, Hb testing, distribution of IFA tablets promotion of iodized salt, nutrition supplements to children and pregnant/lactating women, promotion of breast feeding.	Diagnosis and treatment of seriously deficient patients, referral of acute deficiency cases.	Management of acute deficiency cases, hospitalization, treatment and rehabilitation of severe under-nutrition.
A6. Vector-borne diseases	Slide collection, testing using RDKs, DDT, counselling for practices for vector control and protection.	Diagnosis and treatment, referral of terminally ill cases.	Management of terminally ill cases, hospitalization.
A7. Mental health	–	Initial screening and referral	Psychiatric, neurological services.
A7.1 Oral health	–	Diagnosis and referral	Management of complicated cases.
A7.2 Hearing Impairment/ deafness	–	–	Management of complicated cases.
A8. Chest infections (TB/asthma)	Symptomatic search and referral, ensuring adherence to DOTS, other treatment.	Diagnosis and treatment, referral of complicated cases.	Management of complicated cases.
A9. Cardiovascular diseases	BP measurement, symptomatic search and referral, follow-up of under-treatment patients.	Diagnosis and treatment and referral during specialist visits.	Management of emergency cases, hospitalization and surgical interventions (if needed).
A10. Diabetes	Blood/urine sugar test (using disposable kit), symptomatic search and referral.	Diagnosis and treatment, referral of complicated cases.	Management of complicated cases, hospitalization (if needed).
A11. Cancer	Symptomatic search and referral, follow-up of under-treatment patients.	Identification and referral, follow-up of under-treatment patients.	Diagnosis and treatment, hospitalization (if and when needed).
A12. Trauma care (burns and injuries)	First aid and referral	First-aid/emergency resuscitation, documentation for medicolegal case (if applicable) and referral.	Case management and hospitalization, physiotherapy and rehabilitation.
A13. Other surgical interventions	Not applicable	Identification and referral	Hospitalization and surgical intervention.
B. *Other support services like IEC, BCC, counselling and personal and social hygiene.*			

City level indicators

The city level indicators are as shown in Table 11.

TABLE 11
Process and input indicators in NUHM

Indicator
Community Processes
1. Number of Mahila Arogya Samiti (MAS) formed.*
2. Number of MAS members trained.*
3. Number of Accredited Social Health Activists (ASHAs). selected and trained.
Health Systems
4. Number of ANMs recruited *
5. No. of Special Outreach health camps organized in the slum/HFAs.*
6. No. of UHNDs organized in the slums and vulnerable areas.*
7. Number of UPHCs made operational.*
8. Number of UCHCs made operational.*
9. No. of RKS created at UPHC and UCHC.*
10. OPD attendance in the UPHCs.
11. No. of deliveries conducted in public health facilities.
RCH Services
12. ANC early registration in first trimester.
13. Number of women who had ANC check-up in their first trimester of pregnancy.
14. TT (2nd dose) coverage among pregnant women.
15. No. of children fully immunized (through public health facilities).
16. No. of Severely Acute Malnourished (SAM) children identified and referred for treatment.
Communicable Diseases
17. No. of malaria cases detected through blood examination.
18. No. of TB cases identified through chest symptomatic.
19. No. of suspected TB cases referred for sputum examination.
20. No. of MDR-TB cases put under DOTS-plus.
Non-communicable Diseases
21. No. of diabetes cases screened in the city.
22. No. of cancer cases screened in the city.
23. No. of hypertension cases screened in the city.

* Year 2013–14 being the baseline year, the indicators for these NUHM components would be zero. For other indicators, the figure for 2012–13 will be the base line.

Source : *(51)*

Impact level targets of NUHM are as follows :

1. Reduce IMR by 40% (in urban areas) – National Urban IMR down to 20 per 1000 live births by 2017.
   40% reduction in U5MR and IMR.
   Achieve universal immunization in all urban areas.
2. Reduce MMR by 50%.
   50% reduction in MMR (among urban population of the state/country).
   100% ANC coverage (in urban areas).
3. Achieve universal access to reproductive health including 100% institutional delivery.
4. Achieve replacement level fertility (TFR 2.1).
5. Achieve all targets of disease control programmes.

Source : *(52)*

NATIONAL RURAL HEALTH MISSION

Recognizing the importance of health in the process of economic and social development and to improve the quality of life of its citizens, the government of India launched "National Rural Health Mission" (NRHM) on 5th April, 2005 for a period of 7 years (2005–2012) and recently extended upto year 2017. The mission seeks to improve rural health care delivery system. It is operational in the whole country with special focus on 18 states viz. 8 Empowered Action Group states (Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Uttar Pradesh, Uttarakhand, Orissa and Rajasthan), 8 North East states (Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura), Himachal Pradesh and Jammu and Kashmir. By making necessary changes in the basic health care delivery system the mission adopts a synergic approach by relating health to determinants of good health viz. of nutrition, sanitation, hygiene and safe drinking water. It also brings the Indian system of medicine (AYUSH) to the mainstream of health care *(53)*.

The main aim of NRHM is to provide accessible, affordable, accountable, effective and reliable primary health care, and bridging the gap in rural health care through creation of a cadre of Accredited Social Health Activist (ASHA). The mission is an instrument to integrate multiple vertical programmes alongwith their funds at the district level. The programmes integrated into NRHM are existing programmes of health and family welfare including RCH II; national vector borne disease control programmes against malaria, filaria, kala-azar, dengue fever/DHF and Japanese encephalitis; national leprosy eradication programme; revised national tuberculosis control programme; national programme for control of blindness; iodine deficiency disorder control programme, and integrated disease surveillance project *(53)*.

PLAN OF ACTION TO STRENGTHEN INFRASTRUCTURE

1. Creation of a cadre of Accredited Social Health Activist (ASHA).
2. Strengthening sub-centres by : (a) Supply of essential drugs both allopathic and AYUSH to the sub-centre; (b) In case of additional outlay, provision of multipurpose worker (male)/additional ANMs wherever needed, sanction of new sub-centres and upgrading existing sub-centres; and (c) Strengthening sub-centres with untied funds of Rs. 10,000 per annum in all 18 states.
3. Strengthening Primary Health Centres : Mission aims at strengthening PHCs for quality preventive, promotive, curative, supervisory and outreach services through (a) Adequate and regular supply of essential drugs and equipment to PHCs (including supply of auto-disabled syringes for immunization); (b) Provision of 24 hours service in at least 50 per cent PHCs by including an AYUSH practitioner; (c) Following standard treatment guidelines; (d) Upgradation of all the PHCs for 24 hours referral service and provision of second doctor at PHC level (one male and one female) on the basis of felt need; strengthening the ongoing communicable disease control programmes and new programmes for control of non-communicable diseases.
4. Strengthening Community Health Centres for First Referral care by (a) Operating all existing CHCs (30–50 beds) as 24 hours first referral units, including

posting of an anaesthetist; (b) Codification of new "Indian Public Health Standards" (Refer to chapter 20 for more details) by setting up norms for infrastructure, staff, equipment, management etc. for CHCs; (c) Promotion of *"Rogi Kalyan Samiti"* for hospital management; and (d) Developing standards of services and costs in hospital care.

The NRHM infrastructure is as shown in Fig. 13.

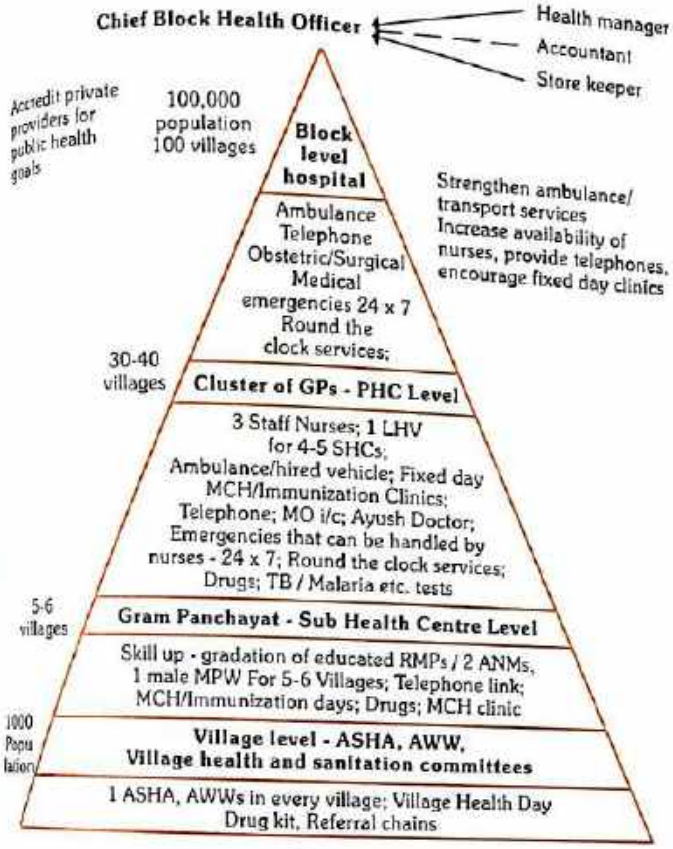


Fig. 13
The NRHM infrastructure

District is the core unit of planning, budgeting and implementation of the programme. All vertical health and family welfare programmes at district level have merged into one common "District Health Mission" and at state level into "State Health Mission". There is provision of a *"mobile medical unit"* at district level for improved outreach services.

Since almost 75 per cent of health services are being currently provided by the private sector, it is contemplated that involving the private sector as part of the RCH initiatives will provide more effective health care delivery system. Thus setting up of *"Public Private Partnership"* (PPP)" is to help to make the RCH II programme better, and ensure availability of preventive and curative reproductive and child health services to the community.

Major initiatives under NRHM

1. *Selection of ASHA:* ASHA must be the resident of the village – a woman (married / widow / divorced) preferably in the age group of 25 to 45 years with formal education up to eighth class, having communication skills and leadership qualities. Adequate representation from the disadvantaged population group will ensure to serve such groups better.

The general norm of selection is *one* ASHA *for 1000 population*. In tribal, hilly and desert areas the norm could be relaxed to one ASHA per habitation.

2. *Rogi Kalyan Samiti (Patient Welfare Committee/Hospital Management Society:* It is a simple yet effective management structure. This committee is a registered society whose members act as trustees to manage the affairs of the hospital and is responsible for upkeep of the facilities and ensure provision of better facilities to the patients in the hospital. Financial assistance is provided to these Committees through untied fund to undertake activities for patient welfare. 33,757 Rogi Kalyan Samities (RKS) have been set up involving the community members in almost all District Hospitals (DHs), Sub-District Hospitals (SDHs), Community Health Centres (CHCs) and Primary Health Centres (PHCs) till June 2021.

3. *The untied grants to sub-centres (SCs):* The SCs are far better equipped now with blood pressure measuring equipment, haemoglobin (Hb) measuring equipment, stethoscope, weighing machine etc. This has facilitated provision of quality antenatal care and other health care services.

4. *The Village Health Sanitation and Nutrition Committee (VHSNC):* It is an important tool of community empowerment and participation at the grassroots level. The VHSNC reflects the aspirations of the local community, especially the poor households and children by year 2021, 5.55 lakh VHSNCs have been set up across the country.

5. *Janani Suraksha Yojana (JSY):* aims to reduce maternal mortality among pregnant women by encouraging them to deliver in government health facilities. Under the scheme, cash assistance is provided to eligible pregnant women for giving birth in a government health facility. Since the inception of NRHM, 8.55 crore women have benefited under this scheme. For details please refer to page 532.

6. *Janani Shishu Suraksha Karyakarm (JSSK):* Launched on 1st June, 2011, JSSK entitles all pregnant women delivering in public health institutions to absolutely free and no expense delivery, including caesarean section. This marks a shift to an entitlement based approach. Please refer to page 533 for details.

7. *National Mobile Medical Units (NMMUs):* Support has been provided by 1,634 MMUs under NHM in the country. To increase visibility, awareness and accountability, all Mobile Medical Units have been repositioned as "National Mobile Medical Unit Service" with universal colour and design.

8. *National Ambulance Services:* NRHM has supported free ambulance services to provide patients transport in every nook and corner of the country connected with a toll free number. Currently, 35 states/UTs have the facility where people can dial 108 or 102 telephone number for calling an ambulance. Dial 108 is predominantly an emergency response system, primarily designed to attend to patients of critical care, trauma and accident victims etc. Dial 102 services essentially consist of basic patient transport aimed to cater the needs of pregnant women and children though other categories are also taking benefit and are not excluded. Janani Shishu Suraksha Karyakram (JSSK) entitlements e.g. free transport from home to facility, inter facility transfer in case of referral and drop back for mother and children are the key focus of 102 service. This service can be accessed through a toll free call to a Call Centre *(7)*.

Presently as on June 2021, 11,879 Dial-108 and 10,716 Dial-102/104 Emergency Response Service Vehicles are operational under NRHM, besides 5859 empaneled vehicles are for transportation of patients, particularly pregnant women and sick infants from home to public health facilities and back *(7)*.

9. *Web enabled Mother and Child Tracking System (MCTS)*: The name-based tracking of pregnant women and children has been initiated under NRHM with an intention to track every pregnant woman, infant and child upto the age of three years by name, for ensuring delivery of services like timely antenatal care, institutional delivery and postnatal care for the mother, and immunization and other related services for the child. The MCTs is to be fully updated for regular and effective monitoring of service delivery, including tracking and monitoring of severely anaemic women, low birth weight babies and sick neonates. In the long run, it could be used for tracking the health status of the girl child and school health services. A more recent initiative is to link MCTS with AADHAR in order to track subsidies to eligible women *(54)*.

New initiatives *(47)*

The following are the major decisions of Mission Steering Group; taken since 2011 :

1. Home delivery of contraceptives (condoms, oral contraceptive pills, emergency contraceptive pills) by ASHA;
2. Conducting District Level Household Survey (DLHS) – 4 in 26 States/UTs where the Annual Health Survey (AHS) is not being done;
3. Modifications in the scheme for promotion of menstrual hygiene covering 152 districts and nearly 1.5 crores of adolescent girls in 20 states;
4. Differential financial approach for comprehensive health care by which allocation of Untied Funds and Rogi Kalyan Samiti grants will be made based on the case load and services provided by the health facility;
5. Involving ASHA in Home Based Newborn Care;
6. Revision in the criterion of allocation of funds to the states under NRHM based on the performance of the states against the monitorable targets and implementation of specific reform agenda in the health sector;
7. Expansion of Village Health and Sanitation Committees to include nutrition in its mandate and renaming it as Village Health, Sanitation and Nutrition Committee (VHSNC);
8. Partial modification of the centrally sponsored scheme for development of AYUSH hospitals and dispensaries for mainstreaming of AYUSH under NRHM;
9. Rashtriya Bal Swasthya Karyakram (RBSK) : This initiative was launched in February 2013 and provides for Child Health Screening and Early Intervention Services through early detection and management of 4 Ds i.e., Defects at birth, Diseases, Deficiencies, Development delays including disability. For details please refer to page 540;
10. Rashtriya Kishor Swasthya Karyakram (RKSK) : This is a new initiative, launched in January 2014 to reach out to 253 million adolescents in the country in their own spaces and introduces peer-led interventions at the community level, supported by augmentation of facility based services. This initiative broadens the focus of the adolescent health programme beyond reproductive and sexual health and brings in focus on life skills, nutrition, injuries and violence (including gender based violence), non-communicable diseases, mental health and substance misuse *(1)*;
11. Mother and Child Health Wings (MCH Wings) : 100/50/30 bedded Maternal and Child Health (MCH) Wings have been sanctioned in public health facilities with high bed occupancy to cater to the increased demand for services. More than 42,000 additional beds have been sanctioned across 667 health facilities across 18 states *(9)*;
12. Free drugs and free diagnostic service;
13. National Iron+ Initiative is another new initiative launched in 2013, to prevent and control iron deficiency anaemia, a grave public health challenge in India. Besides pregnant women and lactating mothers, it aims to provide IFA supplementation for children, adolescents and women in reproductive age group. Weekly Iron and Folic Acid Supplementation (WIFS) for adolescents is an important strategy under this initiative. WIFS (for 10-19 years age) has already been rolled out in 32 states and UTs under the National Iron Plus Initiative. WIFS covered around 5.57 crore beneficiaries in the year 2023-24 *(9)*;
14. Reproductive, Maternal, Newborn, Child and Adolescent Health Services (RMNCH+A) : A continuum of care approach has now been adopted under NRHM with the articulation of strategic approach to Reproductive Maternal, Newborn, Child and Adolescent Health (RMNCH+A) in India. This approach brings focus on adolescents as a critical life stage and linkages between child survival, maternal health and family planning efforts. It aims to strengthen the referral linkages between community and facility based health services and between the various levels of health system itself. Please refer to page 541 for details;
15. Delivery Points (DPs) : Health facilities that have a high demand for services and performance above a certain benchmark have been identified as "Delivery Points" with the objective of providing comprehensive reproductive, maternal, newborn, child and adolescent health services (RMNCH+A) at these facilities. Funds have been allocated to strengthen these DPs in terms of infrastructure, human resource, drugs, equipments etc. Around 27,000 health facilities have been identified as "Delivery Points" for focussed support under NRHM;
16. Universal Health Coverage (UHC) : Moving towards Universal Health Coverage (UHC) is a key goal of the 12th Five Year Plan. The National Health Mission is the primary vehicle to move towards this goal;
17. Comprehensive primary healthcare : Nine areas for action to make primary healthcare comprehensive and universal are proposed. They are *(46)* :
    a. Strengthen institutional structures and organization of primary healthcare services;
    b. Improve access to technologies, drugs and diagnostics for comprehensive primary healthcare;
    c. Increase utilization of Information, Communication and Technology (ICT) – empowering patients and providers;
    d. Promote continuity of care - making care patient centric;
    e. Enhance quality of care;
    f. Focus on social determinants of health;
    g. Emphasize community participation and address equity concerns in health;
    h. Develop a human resource policy to support primary healthcare;
    i. Strengthen governance including financing, partnerships and accountability; and
    j. States are also offered support through the PIPs of the NHM to strengthen existing sub-centres.
18. Kilkari : Kilkari is an Interactive Voice Response (IVR) based mobile service that delivers time- sensitive audio messages (voice call) about pregnancy and child health directly to the mobile phones of pregnant women, mothers of young children and their families. The service covers the critical time period– where the most maternal/infant deaths occur from the 4th month of pregnancy until the child is one year

old. Families which subscribe to the service receive one pre-recorded system generated call per week. Each call will be 2 minutes in length and serve as reminders for what the family should be doing that week depending on woman's stage of pregnancy or the child's age. Kilkari services will be available to states in regional dialect too *(46)*;

19. Launch of Nationwide anti-TB drug resistance survey: Drug resistance survey for 13 anti-tuberculosis drugs was launched to estimate the burden of MDR-TB within the community. It is the biggest ever such survey in the world; and

20. Kala- azar elimination plan: Kala- azar elimination plan for Uttar Pradesh, Bihar, West Bengal and Jharkhand was launched. It includes active search, new drug regimen, coordinated indoor residual spray and use of non-invasive diagnostic kit.

21. ANMOL: ANMOL is a tablet-based application which helps ANMs in carrying out their day to day work efficiently and effectively by entering and updating service records of beneficiaries on real time basis, provides them with readily available information. It was launched on 7th April, 2016, and is operational in 24 States/UTs. It is being used by more than 97,883 ANMs since its launch *(7)*.

Comprehensive Primary Health Care (CPHC) through Ayushman Arogya Mandirs (AAMS) erstwhile Ayushman Bharat Health and Wellness Centres : Launched in 2018, Ayushman Bharat (AB) marks a paradigm shift to move from sectoral and selective approach of health service delivery to a comprehensive range of health care service. Ayushman Bharat aims to holistically address health (covering prevention, promotion and ambulatory care), at primary, secondary and tertiary level by adopting a continuum of care approach *(9)*.

Ayushman bhav campaign *(9)*

Ayushman bhav campaign was launched by Hon'ble President of India on 13th September, 2023. Ayushman bhav campaign is envisaged to saturate selected health care services in every village/ town in line with the commitment of Hon'ble Prime Minister to ensure reach to the last mile and enable access to health care services to everyone in the society. 'Ayushman Bhav' campaign involves a set of interventions that include following :

1. 'Ayushman - Apke Dwar 3.0' includes achieving Ayushman card saturation at the individual level, printing and distributing Ayushman cards to field level workers for further delivery, and launching a nationwide Ayushman card delivery campaign. The campaign involves collaboration with health, Panchayati Raj, and rural development departments, seeking the support of ASHA, Front Line Workers (FLWs), and Self-Help Groups.
2. Ayushman Bhav - HWCs health melas organized at Ayushman Arogya Mandir.

REPRODUCTIVE AND CHILD HEALTH PROGRAMME

Reproductive and child health approach has been defined as "people have the ability to reproduce and regulate their fertility, women are able to go through pregnancy and child birth safely, the outcome of pregnancies is successful in terms of maternal and infant survival and well being, and couples are able to have sexual relations, free of fear of pregnancy and of contracting disease" *(55)*.

The concept is in keeping with the evolution of an integrated approach to the programme aimed at improving the health status of young women and young children which has been going on in the country namely family welfare programme, universal immunization programme, oral rehydration therapy, child survival and safe motherhood programme and acute respiratory infection control etc. It is obviously sensible that integrated RCH programme would help in reducing the cost inputs to some extent because overlapping of expenditure would not be necessary and integrated implementation would optimise outcomes at field level.

The RCH phase–I programme incorporated the components relating child survival and safe motherhood and included two additional components, one relating to sexually transmitted disease (STD) and other relating to reproductive tract infection (RTI).

The RCH programme was based on a differential approach. Inputs in all the districts were not kept uniform. While the care components was same for all districts, the weaker districts got more support and sophisticated facilities were proposed for relatively advanced districts. On the basis of crude birth rate and female literacy rate, all the districts were divided into three categories. Category A having 58 districts, category B having 184 districts and category C having 265 districts. All the districts were covered in a phased manner over a period of three years. The programme was formally launched on 15th October 1997.

RCH phase–I interventions at district level were as follows :

Interventions in all districts

- Child Survival interventions i.e. immunization, Vitamin A (to prevent blindness), oral rehydration therapy and prevention of deaths due to pneumonia.
- Safe Motherhood interventions e.g. antenatal check up, immunization for tetanus, safe delivery, anaemia control programme.
- Implementation of Target Free Approach.
- High quality training at all levels.
- IEC activities.
- Specially designed RCH package for urban slums and tribal areas.
- District sub-projects under Local Capacity Enhancement.
- RTI/STD Clinics at District Hospitals (where not available)
- Facility for safe abortions at PHCs by providing equipment, contractual doctors etc.
- Enhanced community participation through Panchayats, Women's Groups and NGOs.
- Adolescent health and reproductive hygiene.

Interventions in selected States/Distts.

- Screening and treatment of RTI/STD at sub-divisional level.
- Emergency obstetric care at selected FRUs by providing drugs.
- Essential obstetric care by providing drugs and PHN/ Staff Nurse at PHCs.
- Additional ANM at sub-centres in the weak districts for ensuring MCH care.
- Improved delivery services and emergency care by providing equipment kits, IUD insertions and ANM kits at sub-centres.
- Facility of referral transport for pregnant women during emergency to the nearest referral centre through Panchayat in weak districts.

The major interventions under RCH – Phase I

Essential obstetric care (56)

Essential obstetric care intends to provide the basic maternity services to all pregnant women through (1) early registration of pregnancy (within 12–16 weeks). (2) provision of minimum three antenatal check ups by ANM or medical officer to monitor progress of the pregnancy and to detect any risk/complication so that appropriate care including referral could be taken in time. (3) provision of safe delivery at home or in an institution, and (4) provision of three postnatal check ups to monitor the postnatal recovery and to detect complications.

Emergency obstetric care

Complications associated with pregnancy are not always predictable, hence, emergency obstetric care is an important intervention to prevent maternal morbidity and mortality. Under the CSSM programme 1748 Referral Units were identified and supported with equipment kit E to kit P. Under the RCH programme the FRUs were strengthened through supply of emergency obstetric kit, equipment kit and provision of skilled manpower on contract basis etc. Traditional Birth Attendant still plays an important role during deliveries in our society.

24-Hour delivery services at PHCs/CHCs

To promote institutional deliveries, provision has been made to give additional honorarium to the staff to encourage round the clock delivery facilities at health centres.

Medical Termination of Pregnancy

MTP is a reproductive health measure that enables a woman to opt out of an unwanted or unintended pregnancy in certain specified circumstances without endangering her life, through MTP Act 1971. The aim is to reduce maternal morbidity and mortality from unsafe abortions. The assistance from the Central Government is in the form of training of manpower, supply of MTP equipment and provision for engaging doctors trained in MTP to visit PHCs on fixed dates to perform MTP.

Control of reproductive tract infections (RTI) and sexually transmitted diseases (STD)

Under the RCH programme, the component of RTI/STD control is linked to HIV and AIDS control. It has been planned and implemented in close collaboration with National AIDS Control Organization (NACO). NACO provides assistance for setting up RTI/STD clinics upto the district level. The assistance from the Central Government is in the form of training of the manpower and drug kits including disposable equipment. Each district is assisted by two laboratory technicians on contract basis for testing blood, urine and RTI/STD tests.

Immunization

The Universal Immunization Programme (UIP) became a part of CSSM programme in 1992, RCH programme in 1997, and currently of National Health Mission.

Essential newborn care

The primary goal of essential newborn care is to reduce perinatal and neonatal mortality. The main components are resuscitation of newborn with asphyxia, prevention of hypothermia, prevention of infection, exclusive breast feeding and referral of sick newborn. The strategies are to train medical and other health personnel in essential newborn care, provide basic facilities for care of low birth weight and sick new borns in FRU and district hospitals etc.

Diarrhoeal disease control

In the districts not implementing Integrated Management of Neonatal and Childhood Illness, the vertical programme for control of diarrhoeal disease will continue. India is the first country in the world to introduce the low osmolarity Oral Rehydration Solution. Zinc is to be used as an adjunct to ORS for the management of diarrhoea. Addition of Zinc would result in reduction of the number and severity of episodes and the duration of diarrhoea. De-worming guidelines have been formulated. The incidence of diarrhoea is reduced by provision of safe drinking water.

Acute respiratory disease control

The standard case management of ARI and prevention of deaths due to pneumonia is now an integral part of RCH programme. Peripheral health workers are being trained to recognize and treat pneumonia. Cotrimoxazole is being supplied to the health workers through the drug kit.

Prevention and control of vitamin A deficiency in children

It is estimated that large number of children suffer from sub-clinical deficiency of vitamin A. Under the programme, doses of vitamin A are given to all children under 5 years of age. The first dose (1 lakh units) is given at nine months of age along with measles vaccination. The second dose (2 lakh units) is given after 9 months. Subsequent doses (2 lakh units each) are given at six months intervals upto 5 years of age *(3)*. All cases of severe malnutrition to be given one additional dose of vitamin A.

Prevention and control of anaemia in children

Iron deficiency anaemia is widely prevalent in young children. To manage anaemia, the policy has been revised. Infants from the age of 6 months onwards upto the age of 5 years are to receive iron supplements in liquid formulation in doses of 20 mg elemental iron and 100 mcg folic acid per day for 100 days in a year. Children 6 to 10 years of age will receive iron in the dose of 30 mg elemental iron and 250 mcg folic acid for 100 days in a year. Children above this age group would receive iron supplement in the adult dose *(3)*.

Training of dais

A scheme for training of dais was initiated during 2001–02. The scheme is being implemented in 156 districts in 18 states/UTs of the country. The districts have been selected on the basis of the safe delivery rates being less than 30 per cent. The scheme was extended to all the districts of EAG states. The aim was to train at least one Dai in every village, with the objective of making deliveries safe.

Empowered Action Group (EAG)

An Empowered Action Group has been constituted in the Ministry of Health and Family Welfare, with Union Minister for Health and Family Welfare as chairman on 20th March 2001. As 55 per cent of the increase in the population of India is anticipated in the states of Uttar Pradesh, Bihar, Madhya Pradesh, Rajasthan, Odisha, Chhattisgarh, Jharkhand and Uttarakhand, these states are perceived to be most deficient in critical socio–demographic indices. Through EAG, these states will get focussed attention for different health and family welfare programmes.

District Surveys

There is no regular source of data to indicate the reproductive health status of women. The RCH programme conducts district based rapid household survey to assess the reproductive health status of women. The key indicators are :

a. Percentage of pregnant women with full ANC;
b. Percentage of institutional deliveries and home deliveries;
c. Percentage of home deliveries by trained birth attendant;
d. Current contraceptive prevalence rate;
e. Percentage of children fully immunized;
f. Percentage of unmet need for family planning; and
g. Percentage of household reported visits by health worker in previous 3 months.

RCH – PHASE II

RCH-phase II began from 1st April, 2005. The focus of the programme is to reduce maternal and child morbidity and mortality with emphasis on rural health care.

The major strategies under the second phase of RCH are *(57)* :

- *Essential obstetric care*
  a. Institutional delivery.
  b. Skilled attendance at delivery.
- *Emergency obstetric care*
  a. Operationalizing First Referral Units.
  b. Operationalizing PHCs and CHCs for round the clock delivery services.
- *Strengthening referral system*

The Government of India has given some broad guidelines and strategies for achieving the reduction in maternal mortality rate and infant mortality rate. The initiatives which have been planned are :

Essential obstetric care

a. Institutional delivery - To promote institutional delivery in RCH Phase II, it was envisaged that fifty percent of the PHCs and all the CHCs would be made operational as 24-hour delivery centres, in a phased manner, by the year 2010. These centres would be responsible for providing basic emergency obstetric care and essential newborn care and basic newborn resuscitation services round the clock. The experience of RCH phase-I indicates that giving incentive to health workers for providing round the clock services did not function well in most of the states. On the contrary there is the experience from government of Andhra Pradesh and Tamil Nadu, where round the clock delivery and new born care services could be ensured by providing 3 to 4 staff nurses/ANM at the PHCs.

b. Skilled attendance at delivery - It is now recognized globally that the countries which have been successful in bringing down maternal mortality are the ones where the provision of skilled attendance at every birth and its linkage with appropriate referral services for complicated cases have been ensured. The WHO has also emphasized that skilled attendance at every birth is essential to reduce the maternal mortality in any country. Guidelines for normal delivery and management of obstetric complications at PHC/CHC for medical officers and for ANC and skilled attendance at birth for ANM/LHVs have been formulated and disseminated to the states.

c. The policy decisions : ANMs / LHVs / SNs have now been permitted to use drugs in specific emergency situations to reduce maternal mortality. They have also been permitted to carry out certain emergency interventions when the life of the mother is at stake.

Emergency obstetric care

Operationalization of FRUs and skilled attendance at birth are the two activities which go hand in hand. In view of this, simultaneous steps have been taken to ensure tackling obstetric emergencies. It has been decided that all the First Referral Units be made operational for providing emergency and essential obstetric care during the second phase of RCH.The minimum services to be provided by a fully functional FRU are *(58)* :

1. 24 hours delivery services including normal and assisted deliveries;
2. Emergency obstetric care including surgical interventions like caesarean sections;
3. New-born care;
4. Emergency care of sick children;
5. Full range of family planning services including laproscopic services;
6. Safe abortion services;
7. Treatment of STI/RTI;
8. Blood storage facility;
9. Essential laboratory services; and
10. Referral (transport) services.

There are three critical determinants of a facility being 'declared' as a FRU. They are : availability of surgical interventions, new-born care and blood storage facility on a 24 hours basis.

To be able to perform the full range of FRU function, a health facility must have the following facilities : (a) A minimum bed strength of 20–30. However, in difficult areas, as the North–East states and the underserved areas of EAG states, this could initially be relaxed to 10–12 beds; (b) A fully functional operation theatre; (c) A fully functional labour room; (d) An area earmarked and equipped for new-born care in the labour room, and in the ward; (e) A functional laboratory; (f) Blood storage facility; (g) 24 hour water supply and electricity supply; and (h) Arrangements for waste disposal; and (i) Ambulance facility.

Strengthening referral system

During RCH phase–I, funds were given to the Panchayat for providing assitance to poor people in the case of obstetric emergencies. Feedback from the states indicate that there was no active involvement of Panchayats in running the scheme. Based on these experiences different states have proposed different modes of referral linkage in RCH Phase II. Some of them have indicated to involve local self help groups, NGOs and women groups, whereas few others have indicated to outsource it.

New initiatives

1. Training of MBBS doctors in life saving anaesthetic skills for emergency obstetric care : Provision of adequate and timely emergency obstetric care (EmOC) has been recognized as the most important intervention for saving lives of pregnant women who may develop complications

during pregnancy or childbirth. The operationalisation of First Referral Unit at sub-district/CHC level for providing EmOC to pregnant women is a crucial strategy of RCH-II, which needs focussed attention. The training of MBBS doctors will be undertaken for only such numbers who are required for the functioning of FRUs and CHCs, and shall be limited to the requirement of tackling emergency obstetric situations only. It is **not** the replacement of the specialist anaesthetist. Government of India is also introducing training of MBBS doctors in obstetric management skills. Federation of Obstetric and Gynaecology Society of India has prepared a training plan for 16 weeks in all obstetric management skills, including caesarean section operation.

2. Setting up of blood storage centres at FRUs according to government of India guidelines.

JANANI SURAKSHA YOJANA

The National Maternity Benefit scheme has been modified into a new scheme called *Janani Suraksha Yojana* (JSY). It was launched on 12th April, 2005. The objectives of the scheme are – reducing maternal mortality and neonatal mortality through encouraging delivery at health institutions, and focusing at institutional care among women in below poverty line families.

The salient features of *Janani Suraksha Yojana* are as follows *(16)* :

a. It is a 100 per cent centrally sponsored scheme;

b. Under National Rural Health Mission, it integrates the benefit of cash assistance with institutional care during antenatal, delivery and immediate post-partum care; This benefit will be given to all women, both rural and urban, belonging to below poverty line household. However, with a view to give special focus in 10 low performing states (states having low institutional delivery rate), namely Uttar Pradesh, Uttarakhand, Madhya Pradesh, Jharkhand, Bihar, Rajasthan, Chhattisgarh, Odisha, Assam and Jammu & Kashmir, the benefit will be extended upto the third child if the mother, of her own accord, chooses to undergo sterilization in the health facility where she delivered, immediately after delivery. The other states are called high performing states. The Accredited Social Health Activist (ASHA) would work as a link health worker between the poor pregnant women and public sector health insitution in the low performing states. ASHA would be responsible for making available institutional antenatal as well as postnatal care. She would also be responsible for escorting the pregnant women to the health centre. The scale of assistance under the scheme from 2012-13 would be as follows :

	Rural Area			Urban Area		
Category	Mother's package	ASHA's package*	Total Rs.	Mother's package	ASHA's package**	Total Rs.
LPS	1400	600	2000	1000	400	1400
HPS	700	600	1300	600	400	1000

LPS : Low performing states, HPS : High performing states

* ASHA incentive of Rs. 600/- in rural areas includes Rs. 300/- for ANC component and Rs. 300/- for accompanying pregnant woman for institutional delivery.

** ASHA incentive of Rs. 400/- in urban area includes Rs. 200/- for ANC component and Rs. 200/- for accompanying pregnant woman for institutional delivery.

Source : *(7)*

The eligibility of cash assistance is as follows *(7)*

1. *In low performing states (LPS)* : All women, including those from SC and ST families, delivering in government health centres like sub-centre, primary health centre, community health centre, first referral unit, general wards of district and state hospitals or accredited private institutions.
2. *In high performing states (HPS)* : Below poverty line women, and the SC and ST pregnant women delivering in Govt. health centres or accredited private institutes.

The limitation of cash assistance for institutional delivery is as follows :

1. In low performing states : All births, delivered in health centre, government or accredited private health institutions will get the benefit.
2. In high performing states the benefit is only upto 2 live births.

ASHA package is available in all low performing states, North-East states and in tribal districts of all states and UTs. In rural areas it includes the following components : (a) Cash assistance for referral transport for pregnant women to go to the nearest health centre for delivery (should not be less than Rs. 250/-); (b) Cash incentive : This should not be less than Rs. 200/- per delivery. ASHA should get her money after her post-natal visit to the beneficiary, and when the child has been immunized for BCG; and (c) Balance amount to be paid to ASHA in lieu of her services rendered by her. The payment should be made at the hospital/health institution itself.

The Yojana subsidizes the cost of caesarean section and for management of obstetric complications, upto Rs. 1500 per delivery to the government institutions, where government specialists are not in position.

In low performing and high performing states, all below poverty line pregnant women preferring to deliver at home, are entitled to cash assistance of Rs. 500 per delivery, regardless of age and number of children *(1)*.

Direct benefit transfer under JSY: Payments under the JSY are being made through direct benefit transfer mode. Under this initiative, eligible pregnant women are entitled to get JSY benefit directly into their Aadhar linked bank account/electronic fund transfer *(16)*.

The year 2006–07 was declared as the year for institutional deliveries. During the year scope of the scheme was extended to the urban areas of high performing states and restriction of age and birth order were removed in the low performing states. The benefits of the scheme was also extended to all women belonging to SC/ST families for institutional deliveries.

During the year 2022–23, about 100.41 lakh pregnant women were benefitted from the scheme *(9)*.

Vandemataram scheme

This is a voluntary scheme wherein any obstetric and gynaec specialist, maternity home, nursing home, lady doctor/MBBS doctor can volunteer themselves for providing safe motherhood services. The enrolled doctors will display 'Vandemataram logo' at their clinic. Iron and Folic Acid tablets, oral pills, TT injections etc. will be provided by the respective District Medical Officers to the 'Vandemataram doctors/ clinics' for free distribution to beneficiaries. The cases needing special care and treatment can be referred to the government hospitals, who have been advised to take due care of the patients coming with Vandemataram cards.

Safe abortion services

In India, abortion is a major cause of maternal mortality and morbidity and accounts for nearly 8.9 per cent maternal deaths. Majority of abortions take place outside authorized health services and/or by unauthorized and unskilled persons. Whether spontaneous or induced, abortion is a matter of concern as it may lead to complications. Under RCH phase II following facilities are provided :

a. *Medical method of abortion* : Termination of early pregnancy with two drugs - Mifepristone (RU 486) followed by Misoprostol. They are considered safe under supervision, with appropriate counselling. Currently its use in India is recommended upto 7 weeks (49 days) of amenorrhoea in a facility with provision for safe abortion services and blood transfusion. Termination of pregnancy with RU 486 and Misoprostol is offered to women under the preview of the MTP Act, 1971.

b. *Manual Vacuum Aspiration (MVA)* : The department of family welfare has introduced Manual Vacuum Aspiration (MVA) technique in the family welfare programme. Manual Vacuum Aspiration is a safe and simple technique for termination of early pregnancy, makes it feasible to be used in primary health centres or comparable facilities, thereby increasing access to safe abortion services. The project of introducing the MVA technique has been piloted in coordination with FOGSI, WHO and respective state governments before being accepted for implementation by the ministry of health and family welfare.

Village Health and Nutrition Day

Organizing Village Health and Nutrition Day once a month at anganwadi centre to provide antenatal/post-partum care for pregnant women, promote institutional delivery, health education, immunization, family planning and nutrition services etc.

Maternal death review

Maternal death review as a strategy has been spelt out clearly in the RCH-II. Maternal death audit, both facility and community based, is an important strategy to improve the quality of obstetric care and reduce maternal mortality and morbidity. Guidelines and tools for initiating maternal death review have been formulated *(3)*.

Pregnancy tracking

The link between pregnancy-related care and maternal mortality is well established. RCH-II stresses the need for universal screening of pregnant women and providing essential and emergency obstetric care. Focussed antenatal care, birth preparedness and complication readiness, skilled attendance at birth, care within the first seven days etc. are the factors that can reduce the maternal mortality *(3)*.

JANANI-SHISHU SURAKSHA KARYAKRAM (JSSK)

Government of India launched the Janani-Shishu Suraksha Karyakram (JSSK) on 1st June 2011, a new national initiative, to make available better health facilities for women and child. The new initiatives provide the following facilities to the pregnant women *(59)* :

- All pregnant women delivering in public health institutions to have absolutely free and no expense delivery, including caesarean section. The entitlements include free drugs and consumables, free diet upto 3 days during normal delivery and upto 7 days for C-section, free diagnostics, and free blood wherever required. This initiative would also provide for free transport from home to institution, between facilities in case of a referral and drop back home. Similar entitlements have been put in place for all sick newborns accessing public health institutions for treatment till 30 days after birth. The scheme has now been extended to cover the complications during ANC, PNC and also sick infants.
- The scheme is estimated to benefit more than 12 million pregnant women who access government health facilities for their delivery. Moreover, it will motivate those who still choose to deliver at their homes to opt for institutional deliveries.

PRADHAN MANTRI SURAKSHIT MATRITVA ABHIYAN (PMSMA)

The Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA) has been launched by the Ministry in June, 2016. Under PMSMA, all pregnant women in the country are provided fixed day, free of cost assured and quality antenatal care. As part of the campaign, a minimum package of antenatal care services (including investigations and drugs) is being provided to the beneficiaries on the 9th day of every month. The Abhiyan also involves private sector's health care providers as volunteers to provide specialist care in government facilities. About 2.88 crore ANC check-ups were conducted by about 6,000 volunteers in more than 17,000 government facilities. Also, more than 23.60 lakh high risk pregnancy cases were identified across the country *(9)*.

SUMAN (Surakshit Matritva Aashwasan)

Ministry has launched a new initiative namely "SUMAN-Surakshit Matritva Aashwasan" on 10th October 2019 with an aim to provide assured, dignified, respectful and quality healthcare at no cost and zero tolerance for denial of services for every woman and newborn visiting the public health facility in order to end all preventable maternal and newborn deaths and morbidities and provide a positive birthing experience.

The expected outcome of this new initiative is "Zero preventable maternal and newborn deaths and high quality of maternity care delivered with dignity and respect" *(11)*.

LAQSHYA PROGRAMME (11)

MOHFW launched "LaQshya program" to improve quality of care in labour room and maternity OTs in public health facilities in 2017. The LaQshya programme is evidence based approach to improve quality of maternal and newborn care and provide respectful care, particularly during the intrapartum and postpartum periods, which are the most vulnerable periods for a woman and contribute to a significant proportion of maternal deaths.

Its implementation involves improving infrastructure upgradation, ensuring availability of essential equipment, providing adequate human resources, capacity building of health care workers, and adherence to clinical guidelines and improving quality processes in labour room and maternity OT.

LaQshya program is being implemented at District Hospital (DH), Sub district Hospital (SDH), high case load Community Health Centre (CHC) and First Referral Units (FRUs), and medical colleges. 2,445 public health facilities including 193 medical colleges have been identified under LaQshya. Out of these, 441 labour rooms and 392 OTs have achieved state certification. National certification for LaQshya has been achieved by 447 labour rooms and 365 OTs till Dec. 2021 *(7)*.

Regional trainings of trainers have been completed for all States/UTs across country to build a critical mass of trainers who took this training cascade further. State orientation and baseline assessment have been conducted for all State/UTs. Based on the gaps, the States have prepared gap closure plan. Onsite mentoring is being conducted in 24 identified medical colleges to accelerate process of certification in medical colleges. LaQshya portal has been finalized and operationalized. Data upload on LaQshya portal has been initiated to aid digitization of all LaQshya related data, readily available results and visualization through dashboard.

ANAEMIA MUKT BHARAT PROGRAMME (AMB) (7)

In 2018, Anaemia Mukt Bharat strategy was launched to achieve the envisaged target of 3% reduction in anaemia prevalence every year under the POSHAN Abhiyaan. The strategy recommends 6 × 6 × 6 strategy to reduce anaemia prevalence (nutritional and non-nutritional) in six age groups namely pre-school children (6–59 months), children (5–9 years), adolescent girls and boys (10–19 years), pregnant women, lactating women and in women of reproductive age group (15–49 years) in programme mode through life cycle approach.

The six interventions under Anaemia Mukt Bharat strategy are prophylactic iron folic acid supplementation, periodic deworming, intensified year-round behaviour change communication campaign including delayed cord clamping, testing and treatment of anaemia using digital methods and point of care treatment, mandatory provision of iron folic acid fortified foods in public health programmes and addressing non-nutritional causes of anaemia in endemic pockets, with special focus on malaria, haemoglobinopathies and fluorosis. The six institutional mechanisms are inter-ministerial coordination, national Anemia Mukt Bharat unit, national centre of excellence and advanced research on anaemia control, convergence with other ministries, strengthening supply chain and logistics, Anaemia Mukt Bharat dashboard and digital portal-one-stop shop for anaemia.

To address anaemia in children, bi-weekly IFA supplements are provided to children aged 6-59 months through ASHAs and Weekly IFA supplements to children of 5–10 years and adolescents 10–19 years of age. 180 doses of IFA supplements are also being provided to pregnant and lactating women during ANC and PNC period, respectively. Bi-annual Vitamin-A supplementation is being done for all children below five years of age. During FY 2021–22 (till September, 2021), the achievements under IFA supplementation is as follows :

a. 2 crore children of age group 6–59 months were provided 8–10 doses of Iron Folic Acid (IFA) Syrup every month.
b. 1.9 crore children of age group 5–9 years were provided 4–5 IFA Pink tablets every month.
c. 3 crore children of age group 10–19 years were provided 4–5 IFA Blue tablets every month.
d. 1.3 crore pregnant women and 0.6 crore lactating women were provided 180 IFA Red tablets during ANC and PNC respectively.

MOTHER'S ABSOLUTE AFFECTION (MAA) PROGRAMME :

Mother's Absolute Affection (MAA) programme focuses on promotion of optimum Infant and Young Child Feeding (IYCF) practices including early initiation of breastfeeding within one hour, exclusive breastfeeding up to six months, age appropriate and adequate complementary feeding after six months and continuation of breastfeeding for two years and beyond through capacity building of frontline health workers and comprehensive IEC campaigns. As per NFHS-5 (2019–21), only 41.8 per cent newborns initiated on breastfeed within one hour of birth while, 63.7 per cent children breastfed exclusively till 6 months of age (7).

MIDWIFERY INITIATIVE :

The Government of India has taken a landmark policy decision to roll out midwifery services in the country in order to improve the quality of care and ensure respectful care to pregnant women and newborns. The initiative was launched in December 2018.

The initiative aims to create a cadre of Nurse Practitioners in Midwifery (NPMs) who are skilled in accordance to competencies prescribed by the International Confederation of Midwives (ICM) and are knowledgeable and capable of providing compassionate women-centred, reproductive, maternal and newborn health care services. In order to create a cadre of Nurse Practitioner Midwives, eighteen months training would be provided to GNM/BSc nurses having 2 years experience in conducting deliveries. Training Curriculum would be based on the 'Essential Competencies for Midwifery Practice' defined by International Confederation of Midwife. Midwifery practices intend to minimise unnecessary medical interventions and promote physiological birthing by adoption of alternate birthing positions during child birth (7).

15 National Midwifery Training Centres are located in the country. They are as follows : Telangana (2), one each in Madhya Pradesh, Gujarat, Assam, Maharashtra, Uttar Pradesh, Rajasthan, West Bengal, Tamil Nadu, Karnataka, Delhi, Punjab, Jammu & Kashmir and Andhra Pradesh (7).

Release of Scope of Practice : In July 2021, GoI released a "Scope of Practice document for Midwifery Educators (ME) and Nurse Practitioner Midwife (NPM)" in collaboration with the Indian Nursing Council (INC). It acts as a guiding document for their education, regulation and ongoing professional development.

Newer interventions to reduce newborn mortality have also been implemented, including Vitamin-K injection at birth, Antenatal corticosteroids in preterm labour, Kangaroo Mother Care and empowering ANMs to provide Injection Gentamycin to young infants for possible serious bacterial infection.

Social Awareness and Actions to Neutralize Pneumonia Successfully (SAANS) : SAANS (Social Awareness and Actions to Neutralize Pneumonia Successfully) Initiative was launched on 16th November 2019 to accelerate action to reduce deaths due to Childhood Pneumonia. SAANS Campaign rolled out in the States/ UTs from 12th November 2021–28th February 2022 with aims of accelerating action against Childhood Pneumonia by generating awareness around protect, prevent and treatment aspects of Childhood Pneumonia and to enhance early identification and care seeking behaviours among parents and caregivers (7).

Child health components

The strategy for child health care, aims to reduce under-five child mortality through interventions at every level of service delivery and through improved child care practices and child nutrition.

Nutritional rehabilitation centres (NRCs)

Severe acute malnutrition is an important contributing factor for most deaths among children suffering from

common childhood illness such as diarrhoea and pneumonia. Deaths among these malnourished children are preventable, provided timely and appropriate actions are taken. NRCs are facility based units providing medical and nutritional care to Severe Acute Malnutrition (SAM) children under 5 years of age who have medical complications. In addition special focus is on improving the skill of mothers on child care and feeding practices so that the child continues to get adequate care at home. The services provided at the NRCs include *(1)*:

a. 24 hours care and monitoring of the child;
b. Treatment of medical complication;
c. Therapeutic feeding;
d. Sensory stimulation and emotional care;
e. Counselling on appropriate feed, care and hygiene;
f. Demonstration and practice-by-doing on the preparation of energy dense food using locally available, culturally acceptable and affordable food items;
g. Social assessment of the family to identify and address contributory factors; and
h. Follow up of the children discharged from the facility.

Management of medical complications in a child with SAM at health facility *(60)*

A majority of the deaths in hospitals occur within 24 hours of admission, many of these deaths can be prevented if the critically ill children are identified as soon as they are admitted and their treatment is started immediately.

Triage

Triage is the process of rapidly screening sick children. Triage must be done for all paediatric patients coming to the health facility. The first step is to check every child for emergency signs and provide emergency treatment as necessary, keeping in mind the ABCD steps : Airway, Breathing, Circulation, Coma, Convulsion and Dehydration.

Assessment at admission *(60)*

The child should be assessed by taking detailed history and should be examined for the signs of under-nutrition.

Principles of hospital-based management *(60)*

The principles of management of SAM are based on 3 phases: stabilization phase, transition phase and rehabilitative phase.

Stabilization Phase: Children with SAM without an adequate appetite and/or a major medical complication are stabilized in an in-patient facility. This phase usually lasts for 1–2 days. The feeding formula used during this phase is Starter diet which promotes recovery of normal metabolic function and nutrition – electrolytic balance. All children must be carefully monitored for signs of overfeeding or over hydration in this phase.

Transition Phase: This phase is the subsequent part of the stabilization phase and usually lasts for 2–3 days. The transition phase is intended to ensure that the child is clinically stable and can tolerate an increased energy and protein intake. The child moves to the Transition Phase from Stabilization Phase when there is:

- At least the beginning of loss of oedema.
  AND
- Return of appetite.
  AND
- No nasogastric tube, infusions, no severe medical problems.
  AND
- Is alert and active?

The ONLY difference in management of the child in transition phase is the change in type of diet. There is gradual transition from starter diet to catch up diet. The quantity of catch up diet given is equal to the quantity of starter diet given in stabilization phase.

Rehabilitation Phase: Once children with SAM have recovered their appetite and received treatment for medical complications they enter Rehabilitation Phase. The aim is to promote rapid weight gain, stimulate emotional and physical development and prepare the child for normal feeding at home. The child progresses from transition phase to rehabilitation phase when:

- S/he has reasonable appetite; finishes > 90% of the feed that is given, without a significant pause.
- Major reduction or loss of oedema.
- No other medical problem.

Micronutrient supplementation *(60)*

Vitamin A: Give Vitamin A in a single dose to all SAM children unless there is evidence that child has received vitamin A dose in last 1 month.

Take a history concerning	On examination, look for
• Recent intake of food and fluids • Usual diet (before the current illness) • Breastfeeding • Duration and frequency of diarrhoea and vomiting • Type of diarrhoea (watery/ bloody) • Chronic cough • Loss of appetite • Family circumstances (to understand the child's social background). • Contact with tuberculosis • Recent contact with measles • Known or suspected HIV infection • Immunizations	• Anthropometry– weight, height/length, mid arm circumference. • Oedema. • Pulse, heart rate, respiratory rate. • Signs of dehydration. • Shock (cold hands, slow capillary refill, weak and rapid pulse). • Palmar pallor. • Eye signs of vitamin A deficiency: – Dry conjunctiva or cornea, – Bitot's spots – Corneal ulceration – Keratomalacia • Localizing signs of infection, including ear and throat infections, skin infection or pneumonia. • Mouth ulcers. • Skin changes of kwashiorkor: – Hypo or hyperpigmentation – Desquamation – Ulceration (spreading over limbs, thighs, genitalia, groin, and behind the ears). – Exudative lesions (resembling severe burns) often with secondary infection (including candida).

Recommended oral dose of Vitamin A according to child's age:

Age	Vit. A dose
<6 months	50,000 IU
6–12 months or if weight <8 kg	100,000 IU
>12 months	200,000 IU

- Give same dose on Day 1, 2 and 14 if there is clinical evidence of vitamin A deficiency.
- Children more than twelve months but having weight less than 8 kg should be given 100,000 IU orally irrespective of age.
- Oral treatment with vitamin A is preferred. For oral administration, an oil-based formulation is preferred.
- IM treatment should be used in children with severe anorexia, oedematous malnutrition, or septic shock. Only water based formulations and half of oral dose should be used.

Other micronutrients should be given daily for at least 2 weeks:

- *Multivitamin supplement* (should contain vitamin A, C, D, E and B_{12} and not just vitamin B complex): Twice recommended daily allowance.
- *Folic acid:* 5 mg on day 1, then 1 mg/day.
- *Elemental Zinc:* 2 mg/kg/day.
- *Copper:* 0.3 mg/kg/day (if separate preparation not available use commercial preparation containing copper).
- *Iron:* Start daily iron supplementation after two days of the child being on catch up diet. Give elemental iron in the dose of 3 mg/kg/day in two divided doses, preferably between meals. (DO not give iron in stabilization phase).

Follow-up of children discharged from NRC

Close collaboration and information sharing between NRC and community based care (at PHC, sub-centre and AWC) are essential. The list of SAM children discharged from NRC should be shared with area specific ANM and ICDS supervisors. These children should be enrolled in the anganwadi centre and given supplementary food as per the guidelines. The AWWs should prioritize these children for home visits, every week in the first 4 weeks and then once in 2 weeks till the child is discharged from the programme. During the home visits, AWW should observe feeding and provide appropriate counselling and support to the mother. These children should be weighed every week at AWC. The ASHA and AWW should ensure that these children should return for the scheduled follow-ups at the NRC *(60)*. Incentive of Rs 50 can be provided to ASHA for accompanying the child to the NRC and motivating the mother to stay at NRC for atleast 7 days till the child is stabilized and has started to eat. Additional incentive of Rs 50 may be given for each follow-up visit by the child, upto a maximum of three visits *(60)*.

Presently 1075 NRCs are functional across 17 states/ UTs *(11)*.

Integrated Management of Neonatal and Childhood Illness (IMNCI)

IMNCI strategy is one of the main intervention under the RCH II/ NRHM. The strategy encompasses a range of interventions to prevent and manage the commonest major childhood diseases.

Pre-service IMNCI

Pre-service IMNCI has been accepted as an important strategy to scale up IMNCI by Govt. of India and is being included in the curriculum of medical colleges of the country. This will help in providing the much needed trained IMNCI manpower in the public and private sector.

Facility based IMNCI (F–IMNCI)

F–IMNCI is the integration of the facility based care package with the IMNCI package, to empower the health personnel with the skill to manage new born and childhood illness at the community level as well as the health facility. It focusses on providing appropriate in-patient management of the major causes of neonatal and childhood mortality such as asphyxia, sepsis, low birth weight, pneumonia, diarrhoea, malaria, meningitis and severe malnutrition in children. The master trainers at state and district level are paediatricians from tertiary hospitals and medical colleges *(3)*.

Facility based newborn care (61)

As more sick children are screened at the peripheries through IMNCI and referred to the health facilities, care of the sick newborn and child at CHCs, FRUs, district hospitals and medical college hospitals assumes priority. Equipping the facilities to provide the requisite level of care and simultaneously enhancing the capacity of the medical officers at these facilities to handle such cases thus becomes important. The setting up of SNCUs at district hospitals, stabilization units at CHCs, and newborn care corners at all facilities offering delivery facilities, is thus a key activity *(3)*.

In the overall planning of facility based care it is important to understand the level of care that is provided at the various facility levels. The newborn care facilities at different levels are as follows :

Health facility	All newborns at birth	Sick newborns
Primary health centre (PHC)/Sub-centre (SC) identified as MCH level I	Newborn care corner in labor rooms.	Prompt referral
Community health centre (CHC)/First referral unit (FRU) identified as MCH Level II	Newborn care corner in labor rooms and in operation theatre.	Newborn stabilization unit (NBSU).
District hospital identified as MCH Level III	Newborn care corner in labor rooms and in operation theatre.	Special newborn care unit (SNCU).

Newborn Care Corner (NBCC)

NBCC is a space within the delivery room in any health facility where immediate care is provided to all newborns at birth. This area is MANDATORY for all health facilities where deliveries are conducted. About 22,147 NBCCs are operational in the country *(9)*.

Newborn Stabilization Unit (NBSU)

NBSU is a facility within or in close proximity of the maternity ward where sick and low birth weight newborns can be cared for during short periods. All FRUs/CHCs need to have a neonatal stabilization unit, in addition to the newborn care corner. It requires space for 4 bedded unit and two beds in post-natal ward for rooming-in. About 3,215 NBSUs are functional in the country.

Special Newborn Care Unit (SNCU)

SNCU is a neonatal unit in the vicinity of the labor room

which is to provide special care (all care except assisted ventilation and major surgery) for sick newborns. Any facility with more than 3,000 deliveries per year should have an SNCU (most district hospitals and some sub-district hospitals would fulfil this criteria).

The minimum recommended number of beds for an SNCU at a district hospital is 12. However, if the district hospital conducts more than 3,000 deliveries per year, 4 beds should be added for each 1,000 additional deliveries. A 12 bedded unit will require 4 additional adult beds for the step down. 979 SNCUs are functional in the country.

Triage of sick newborns (61)

Triage is sorting of neonates to rapidly screen sick neonates for prioritizing management. Fig. 14 summarizes the process.

A. CRITERIA FOR ADMISSION TO NBSU *(61)* :

Newborn presenting with any of the following signs to a facility with neonatal stabilization unit requires admission for initial stabilization and transfer to SNCU :

- Apnea or gasping.
- Respiratory distress (Rate>70/min with severe retractions/grunt).
- Hypothermia <35.4°C
- Hyperthermia (>37.5°C)
- Central cyanosis.
- Shock (cold periphery with capillary filling time (CFT) more than 3 seconds and weak and fast pulse).
- Significant bleeding that requires blood or component transfusion.

Newborns, who after assessment and stabilization, can be managed at stabilization unit*.

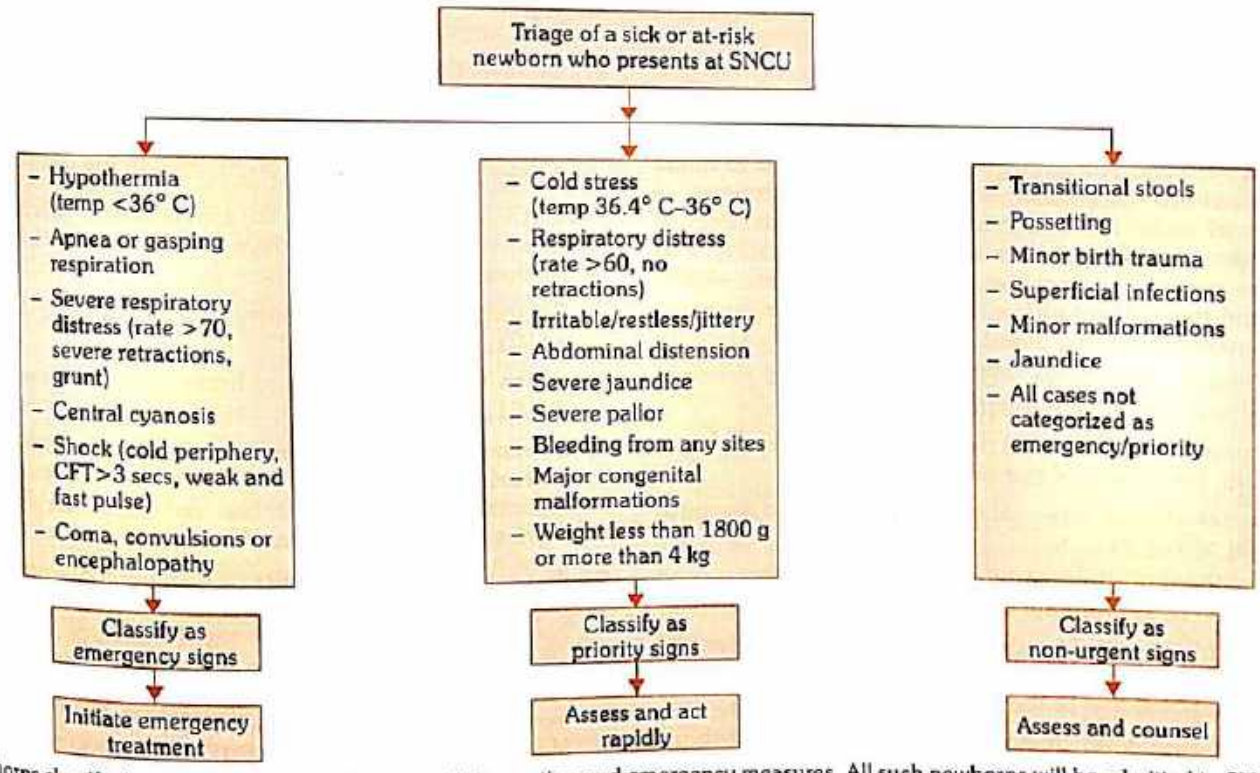
- Newborns with respiratory distress, having respiratory rate 60–70/min without grunting or retractions (for observation and oxygen therapy).
- Newborns with gestation less than 34 weeks or weight <1800 g (for observation and assisted feeding).
- Newborns with hypothermia and hyperthermia who are haemodynamically stable after initial stabilization.
- Newborns with jaundice requiring phototherapy.
- Neonates with sepsis who are haemodynamically stable, for observation and antibiotic therapy.

* Others would require referral to an SNCU after stabilization, if an SNCU and appropriate referral is available in the district.

B. CRITERIA FOR ADMISSION TO SNCU *(61)* :

Criteria for admission to SNCU and criteria for transfer to step-down unit and discharge are as follows :

I. Any newborn with following criteria should be immediately admitted to the SNCU :
   - Birth weight <1800 g or gestation <34 weeks.
   - Large baby (>4.0 kg).
   - Perinatal asphyxia.
   - Apnea or gasping.
   - Refusal to feed.
   - Respiratory distress (rate>60/min or grunt/retractions).
   - Severe jaundice (appears <24 hrs/stains palms and soles/lasts>2 weeks).
   - Hypothermia <35.4°C, or hyperthermia (>37.5°C).



Newborns classified as "Emergency" require urgent intervention and emergency measures. All such newborns will be admitted to SNCU after initial stabilization.
Newborns classified as "Priority" are sick and need rapid assessment and admission to SNCU.
Newborns classified as non-urgent do not require urgent attention, but require further assessment and counselling.

FIG. 14

- Central cyanosis.
- Shock (cold periphery with CFT>3 seconds, and weak and fast pulse).
- Coma, convulsions or encephalopathy.
- Abdominal distension.
- Diarrhoea/dysentery.
- Bleeding.
- Major malformations.

II. Criteria for transfer from SNCU to the Step-Down :

- Newborn whose respiratory distress is improving and does not require oxygen supplementation to maintain saturation.
- Newborn on antibiotics for completion of duration of therapy.
- Low birth weight newborn (less than 1800 g), who are otherwise stable (for adequate weight gain).
- Newborn with jaundice requiring phototherapy but otherwise stable.
- Newborn admitted for any condition, but are now thermodynamically and hemodynamically stable.

III. Criteria for discharge from SNCU :

- Newborn is able to maintain temperature without radiant warmer.
- Newborn is haemodynamically stable (normal CFT, strong peripheral pulse).
- Newborn accepting breast-feeds well.
- Newborn has documented weight gain for 3 consecutive days; and the weight is more than 1.5 kg.
- Primary illness has resolved.

In addition to the above, mother should be confident of taking care of the newborn at home.

HOME BASED NEWBORN CARE (HBNC) (62) :

Home based newborn care is aimed at improving newborn survival. The strategy of universal access to home based newborn care must complement the strategy of institutional delivery to achieve significant reduction in postpartum and neonatal mortality and morbidity. The providers of service include anganwadi workers, ANM, ASHA and the medical officer. However, ASHA is the main person involved in home based newborn care.

The major objective of HBNC is to decrease neonatal mortality and morbidity through :

1. The provision of essential newborn care to all newborns and the prevention of complications.
2. Early detection and special care of preterm and low birth weight newborns.
3. Early identification of illness in the newborn and provision of appropriate care and referral.
4. Support the family for adoption of healthy practices and build confidence and skills of the mother to safeguard her health and that of the newborn.

The responsibilities of ASHA for home based newborn care are as follows *(62)* :

1. Mobilize all pregnant mothers and ensure that they receive the full package of antenatal care.
2. Undertake birth planning and birth preparedness with the mother and family to ensure access to safe delivery.
3. Provide newborn care through a series of home visits which include the skills for:
   a. Weighing the newborn;
   b. Measuring newborn temperature;
   c. Ensuring warmth;
   d. Supporting exclusive breast-feeding by teaching the mother proper positioning and attachment for initiating and maintaining breast-feeding;
   e. Diagnosing and counselling in case of problems with breast-feeding;
   f. Promoting hand-washing;
   g. Providing skin, cord and eye care;
   h. Health promotion and counselling mothers and families on key messages on newborn care which includes discouraging unhealthy practices such as early bathing, and bottle feeding; and
   i. Ensuring prompt identification of sepsis or other illnesses.
4. Assessing if the baby is high-risk (preterm or low birth weight), through the use of protocols and managing such LBW or preterm babies through :
   a. Increasing the number of home visits;
   b. Monitoring weight gain; and
   c. Supporting and counselling the mother and family to keep the baby warm and enabling frequent and exclusive breast-feeding.
5. Detect signs and symptoms of sepsis, provide first level care and refer the baby to an appropriate centre. If the family is unable to go, ASHA should ensure that the ANM visits sick newborn on a priority basis.
6. Recognize postpartum complications in the mother and refer appropriately.
7. Counsel the couple for family planning.
8. Provide immediate newborn care, in case of those deliveries that do not occur in institutions (home deliveries and deliveries occurring on the way to the institution).

ASHA will make visits to all newborns according to specified schedule upto 42 days of life. The schedule of visit is as follows :

a. Six visits in the case of institutional delivery – Day 3, 7, 14, 21, 28, and 42.
b. Seven visits in the case of home delivery (Day 1, 3, 7, 14, 21, 28 and 42).
c. In cases of Caesarean section delivery, where the mother returns home after 5–6 days, ASHAs are entitled to full incentive of Rs. 250 if she completes all five visits starting from Day 7 to Day 42.
d. In cases when a newborn is discharged from SNCU, ASHAs are eligible to full incentive amount of Rs. 250 for completing the remaining visits. In addition, ASHAs are also eligible for an incentive of Rs. 50 for monthly follow-up of low birth weight babies and newborns discharged from SNCU (as approved by MSG of the National Health Mission on 6th December 2013). The low birth weight are followed up for two years and SNCU discharged babies for one year.
e. In cases where the woman delivers at her maternal house and returns to her husband's house, two ASHAs undertake the HBNC visits, i.e., one at maternal house

immediately after delivery, and another one at husband's house when the new-born returns home or vice versa. In such cases the HBNC incentive of Rs. 250 can be divided into two parts in a way that each ASHA who completes 3 visits or more is entitled to Rs. 125. In these instances, if an ASHA undertakes less than 3 visits, she would not be entitled to HBNC incentive.

f. In cases of twin or triples the incentive amount for ASHA would be two time of the regular HBNC incentive of Rs. 250/- (i.e., Rs. 500/-) or three times of Rs. 250/- (i.e., Rs. 750/-) respectively.

The incentive money is paid to ASHA on 45th day subject to the following :

a. Record of birth weight in the mother and child protection card;

b. Immunization of newborn with BCG, first dose of OPV, hep B and DPT/pentavalent vaccine and entry into the mother and child protection card;

c. Registration of birth; and

d. Both mother and newborn are safe until 42nd day of delivery.

Home-Based Care for Young Child (HBYC)

Under National Health Mission, Child Health division, MoHFW, GOI has rolled out Home-Based Care for Young Child (HBYC) Programme as an extension of the Home Based New Born Care (HBNC) programme to promote evidence based interventions delivered in four key domains namely nutrition, health, childhood development and WASH (Water, Sanitation and Hygiene). Under Home Based Care of Young Child (HBYC) programme, the additional five home visits will be carried out by ASHA with support from Anganwadi workers. ASHA will provide home visits on 3rd, 6th, 9th, 12th and 15th months to promote early initiation of breast feeding, exclusive breast feeding till 6 months and continued breast feeding till 2nd year of life along with adequate complementary feeding, prevention of childhood Pneumonia and Diarrhoea and to ensure age appropriate immunization and early childhood development. The quarterly home visits schedule for low birth weight babies, SNCU & NRC discharges will now be harmonized with the new HBYC schedule. ASHAs will be provided incentive of Rs. 250 for completion of 5 home visits under HBYC for each young child (Rs. 50 per visit) as per the recommended schedule and additional commodities namely ORS packet and Iron Folic Acid syrup will be provided in the kit.

Strengthening facility based paediatric care

Facility based care is complementary to community level interventions in bringing down childhood morbidity and mortality. Newborns and children referred from communities and primary healthcare facilities are often seriously ill and at high risk of dying. Those reaching health facilities need to be managed appropriately and without delay in instituting care. This objective can be achieved by establishing a well-organised unit, adequate human resources, drugs, equipment and other logistics that provides functional quality of care consistent with clinical standards.

The vision for paediatric care at District Hospital is to set up a comprehensive unit comprising of the following sub-units :

1. Paediatric Outpatient Facility (including immunization and counselling services).
2. Emergency Triage Assessment and Treatment (ETAT) Facility.
3. Paediatric Inpatient Facility.
   a. High Dependency Unit.
   b. Paediatric Ward.
   c. Diarrhoea Treatment Unit.
   d. Isolation Room.
4. Ancillary (e.g. laboratory, imaging, pharmacy) & Auxiliary Facilities (e.g. play area, hospital kitchen).

The general paediatric care facility will function in close coordination with specialised units that already have approved guidelines for operationalization and include the following : Newborn care facilities (Newborn Care Corners, Newborn Stabilisation Unit, Special Newborn Care Unit); Nutrition Rehabilitation Centre; and District Early Intervention Centre.

Navjat Shishu Suraksha Karyakram (NSSK)

NSSK is a programme aimed to train health personnel in basic newborn care and resuscitation. It has been launched to address care at birth issue i.e. prevention of hypothermia, prevention of infection, early initiation of breast-feeding and basic newborn resuscitation. The objective of the new initiative is to have a trained health person in basic newborn care and resuscitation unit at every delivery point *(47)*.

Integrated management of neonatal and childhood illness (IMNCI)

Integrated management of childhood illness (IMCI)

The extent of childhood morbidity and mortality caused by diarrhoea, ARI, malaria, measles and malnutrition is substantial. Most sick children present with signs and symptoms of more than one of these conditions. This overlap means that a single diagnosis may not be possible or appropriate, and treatment may be complicated by the need to combine for several conditions. An integrated approach to manage sick children is, therefore, necessary. IMCI is a strategy for an integrated approach to the management of childhood illness as it is important for child health programmes to look beyond the treatment of a single disease. This is cost effective and emphasizes prevention of disease and promotion of child health and development besides provision of standard case management of childhood illness.

In the Indian context this strategy is quite pertinent considering the evidence from NFHS–III report highlighting that ARI (17 per cent), diarrhoea (13 per cent), fever (27 per cent) and under–nutrition (43 per cent) were the commonest morbidities observed in the children aged under 3 years. Coverage of measles vaccination in children between 12–23 months was also low. An integrated approach to address these major childhood illnesses seems to be an effective strategy to promote child health in this country. The line of action is as shown in Fig. 15.

The Indian version of IMCI has been renamed as Integrated Management of Neonatal and Childhood Illness (IMNCI). It is the central pillar of child health interventions under the RCH II strategy. The major highlights of the Indian adaptation are :

a. Inclusion of 0–7 days age in the programme;
b. Incorporating national guidelines on malaria, anaemia, vitamin–A supplementation and immunization schedule;
c. Training of the health personnel begins with sick young infants upto 2 months;
d. Proportion of training time devoted to sick young infant and sick child is almost equal; and
e. Is skill based ?

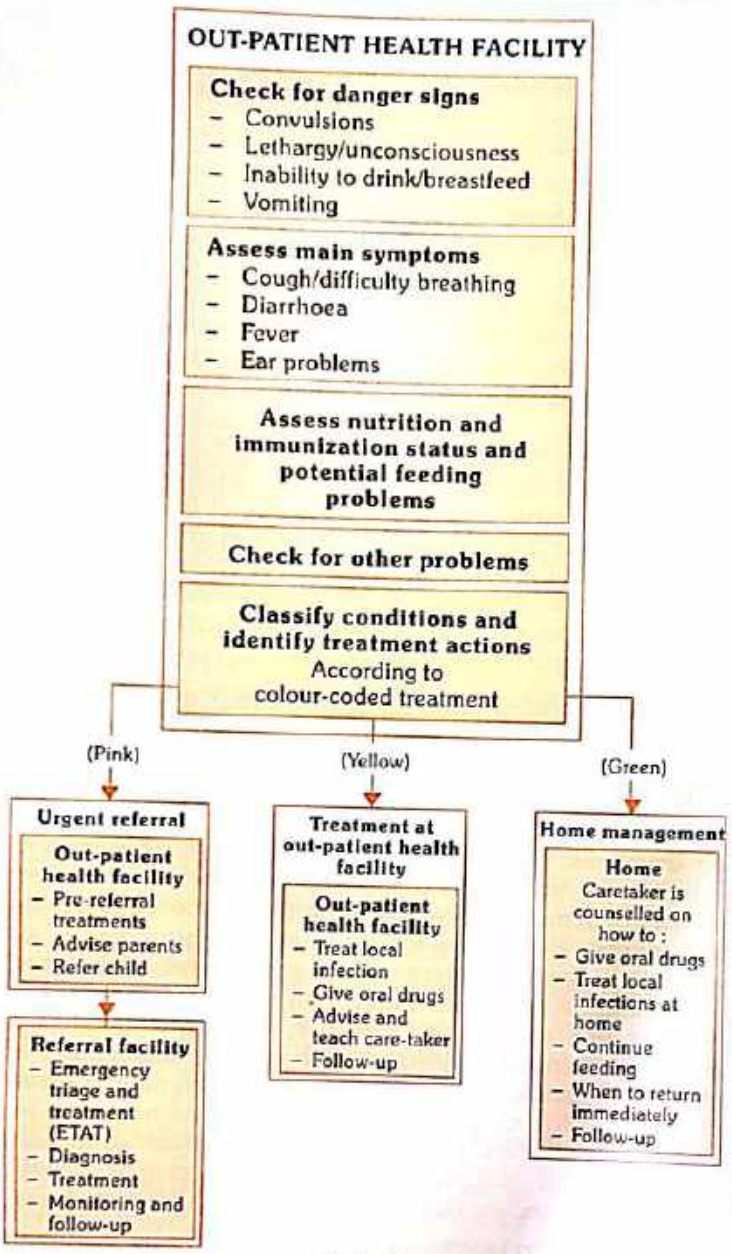


FIG. 15
The integrated case management process

Source : *(63)*

For more details please refer to chapter 9.

IMNCI strategy is one of the main interventions under RCH-II/NRHM. It focusses on preventive, promotive and curative aspects of the programme. The objective is to implement IMNCI package at the level of household, and through ANMs at sub-centre level; through medical officers, nurses and LHVs at PHCs level.

Rashtriya Bal Swasthya Karyakram (RBSK) *(64)*

RBSK is a new initiative launched in February 2013. It includes provision for Child Health Screening and Early Intervention Services through early detection and management of 4 Ds, prevalent in children. These are defects at birth, diseases in children, deficiency conditions and development delays including disabilities. An estimated 27 crore children in the age group of 0–18 years are expected to be covered across the country in a phased manner.

Child Health Screening and Early Intervention Services under NRHM envisage to cover 30 identified health conditions for early detection, free treatment and management. Based on the high prevalence of diseases like hypothyroidism, sickle cell anaemia and beta thalassaemia in certain geographical pockets of some states/UTs, and availability of testing and specialized support facilities, these states and UTs may incorporate them as part of this initiative. The health conditions are as shown in Table 12.

Programme Implementation

1. For newborn :
   - Facility based newborn screening at public health facilities, by existing health manpower.
   - Community based newborn screening at home through ASHAs for newborn till 6 weeks of age during home visits.
2. For children 6 weeks to 6 years :
   - Anganwadi centre based screening by dedicated Mobile Health Teams.
3. For children 6 years to 18 years :
   - Government and Government aided school based screening by dedicated Mobile Health Teams.

Facility based newborn screening

This includes screening of birth defects in institutional deliveries at public health facilities, especially at the designated delivery points by ANMs, Medical Officers/ Gynaecologists. Existing health service providers at all

TABLE 12
Identified health conditions for child health screening and early intervention services

Defects at Birth :
1. Neural tube defect
2. Down's Syndrome
3. Cleft Lip and Palate / cleft palate alone
4. Talipes (club foot)
5. Developmental dysplasia of the Hip
6. Congenital cataract
7. Congenital deafness
8. Congenital heart diseases
9. Retinopathy of prematurity

Deficiencies :
10. Anaemia especially severe anaemia
11. Vitamin A deficiency (Bitot's spots)
12. Vitamin D deficiency (Rickets)
13. Severe acute malnutrition
14. Goitre

Childhood Diseases :
15. Skin conditions (scabies, fungal infection and eczema)
16. Otitis media
17. Rheumatic Heart Disease
18. Reactive Airway Disease
19. Dental caries
20. Convulsive disorders

Developmental delays and disabilities :
21. Vision impairment
22. Hearing impairment
23. Neuro-motor impairment
24. Motor delay
25. Cognitive delay
26. Language delay
27. Behaviour disorder (Autism)
28. Learning disorder
29. Attention Deficit Hyperactivity Disorder
30. Congenital Hypothyroidism, Sickle Cell Anaemia, Beta Thalassaemia (Optional)

Source : *(64)*

designated delivery points will be trained to detect, register report and refer birth defects to the District Early Intervention Centres in District Hospitals.

Community based newborn screening (age 0–6 weeks) for birth defects

Accredited Social Health Activists (ASHAs) during home visits for newborn care will use the opportunity to screen the babies born at home and the institutions till 6 weeks of age. ASHAs will be trained with simple tools for detecting gross birth defects. Further ASHAs will mobilise caregivers of children to attend the local Anganwadi Centres for screening by the dedicated Mobile Health Team. For performing the above additional tasks, she would be equipped with a tool kit consisting of a pictorial reference book having self-explanatory pictures for identification of birth defects. Suitable performance based incentive may also be provided to ASHAs. In order to ensure improved outcome of the screening programme by Mobile Health Teams, ASHAs will give priority to the children with low birth weight, underweight and children from households known to have any chronic illness (e.g., tuberculosis, HIV, haemoglobinopathy etc.). Line lists maintained by the ANMs and AWWs would also be used to mobilise children.

Screening of children aged 6 weeks till 6 years attending Anganwadi Centres

Children in the age group 6 weeks to 6 years of age will be examined in the Anganwadi Centres by dedicated Mobile Health Teams.

Screening of children enrolled in Government and Government aided schools

For children in the age group 6 to 18 years, who will be screened in Government and Government aided schools, the block will be the hub of activity for the programme. At least two dedicated Mobile Health Teams in each block will be engaged to conduct screening of children. Villages within the jurisdiction of the block would be distributed amongst the mobile health teams. The number of teams may vary depending on the number of Anganwadi Centres, difficult to reach areas and children enrolled in the schools. The screening of children in the Anganwadi Centres would be conducted at least twice a year and at least once a year for school children to begin with.

In RCH Phase–II the other interventions of RCH Phase–I, e.g., additional ANMs, public health nurses, private anaesthetists, safe motherhood consultants, 24 hours delivery services at PHCs and CHCs, referral transports, integrated financial envelop, RCH camps, training of Dais, border district cluster strategy, and intervention for newborn care and child health (immunization, control of ARI and diarrhoea, vitamin A and iron suplementation etc.) will continue.

The quality indicators used to monitor and evaluate RCH programme through monthly reports are (65) :

1. Number of antenatal cases registered – total and at less than 12 weeks;
2. Number of pregnant women who had 3 antenatal check-ups;
3. Number of high-risk pregnant women referred;
4. Number of pregnant women who had two doses of tetanus toxoid injection;
5. Number of pregnant women under prophylaxis and treatment for anaemia;
6. Number of deliveries by trained and untrained birth attendant;
7. Number of cases with complications referred to PHC/FRU;
8. Number of new born with birth weight recorded;
9. Number of women given 3 post natal check-ups;
10. Number of RTI/STI cases detected, treated and referred;
11. Number of children fully immunized;
12. Number of adverse reactions reported after immunization;
13. Number of cases of ARI and diarrhoea under 5 years treated, referred PHC/FRU and deaths; and
14. Number of cases motivated and followed up for contraception.

REPRODUCTIVE, MATERNAL, NEWBORN, CHILD AND ADOLESCENT HEALTH (RMNCH+A) STRATEGY

In June 2012, the Government of India, Ethiopia, USA and the UNICEF convened the "Global Child Survival Call to Action : A Promise to Keep" summit in Washington, DC to energize the global fight to end preventable child deaths through targeted interventions in effective, life-saving interventions for children. More than 80 countries gathered at the Call to Action to pledge to reduce child mortality to ≤ 20 child deaths per 1000 live births in every country by 2035 *(57)*. Eight months after the event, in February 2013, the Government of India held its own historic Summit on the Call to Action for Child Survival, where it launched "A Strategic Approach to Reproductive, Maternal, Newborn, Child, and Adolescent Health (RMNCH+A) in India." Since that time, RMNCH+A has become the heart of the Government of India's flagship public health programme, the National Health Mission *(66)*.

With support from USAID and its Maternal Child Health Integrated Programme (MCHIP), as well as from UNICEF, UNFPA, NIPI and other development partners, the Government of India has taken important steps to introduce and support RMNCH+A implementation. This approach is likely to succeed given that India already has a community based programme with presence of 9.15 lakh ASHA workers, as well as the three tiered health system in place. These provide a strong platform for delivery of services. This integrated strategy can potentially promote greater efficiency while reducing duplication of resources and efforts in the ongoing programme.

The RMNCH+A strategy is based on provision of comprehensive care through the five pillars, or thematic areas, of reproductive, maternal, neonatal, child, and adolescent health, and is guided by central tenets of equity, universal care, entitlement, and accountability. The "plus" within the strategy focusses on :

- Including adolescence for the first time as a distinct life stage;
- Linking maternal and child health to reproductive health, family planning, adolescent health, HIV, gender, preconception and prenatal diagnostic techniques;
- Linking home and community-based services to facility-based care; and
- Ensuring linkages, referrals, and counter-referrals between and among health facilities at primary (primary health centre), secondary (community health centre), and tertiary levels (district hospital).

In developing the RMNCH+A strategy, the aim is to reach the maximum number of people in the remotest corners of the country through a continuum of services, constant innovation, and routine monitoring of interventions. In rolling out the new strategy, the emphasis is on high impact interventions in each of the five thematic areas of reproductive, maternal, newborn, child, and adolescent health, and then to focus its efforts, and those of its development partners, on improving the coverage and quality of those interventions in 184 high-priority districts (HPDs) across India. Guidelines and tools were developed and policies were adjusted.

1. *High-Priority Districts:* The RMNCH+A strategy addresses India's inter-state and inter-district variations. The districts with relatively weak performance against RMNCH+A indicators were identified. Uniform and clearly defined criteria were used to identify 184 high-priority districts across all 29 states. The RMNCH+A approach is a conscious articulation of the GOI's commitment to tailoring programmes to meet the needs of previously underserved groups, including adolescents, urban poor, and tribal populations.

2. *Management tools and job aids:* The RMNCH+A 5×5 matrix identifies five high-impact interventions across each of the five thematic areas, five cross-cutting and health systems strengthening interventions, and the minimum essential commodities. The 5×5 matrix as shown in Fig. 16, is an important tool for explaining the strategy in simple terms, organizing technical support, and monitoring progress with the states and high-priority districts.

Goals and targets (54)

Taking into account the progress made so far in maternal and child health, it is pertinent to establish the goals and targets for the implementation phase 2012–2017, after considering the main reasons for mortality and interventions proven to have an impact on them. The 12th Five Year Plan has defined the national health outcomes and the three goals that are relevant to RMNCH+A strategic approach are as follows :

- Reduction of Infant Mortality Rate (IMR) to 25 per 1,000 live births by 2017.
- Reduction in Maternal Mortality Ratio (MMR) to 100 per 100,000 live births by 2017.
- Reduction in Total Fertility Rate (TFR) to 2.1 by 2017.

For achieving these goals, variable increase in the coverage level for key interventions are required. These are defined in the Table 13.

While the country aims to set one collective goal towards reducing preventable maternal, newborn and child deaths by 2017, it is increasingly becoming apparent that there is varied and unequal rate of progress within the states and districts. Therefore, state specific coverage targets should be established against existing baselines. The national and state

Reproductive Health
- Focus on spacing methods, particularly PPIUCD at high case load facilities.
- Focus on interval IUCD at all facilities including subcentres on fixed days.
- Home delivery of Contraceptives (HDC) and Ensuring Spacing at Birth (ESB) through ASHAs.
- Ensuring access to Pregnancy Testing Kits (PTK "Nischay Kits") and strengthening comprehensive abortion care services.
- Maintaining quality sterilization services.

Maternal Health
- Use MCTS to ensure early registration of pregnancy and full ANC.
- Detect high risk pregnancies and line list including severely anaemic mothers and ensure appropriate management.
- Equip delivery points with highly trained HR and ensure equitable access to EmOC services through FRUs, Add MCH wings as per need.
- Review maternal, infant and child deaths for corrective actions.
- Identify villages with high numbers of home deliveries and distribute Misoprostol to selected women in 8th month of pregnancy for consumption during 3rd stage of labour; Incentivize ANMs for home deliveries.

Newborn Health
- Early initiation and exclusive breast-feeding.
- Home based newborn care through ASHA.
- Essential Newborn Care and resuscitation services at all delivery points.
- Special Newborn Care Units with highly trained human resource and other infrastructure.
- Community level use of Gentamycin by ANM.

Child Health
- Complementary feeding, IFA supplementation and focus on nutrition.
- Diarrhoea management at community level using ORS and Zinc.
- Management of pneumonia.
- Full immunization coverage.
- Rashtriya Bal Swasthya Karyakram (RBSK); screening of children for 4Ds' (birth defects, development delays, deficiencies and disease) and its management.

Adolescent Health
- Address teenage pregnancy and increase contraceptive prevalence in adolescents.
- Introduce community based services through peer educators.
- Strengthen ARSH clinics.
- Roll out National Iron Plus Initiative including weekly IFA supplementation.
- Promote menstrual hygiene.

Health Systems Strengthening
- Cases load based deployment of HR at all levels.
- Ambulances, drugs, diagnostics, reproductive health commodities.
- Health education, demand promotion & behaviour change communication.
- Supportive supervision and use of data for monitoring and review, including scorecards based on HMIS.
- Public grievances redressal mechanism, client satisfaction and patient safety through all round quality assurance.

Cross Cutting Interventions
- Bring down out of pocket expenses by ensuring JSSK, RBSK and other free entitlements.
- ANMs & Nurses to provide specialized and quality care to pregnant women and children.
- Address social determinants of health through convergence.
- Focus on un-served and underserved villages, urban slums and blocks.
- Introduce difficult area and performance based incentives.

FIG. 16
5 × 5 matrix for high impact RMNCH+A interventions
To be Implemented with High Coverage and High Quality

TABLE 13
Coverage targets for key RMNCH+A interventions for 2017

- Increase facilities equipped for perinatal care (designated as 'delivery points') by 100%.
- Increase proportion of all births in government and accredited private institutions at annual rate of 5.6% from the baseline of 61% (SRS 2010).
- Increase proportion of pregnant women receiving antenatal care at annual rate of 6% from the baseline of 53% (CES 2009).
- Increase proportion of mothers and newborns receiving postnatal care at annual rate of 7.5% from the baseline of 45% (CES 2009).
- Increase proportion of deliveries conducted by skilled birth attendants at annual rate of 2% from the baseline of 76% (CES 2009).
- Increase exclusive breast-feeding rates at annual rate of 9.6% from the baseline of 35% (CES 2009).
- Reduce prevalence of under-five children who are underweight at annual rate of 5.5% from the baseline of 45% (NFHS-3).
- Increase coverage of three doses of combined diphtheria-tetanus-pertussis (DTP3) (12–23 months) at annual rate of 3.5% from the baseline of 7% (CES 2009).
- Increase ORS use in under-five children with diarrhoea at annual rate of 7.2% from the baseline of 43% (CES 2009).
- Reduce unmet need for family planning methods among eligible couples, married and unmarried, at annual rate of 8.8% from the baseline of 21% (DLHS 3).
- Increase met need for modern family planning methods among eligible couples at annual rate of 4.5% from the baseline of 47% (DLH 3).
- Reduce anaemia in adolescent girls and boys (15–19 years) at annual rate of 6% from the baseline of 56% and 30%, respectively (NFHS-3).
- Decrease the porportion of total fertility contributed by adolescents (15–19 years) at annual rate of 3.8% per year from the baseline of 16% (NFHS-3).
- Raise child sex ratio in the 0–6 years age group at annual rate of 0.6% per year from the baseline of 914 (Census 2011).

'scorecard' is being introduced as a tool to increase transparency and track progress against reproductive and maternal health and child survival indicators related with intervention coverage. For more details about the score cards please refer to page 545.

The implementation strategies of RMNCH+A *(54)*

The key interventions of RMNCH+A as a "Continuum of Care" are as shown in Fig. 17. The set of interventions are those that have high impact on reducing mortality and

Clinical

Reproductive care	*Pregnancy and child birth care*	*Newborn and childcare*
- Comprehensive abortion care - RTI/STI case management, - Postpartum IUCD and sterilization; interval IUCD procedures - Adolescent friendly health services	– Skilled obstetric care, immediate newborn care and resuscitation – Emergency obstetric care – Preventing Parent-to-Child Transmission (PPTCT) of HIV – Postpartum sterilization	– Essential newborn care – Care of sick newborn (SNCU, NBSU) – Facility-based care of childhood illnesses (IMNCI) – Care of children with severe acute malnutrition (NRC) – Immunization

Outreach/Sub-centre

Reproductive health care	*Antenatal care*	*Postnatal care*	*Child health care*
- Family planning (including IUCD insertion, OCP and condoms) - Prevention and management of STIs - Peri-conception folic acid supplementation	– Full antenatal care package – PPTCT	– Early detection and management of illnesses in mother and newborn. – Immunization	– First level assessment and care for newborn and childhood illnesses. – Immunization – Micro-nutrient supplementation

Family & Community

- Weekly IFA supplementation - Information and counselling on sexual reproductive health and family planning. - Community based promotion and delivery of contraceptives. - Menstrual hygiene	– Counselling and preparation for newborn care, breast-feeding, birth preparedness. – Demand generation for pregnancy care and institutional delivery (JSY, JSSK).	– Home-based newborn care and prompt referral (HBNC scheme). – Antibiotic for suspected case of newborn sepsis. – Infant and Young Child Feeding (IYCF), including exclusive breast-feeding and complementary feeding. – Child health screening and early intervention services (0–18 years). – Early childhood development – Danger sign recognition and care-seeking for illness – Use of ORS and Zinc in case of diarrhoea

Intersectoral : Water, sanitation, hygiene, nutrition, education, empowerment.

Adolescence/Pre-pregnancy → Pregnancy → Birth → Newborn/postnatal → Childhood

FIG. 17
Continuum of care across life cycle and different levels of health system

improving survival. Most of these interventions have been part of the previous phase of NRHM. The effectiveness of these will be determined by the coverage achieved among the affected fraction of population as also the availability, accessibility, actual utilization of services and quality of services delivered.

Adolescent Health Programme (1, 54)

Taking cognisance of the diverse nature of adolescent health needs, a comprehensive adolescent health strategy has been developed. The priority under adolescent health include nutrition, sexual and reproductive health, mental health, addressing gender-based violence, non-communicable diseases and substance use. The strategy proposes a set of interventions (health promotion, prevention, diagnosis, treatment and referral) across levels of care. These interventions and approaches work towards building protective factors that can help adolescents and young people develop 'resilience' to resist negative behaviours and operate at four major levels: individual, family, school and community by providing a comprehensive package of information, commodities and services.

The priority interventions are as follows :

1. Adolescent nutrition; iron and folic acid supplementation.
2. Facility-based adolescent reproductive and sexual health services (ARSH) (Adolescent health clinics).
3. Information and counselling on adolescent sexual reproductive health and other health issues.
4. Menstrual hygiene.
5. Preventive health check-ups.

A. *Adolescent Reproductive and Sexual Health programme (ARSH)*

Adolescent Reproductive and Sexual Health programme (ARSH) focusses on reorganizing the existing public health system in order to meet service needs of adolescents. Steps are being taken to ensure improved service delivery for adolescents during routine sub-centre clinics and also to ensure service availability on fixed days and timings at the Primary Health Centre, Community Health Centre and District Hospital levels. Core package of services includes promotive, preventive, curative and counselling services being made available for all adolescents – married and unmarried, girls and boys through adolescent friendly health clinics. ARSH programme envisages creating an enabling environment for adolescents to seek health care services through a spectrum of programmatic approaches :

- Facility based health services–Adolescent Friendly Health Clinics;
- Counselling–Dedicated ARSH and ICTC counselling;
- Community based interventions–Outreach activities; and
- Capacity building for service providers.

i. *Adolescent Friendly Health Clinics (AFHC):* Through Adolescent Friendly Health Clinics, routine check-up at primary, secondary and tertiary levels of care is provided on fixed day clinics. At present 6,302 AFHCs are functional across the country providing services, information and commodities to more than 2.5 million adolescents for varied health related needs such as contraceptives provision, management of menstrual problems, RTI/STI management, antenatal care and anaemia.

ii. *Facility based counselling services:* Counselling services for adolescents on important issues such as nutrition, puberty, RTI/STI prevention and contraception, delaying marriage and childbearing and concerns related to contraception, abortion services, pre-marital concerns, substance misuse, sexual abuse and mental health problems are being provided through recruitment and training of dedicated counsellors. At present 881 dedicated ARSH counsellors are providing comprehensive counselling services to adolescents across the country. In 23 States/UTs, 1439 ICTC counsellors have been enrolled to provide sexual and reproductive health counselling to adolescents.

iii. *Outreach activities:* Outreach activities are being conducted in schools, colleges, teen clubs, vocational training centres, during Village Health Nutrition Day (VHND), health melas and in collaboration with self help groups to provide adequate and appropriate information to adolescents in spaces where they normally congregate.

B. *Weekly Iron and Folic Acid Supplementation (WIFS)*

Ministry of Health and Family Welfare has launched the Weekly Iron and Folic Acid Supplementation (WIFS) Programme to meet the challenge of high prevalence and incidence of anaemia amongst adolescent girls and boys. The long term goal is to break the intergenerational cycle of anaemia, the short term benefit is of a nutritionally improved human capital. The programme, implemented across the country, both in rural and urban areas, will cover 10.25 crore adolescents. The key interventions under this programme are as follows :

- Administration of supervised weekly iron-folic acid supplements of 100 mg elemental iron and 500 µg folic acid using a fixed day approach.
- Screening of target groups for moderate/severe anaemia and referring these cases to an appropriate health facility.
- Biannual de-worming (Albendazole 400 mg), six months apart, for control of helminths infestation.
- Information and counselling for improving dietary intake and for taking actions for prevention of intestinal worm infestation.

C. *Menstrual Hygiene Scheme (1)*

The Ministry of Health and Family Welfare has launched scheme for promotion of menstrual hygiene among adolescent girls in the age group of 10–19 years in rural areas. This programme aims at ensuring that girls have adequate knowledge and information about menstrual hygiene and have access to high quality sanitary napkins along with safe disposal mechanisms. Key activities under the scheme include :

- Community based health education and outreach in the target population to promote menstrual health;
- Ensuring regular availability of sanitary napkins to the adolescents;
- Sourcing and procurement of sanitary napkins;
- Storage and distribution of sanitary napkins to the adolescent girls;
- Training of ASHA and nodal teachers in menstrual health; and
- Safe disposal of sanitary napkins.

CARE DURING PREGNANCY AND CHILDBIRTH *(54)*

Pregnancy and childbirth are physiological events in the life of a woman. Though most pregnancies result in normal birth, it is estimated that about 15 per cent may develop complications, which cannot be predicted. Most of these complications can be averted by preventive care, skilled care at birth, early detection of risk, appropriate and timely management of obstetric complications and postnatal care.

The delivery of services during pregnancy and childbirth requires a strong element of continuum of care from community to facility level and vice versa. While the antenatal package, counselling and preparation for newborn care, breast-feeding, birth and emergency preparedness will mainly be delivered through community outreach; skilled birth attendance are to be provided at health facilities, primarily 24×7 PHC and FRU. These facilities are most likely to be the one that have been designated as "delivery points" and therefore have provision for full complement of RMNCH services. Following discharge from the health facilities, mothers and newborns will be provided postnatal care through home visits. Most of these services are already in place.

The priority interventions are as follows *(54)* :

1. Delivery of antenatal care package and tracking of high-risk pregnancies.
2. Skilled obstetric care.
3. Immediate essential newborn care and resuscitation.
4. Emergency obstetric and newborn care.
5. Postpartum care for mother and newborn.
6. Postpartum IUCD and sterilization.
7. Implementation of PC & PNDT Act.

NEWBORN AND CHILD CARE

The interventions in this phase of life mainly focus on children under 5 years of age. Given below are the priority child health interventions that are already in place under NRHM.

Priority Interventions (54) :

1. Home-based newborn care and prompt referral.
2. Facility-based care of the sick newborn.
3. Integrated management of common childhood illnesses (diarrhoea, pneumonia and malaria).
4. Child nutrition and essential micronutrients supplementation.
5. Immunization
6. Early detection and management of defects at birth, deficiencies, diseases and disability in children 0–18 years of age (Rashtriya Bal Swasthya Karyakram).

CARE THROUGH THE REPRODUCTIVE YEARS

Reproductive health needs to exist across the reproductive years and therefore access to these services is required in various life stages starting from the adolescence phase. Reproductive health services include the provision for contraceptives, access to comprehensive and safe abortion services, diagnosis and management of sexually transmitted infections, including HIV.

A new strategic direction has been developed for the family planning programme, wherein it has been repositioned to not only achieve population stabilisation but also to reduce maternal mortality as also infant and child mortality. A target-free approach based on unmet needs for contraception; equal emphasis on spacing and limiting methods; and promoting 'children by choice' in the context of reproductive health are the key approaches to be adopted for the promotion of family planning and improving reproductive health.

These services will be delivered at home, through community outreach and at all levels of health facilities and include adolescents and adults in the reproductive age group.

Priority interventions (54)

1. Community-based promotion and delivery of contraceptives.
2. Promotion of spacing methods (interval IUCD).
3. Sterilization services (vasectomies and tubectomies).
4. Comprehensive abortion care (includes MTP Act).
5. Prevention and management of sexually transmitted and reproductive infections (STI/RTI).

Delivery Points *(54)*

The provision of services for delivery care in a health facility generally serves as an important indicator to assess whether the facility is optimally functional or not. The concept of 'delivery point' emerges from this presumption. Among the health facilities designated as L1, L2 and L3, there are some facilities which are conducting deliveries above a minimum bench mark (minimum 3 normal deliveries per month at L1; minimum 10 deliveries per month, including management of complications, at L2; and minimum 20–50 deliveries per month including C-section at L3). These are designated as delivery points. According to the government mandate, these facilities should be the first to be strengthened for providing comprehensive RMNCH Services. This should be supported by a referral transport system that reaches the patient within 30 minutes of receiving a call and the health facility within the next 30 minutes. The long-term goal should be to establish and operationalize Basic Emergency Obstetric Care and Comprehensive Emergency Obstetric Care Centres as per the expected delivery load in the state and district.

Maternal and Child Health (MCH) Wing *(54)*

Most health facilities, especially those at secondary and tertiary level are having high case load of pregnant women and newborn due to increase in institutional deliveries following launch of JSY and JSSK. Therefore, it has been decided that dedicated Maternal and Child Health Wings will be established in high case load facilities with adequate provision of beds. The new MCH wings will be comprehensive units (30/50/100 bedded) with antenatal waiting rooms, labour wing, essential newborn care room, SNCU, operation theatre, blood storage units and a postnatal ward and an academic wing. This will ensure provision of emergency maternal and newborn care services as well as 48 hours stay, i.e., quality postnatal care to mothers and newborns *(54)*.

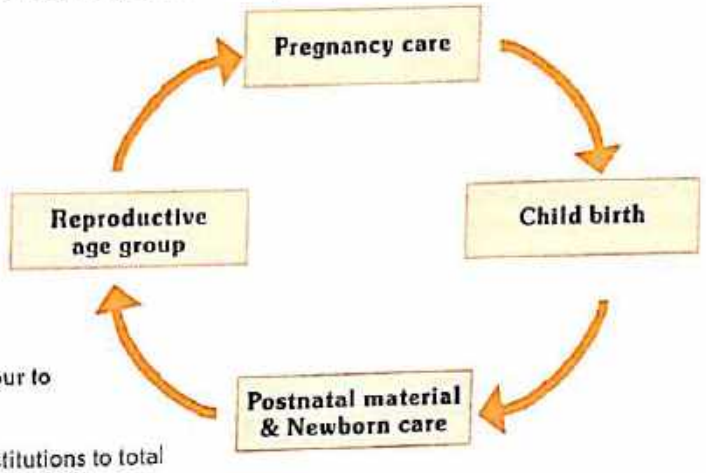
SCORE CARD *(54)*

A. Health Management Information System – based dashboard monitoring system:

The choice of indicators for dashboard monitoring system are based on life cycle approach, and are as shown in Fig. 18.

Proportion of :
- 1st Trimester registration to total ANC registration.
- Pregnant women recieved 3 ANC to total ANC registration.
- Pregnant women given 100 IFA to total ANC registration.
- Cases of pregnant women with obstetric complications and attended to reported deliveries.
- Pregnant women receiving TT2 or Booster to total ANC registration.

Proportion of :
- Postpartum sterilization to total female sterilization.
- Male sterilization to total sterilization.
- IUD insertions in public plus private accredited institutions to all family planning methods (IUD plus permanent).



Proportion of :
- SBA attended home deliveries to total reported home deliveries.
- Institutional deliveries to total ANC registration.
- C-Section to reported deliveries.

Proportion of :
- Newborns breast-fed within 1 hour to total live births.
- Women discharged in less than 48 hours of delivery in public institutions to total number of deliveries in public institutions.
- Newborns weighing less than 2.5 kg to newborns weighed at birth.
- Newborns visited within 24 hrs of home delivery to total reported home deliveries.
- Infants 0 to 11 months old who received measles vaccine to reported live births.

FIG. 18
Choice of indicators for dash board

1. Steps underway to include proportion:
   - Pregnant women <19 yrs old to total women registered for ANC.
   - Home Based New born Care (HBNC) visit by ASHA to planned visits.
   - Children 9–11 months fully immunized to children 9–11 months due for immunization.
   - Children with diarrhoea who were treated with ORS to children reported with diarrhoea.
   - Children with diarrhoea who were treated with ORS and Zinc to children reported with diarrhoea.
   - Children discharged live from SNCUs to number of admissions in SNCUs.
   - Children with ARI who received treatment to children reported with ARI.
2. All India average for each indicator will be taken as the reference point.
3. States scores will be determined on the basis of the national average :
   - Positive scores from 1 to 4 for those above the national average (for positive indicators) and for those below the national average (for negative indicators).
   - Negative scores –1 to –4 for those below national average (for positive indicators) and for those above national average (for negative indicators).
4. All the indicator scores for each state will be consolidated as state score (all indicators have the same weightage).
5. States have been classified into four categories based on the state scores.

B. Survey based score card *(54)*

19 survey based outcome and coverage indicators related to health, nutrition and sanitation will be used for the score card. The indicators are as shown in Table 14.

Latest available data from national surveys will be taken into consideration including Sample Registration System, Coverage Evaluation Survey, District Level Household and Facility Survey, National Family Health Survey, Census, Annual Health Survey.

TABLE 14
Indicators for survey based score card

Mortality	– Under-five mortality rate – Infant mortality rate – Neonatal mortality rate – Maternal mortality ratio (per 100,000 live births)
Fertility	– Total fertility rate – Births to women during age 15–19 out of total births.
Nutrition	– Children with birth weight less than 2.5 kg – Children under 3 years who are underweight
Gender	– Child sex ratio 0–6
Cross-cutting	– Full Immunization Children (12–23 months) receiving 1 dose BCG, 3 doses of Pentavelent/OPV/ 1 dose IPV each and 2 measles vaccine. – Household having access to toilet facility – Couple using spacing method for more than 6 months.
Diarrhoea	– ORT or increased fluids for diarrhoea (among children <2 years of age who had diarrhoea in preceding 2 weeks).
Pneumonia	– Care seeking for ARI in any health facility (Among children <2 years of age who had ARI in preceding 2 weeks).
Service Delivery	– Woman who received 4 + ANC – Skilled Birth Attendance (delivery by doctor, ANM/Nurse/LHV). – Mothers who recieved postnatal care from a doctor/nurse/LHV/ANM/other health personnel within 2 days of delivery for their last birth (%). – Early initiation of breast-feeding (<1hr) – Exclusive breast-feeding for 6 months (among 6–9 months children).

All India average for each indicator will be taken as a reference point. States will be colour coded based on :

- *Mortality indicators, nutrition, fertility:* Green – less than 20% of the national average, Yellow – 20% below and above national average, Red – more than 20% of the national average.
- *Remaining Indicators:* Green – more than 20% of the national average, Yellow – 20% below and above the national average, Red – less than 20% of the national average.

The score card will be updated as and when (every 1–2 years) new survey data is available.

REPRODUCTIVE, MATERNAL, NEWBORN, CHILD, ADOLESCENT HEALTH "PLUS" NUTRITION STRATEGY (RMNCAH+N)

Due to the importance of nutrition across all life stages, the strategy now includes nutrition as one of its important pillars. RMNCAH+N strategy thus covers Reproductive, Maternal, Newborn, Child and Adolescent Health and the "plus" within it focuses on Nutrition, as well as important linkages between these services and with other components like family planning, adolescent health, HIV, gender, and preconception and prenatal diagnostic techniques. It also focuses on linkages between community-based services and facility-based services and ensures referrals, and counter-referrals between various levels of health care system to create a continuous care pathway.

The life course approach determines equal care and interventions to address both men and women in the community addressing the gender disparity in health seeking behaviour and health education and promotion at all levels. The interlinkages between different life stages are summarized in Fig. 19.

INDIA NEWBORN ACTION PLAN (INAP)

In the past two decades, there has been remarkable progress in the survival of mother and children beyond the newborn period. Presently, the newborn health has captured the attention of the policy makers and two important milestones in this direction have been the National Rural Health Mission and the Reproductive, Maternal, Newborn, Child and Adolescent Health Strategy (RMNCH+A Strategy), NRHM has provided unprecedented attention and

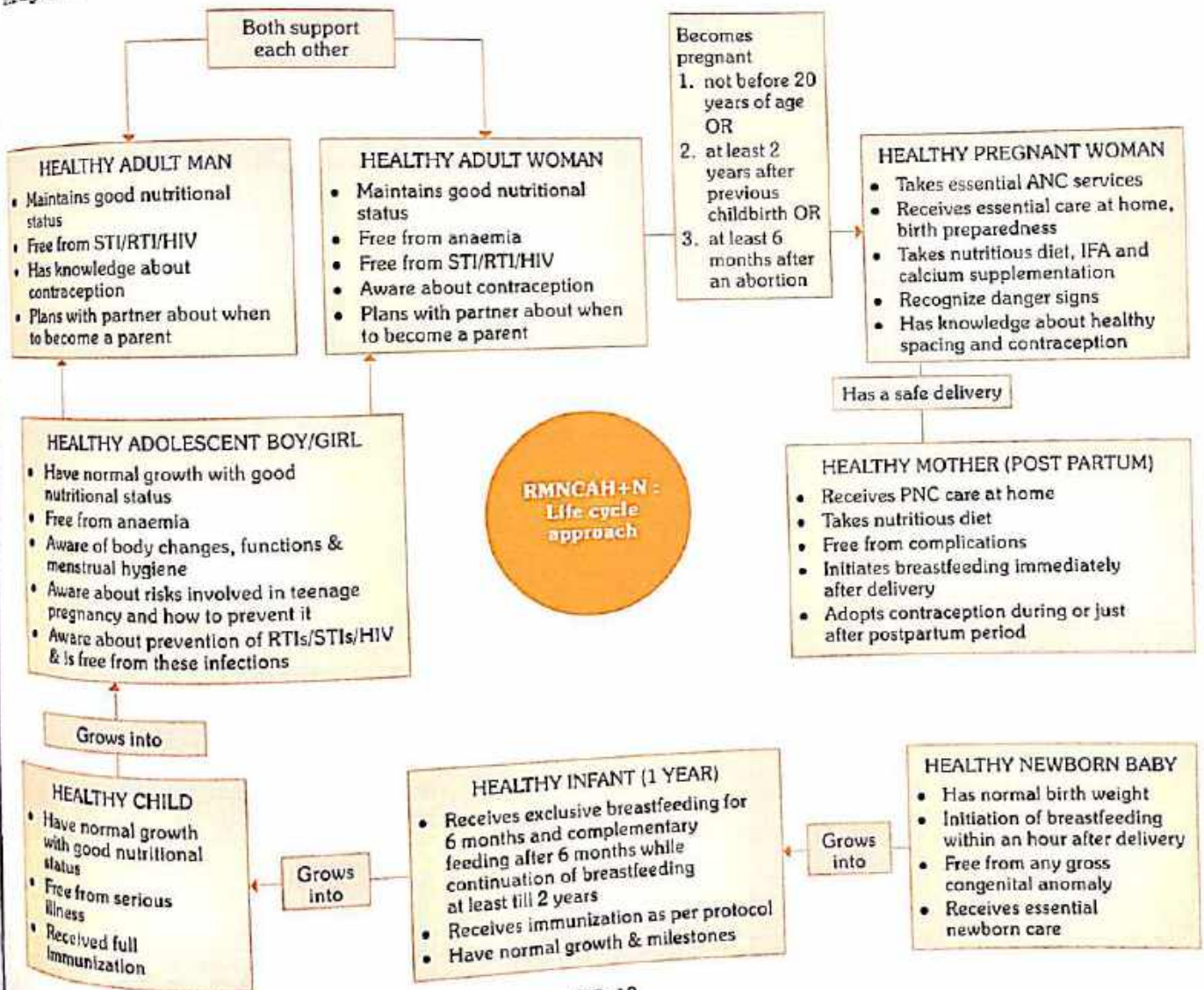


FIG. 19
Interlinkages between different life stages

Source : (67)

resources for newborn health. By adopting RMNCH+A strategy in 2013, the country observed a paradigm shift in its approach towards health care. Newborn health occupies centre stage in the overall strategy as all the inter-linkages between various components have the greatest impact on the mortality and morbidity rates of the newborn.

In India, Newborn Action Plan (INAP) developed in response to the global Every Newborn Action Plan (ENAP), was launched in June 2014. The plan outlines a targetted strategy for accelerating the reduction of preventable newborn deaths and stillbirths in the country. INAP defines the latest evidence on effective interventions which will not only help in reducing the burden of stillbirths and neonatal mortality, but also maternal deaths. The goal is to attain "Single Digit Neonatal Mortality Rate by 2030" and "Single Digit Stillbirth Rate by 2030".

The INAP will be implemented within the existing RMNCH+A framework, and guided by the principles of integration, equity, gender, quality of care, convergence, accountability and partnerships. Its strength is built on its six pillars of intervention packages impacting stillbirths and newborn health, which includes : (a) Pre-conception and antenatal care; (b) Care during labour and childbirth; (c) Immediate newborn care; (d) Care of the healthy newborn; (e) Care of small and sick newborn; and (f) Care beyond newborn survival. For effective implementation, a systematic plan of monitoring and evaluation has been developed with a list of dashboard indicators *(49)*.

The interventions under the National Health Mission focussing on newborns are shown in Table 15.

Strategic Intervention Packages *(49)*

The interventions are grouped in six packages, corresponding to the various life stages of the newborn. It is estimated that high coverage of available intervention packages can prevent almost three-quarters of the newborn deaths, one-third of stillbirths and half of the maternal deaths by 2025.

The interventions have been categorized as :

a. Essential [E], to be implemented universally;

b. Situational [S], implementation dependent on epidemiological context; and

c. Advanced [A], implementation based on health-system capacity of the state/district.

TABLE 15

Interventions under National Health Mission focussing on newborns

Programme (Year)	Objectives	Status
Janani Suraksha Yojana (JSY) (2005).	Safe motherhood intervention to increase institutional delivery through demand-side financing and conditional cash transfer.	– Implemented in all states and union territories (UTs). – Special focus on low-performing states.
Integrated Management of Neonatal and Childhood Illnesses (IMNCI) at the community level and F-IMNCI at health facilities (2007).	Standard case management of major causes of neonatal and childhood morbidity and mortality.	– Operationalised universally. – 5.9 lakhs health and other functionaries, including physicians, nurses, AWWs, and ASHAs trained under IMNCI. – 26,800 medical officers and specialists placed at the CHCs/FRUs trained under F-IMNCI. – 1.3 lakh health providers trained to-date.
Navjat Shishu Suraksha Karyakram (NSSK) (2009).	Basic newborn care and resuscitation training programme.	– Implemented in all states and UTs.
Janani Shishu Suraksha Karyakram (JSSK) (2011).	Zero out-of-pocket expenditure for maternal and infant health services through free healthcare and referral transport entitlements.	– Assured service package benefits extended to sick children upto age one.
Facility Based Newborn Care (FBNC) (2011).	Newborn care facilities at various levels of public health services that includes Newborn Care Corners (NBCCs) at all points of childbirth to provide immediate care; Newborn Stabilization Units (NBSUs) at CHC/FRUs for management of selected conditions and to stablize sick newborns before referral to higher centres; and Special Newborn Care Unit (SNCUs) at district/ sub-district hospitals to care for sick newborns (all types of care except assisted ventilation and major surgeries).	– 22,147 NBCCs established at delivery points to provide essential newborn care. – 3,215 NBSUs established at CHCs/FRUs. – 1054 SNCUs established at district/sub-district hospitals or medical colleges. – More than 6,300 personnel provided FBNC training. – Online reporting system adapted and scaled up in seven states with 245 SNCUs made online and more than 14.11 lakhs newborns registered in the data base.
Home Based Newborn Care (HBNC) (2011).	Provision of essential newborn care to all newborns, special care of preterm and low-birth-weight newborns; early detection of illness followed by referral; and support to family for adoption of healthy practices, by ASHA worker.	– Implemented in all states and UTs. – Most of the ASHAs trained in newborn care. – ASHAs visited more than 1.47 crore newborns during year 2023–2024.
Rashtriya Bal Swasthya Karyakram (RBSK) (2013).	Screening of children with birth defects, diseases, deficiencies, and developmental delays (including disabilities).	– All children, ages 0 to 18 years targeted. – More than 8 crore children screened and more than 21.75 crore children were screened and 1.12 crore children availed services in secondary and tertiary facilities during the year 2023–2024.

Source : *(9, 49)*

The states are urged to develop their own action plans based on the six packages described below :

1. *Pre-conception and antenatal care*

Health interventions must start well before conception and their impact on the neonatal and stillbirth outcome requires equivalent consideration. The importance of antenatal care for improved neonatal and perinatal outcome is well established; however, coverage of a few salient interventions needs increased attention (e.g., use of long lasting insecticide treated nets and intermittent preventive treatment of malaria, antenatal syphilis screening combined with treatment and increased emphasis on early detection, and prompt treatment of complications in pregnancy such as pre-eclampsia, type-2 diabetes).

The strategic interventions for pre-conception and antenatal care for newborns are given below.

Pre-conception and antenatal care interventions package

Family and community

1. Reproductive health & family planning [E] :
   - Adolescent reproductive health
   - Delaying age of marriage and first pregnancy
   - Birth spacing
2. Nutrition related interventions [E] :
   - Balanced energy protein supplementation
   - Peri-conceptional folic acid
   - Maternal calcium supplementation
   - Multiple micronutrient supplementation (Iron, folic acid (Iron, folic acid and iodine)
   - Nutrition counselling
3. Counselling and birth preparedness [E]
4. Prevention against malaria [S]

Outreach/Sub-centre

5. Antenatal screening for anaemia and hypertensive disorders of pregnancy (PIH, preeclampsia, eclampsia) [E]
6. Antenatal screening for malaria [S]
7. Prevention and management of mild to moderate anaemia [E]
8. Maternal tetanus immunization [E]
9. Adolescent friendly health services (nutrition and reproductive health counselling) [E]
10. Interval IUCD insertion [E]

Health facility

11. Antenatal screening and management of severe anaemia, hypertensive disorders of pregnancy (PIH, preeclampsia, eclampsia), gestational diabetes, syphilis [E]
12. Antenatal screening and management of hypothyroidism, hepatitis B, HIV, malaria [S]
13. Adolescent friendly health clinics (as per RKSK guidelines) [E]
14. Postpartum family planning services including PPIUCD insertion [E]
15. Prevention of Rh disease using anti D immunoglobulin [S]

2. *Care during labour and childbirth*

Intra-partum complications and preterm births remain a challenge to the neonatal survival. Care during labour and childbirth have the potential to reduce stillbirths by a third. It is important to emphasize that BEmOC can reduce intra-partum-related neonatal deaths by 40% and CEmOC can also reduce newborn mortality by 40%, whereas skilled attendance at birth alone without access to the emergency component has a smaller effect at 25%. Care at childbirth also has additional benefits on child survival, improved growth, reduced disability and non-communicable diseases.

Antenatal corticosteroids use to manage preterm labour not only reduces neonatal deaths by 31%, but this intervention is also associated with reduced need of specialized care for newborns, such as ventilators, etc. Antibiotics administration for pre-mature rupture of membranes (PROM) reduces early-onset postnatal sepsis. Clean birth practices especially hand-washing with soap and water by birth attendant has been found to reduce mortality due to sepsis in births at home (15%), facilities (27%), and during postnatal period (40%).

The strategic interventions for care during labour and child birth are given below :

Care during labour and childbirth

Family and community

1. Skilled birth attendance [E]
2. Clean birth practices [E]

Outreach/Sub-centre

3. Identification of complications and timely referral [E]
4. Pre-referral dose by ANM [E] :
   - Antenatal corticosteriods in preterm labour
   - Antibiotics for premature rupture of membranes

Health facility

5. Emergency obstetric care [E] :
   - Basic and comprehensive
6. Management of preterm labour [E] :
   - Antenatal corticosteroids in preterm labour
   - Antibiotics for premature rupture of membranes

3. *Immediate newborn care*

Immediate care is the basic right of every newborn baby. This package includes interventions such as immediate drying and stimulation, provision of warmth, hygienic care, early initiation of breast-feeding, and administration of vitamin K. For babies who do not breathe at birth, neonatal resuscitation is a crucial life-saving intervention. Resuscitation training of providers in facilities reduces intrapartum-related neonatal deaths and early neonatal deaths substantially. Hypothermia is a risk factor for neonatal mortality, especially in cases of preterm and low birth weight babies. All steps should be taken to prevent and manage hypothermia, and rooming-in of babies with mother must be universally practiced. Delayed cord clamping in newborns, including pre-term babies is associated with decreased risk of anaemia and intraventricular haemorrhage. Administration of vitamin K at birth prevents haemorrhagic disease of newborn.

The strategic interventions for immediate newborn care are given below :

Immediate newborn care

Family and community

1. Delayed cord clamping [E]
2. Interventions to prevent hypothermia [E] :
   - Immediate drying
   - Head covering
   - Skin-to-skin care
   - Delayed bathing
3. Early initiation and exclusive breast-feeding [E]
4. Hygiene to prevent infection [E]

Outreach/Sub-centre

5. Vitamin K at birth [E]
6. Neonatal resuscitation [E]

Health facility

7. Advanced neonatal resuscitation [E]

4. *Care of healthy newborn*

Evidence shows that community-based interventions can significantly improve child survival. A large number of ASHAs have been trained to perform various preventive and promotive health activities, such as counselling of mothers on breast-feeding, complementary feeding, immunization, care-seeking, promoting nutrition, sanitation, and safe drinking water, etc. Despite the significant increase in institutional deliveries, home deliveries persist to about 25% to 40% in pockets across states. Even in cases of institutional deliveries, most women tend to return home within a few hours after delivery. For women who stay at the institution for 48 hours or more, it is also important to provide care to the neonate at home for the remaining critical days of the first week and upto the 42nd day of life. Home visitation by ASHAs can contribute significantly to delivery of interventions with focus on the newborn period. Regular and timed contacts with the newborn are essential for ensuring continued exclusive breast-feeding, appropriate immunization, and care-seeking of children with danger signs.

The interventions for care of healthy newborn are given below :

Care of healthy newborn

Family and community

1. Home visits till six weeks by trained ASHA [E] :
   - Counselling
   - Prevention of hypothermia, cord care
   - Early identification of danger signs
   - Prompt and appropriate referral
2. Exclusive breast-feeding [E]
3. Clean postnatal practices [E]

Outreach/Sub-centre

4. Immunization [E] :
   - BCG
   - OPV
   - Hepatitis B
   - Pentavalent vaccine

Health facility

All the interventions (except home visits)

5. *Care of small and sick newborn*

Specific interventions for small and sick newborns include Kangaroo mother care (KMC). KMC involves package of early and continuous skin-to-skin contact breast-feeding support, and supportive care in stable newborns weighing less than 2000 gm. KMC can be practiced even at home, thus improving chances of newborn survival.

Strategic interventions for care of small and sick newborn include :

Care of small and sick newborn

Family and community

1. Thermal care and feeding support (for home deliveries) [E]

Outreach/Sub-centre

2. Integrated management using IMNCI and use of oral antibiotics [E]
3. Injectable Gentamicin by ANMs for sepsis [E] :
   - Pre -referral
   - Completion of antibiotic course in case referral is refused/not possible "OR" as advised by treating physician.

Health facility

4. Kangaroo mother care at facility [E]
5. Full supportive care at block and district level [E] :
   - NBSU at block level
   - SNCU at district level
6. Intensive care services (NICU) at regional level [A] for -
   - Assisted ventilation
   - Surfactant use
   - Surgery

6. *Care beyond newborn survival*

This is a new package considering the burden of birth defects and development delays in newborns. It is of particular significance for SGA and preterm newborns, as well as newborns discharged from SNCUs.

The table below lists the interventions to care for newborns beyond their survival.

Care beyond newborn survival

Family and community	*Outreach/Sub-centre*	*Health facility*
1. Screening for birth defects, failure to thrive and developmental delays [E]	3. As before	4. Newborn screening [A]
2. Follow-up visits of [E] :		5. Management of birth defects [E] :
– SNCU discharged babies till 1 year of age		– Diagnosis
– Small and low birth weight babies till 2 years of age		– Treatment, including surgery
		6. Follow-up of high-risk infants (discharged from SNCUs and small newborns) for –
		– Developmental delay
		– Appropriate management

Monitoring and evaluation *(49)*

A comphrehensive assessment of targets would be done in 2020, which will help plan course corrections, if any, in on-going interventions. Further, from the year 2020, the milestones will be reviewed every five years keeping in sync with ENAP – i.e., 2025, 2030, and 2035.

Following core indicators (dashboard indicators) have been selected for monitoring, based on direct relevance to the action plan framework, targets, goals, and review of current data availability.

Dashboard indicators for INAP

Level and focus areas	Indicators
Impact level indicators	– Birth registration – Stillbirth rate – Early neonatal mortality rate – Neonatal mortality rate – Percentage of neonatal deaths to under-5 deaths – Survival rate of newborns discharged from SNCU/NICU at one year of age – Cause-specific neonatal mortality
Pre-conception & antenatal care	– Births to women aged 15–19 years out of total births (teenage pregnancy) – Percentage of pregnant women who received full ANC – Percentage of pregnant women detected and treated with severe anaemia – Percentage of pregnant women detected and treated with PIH
Care during labour and child birth	– Percentage of safe deliveries (institutional + home deliveries by SBA) – Percentage of preterm births – Caesarean section rate – Percentage of women with preterm labour (< 34 weeks) receiving at least one dose of antenatal corticosteroid – Intra-partum stillbirth rate
Immediate newborn care	– Percentage of newborns breast-fed within one hour of birth – Percentage of newborns delivered at health facility receiving vitamin K at birth – Percentage of labour room staff trained in Navjat Shishu Suraksha Karyakram – Percentage of newborns weighed at birth – Percentage of low birth weight babies
Care of healthy newborn	– Percentage of newborns received complete schedule of home visits under HBNC by ASHAs – Percentage of sick newborns identified during home visits by ASHAs – Exclusive breast-feeding rate – Percentage of mothers stayed for 48 hrs in the facility – Percentage of newborn received birth dose of Hepatitis B, OPV and BCG
Care of small and sick newborn	– Percentage of district hospitals with functional SNCU – Percentage of facilities with SNCUs having functional KMC units – Percentage of female admissions in SNCU – Mortality rate in newborns with admission weight <1800 gm – Percentage of newborn deaths due to birth asphyxia – Percentage of newborns with suspected sepsis receiving pre-referral dose of gentamicin by ANM
Care beyond survival	– Percentage of newborns screened for birth defects (facility + community) – Percentage of newborns with any defect seen as birth – Percentage of newborns discharged from SNCU followed up till one year of age – Percentage of districts with functional District Early Intervention Centre (DEIC)

NATIONAL PROGRAMME FOR HEALTHCARE OF THE ELDERLY (NPHCE)

Government of India has launched the "National Programme for Health Care of the Elderly" (NPHCE) to address health related problems of elderly people, in 100 identified districts of 21 states during the 11th Plan period. 8 regional geriatrics centres as referral units have also been developed in different regions of the country under the programme *(46)*.

The basic aim of the NPHCE Programme is to provide separate, specialized and comprehensive healthcare to the senior citizens at various level of state healthcare delivery system including outreach services. Preventive and promotive care, management of illness, health manpower development for geriatric services, medical rehabilitation and therapeutic intervention and Information Education & Communication (IEC) are some of the strategies envisaged in the NPHCE.

It is expected to cover other districts in a phased manner 12 regional geriatric centres in selected medical colleges o the country are expected to be developed under th programme. In addition, 2 National Centre of Ageing (NCA are being established at AIIMS, New Delhi and Madra Medical College, Chennai, the core functions of which ar training of health professionals, research activity an healthcare delivery in the field of geriatrics.

The details of the geriatric setup and activitie undertaken so far under the programme at variou healthcare levels are as below *(16)* :

Department of Geriatric at 20 Super Specialized Institutions : Geriatric Departments are being developed at 8 identified medical institution located in various regions of the country with 30 bedded in-patient facility. Apart from providing referral treatment, research and manpower development, these institutions are involved in developing and updating training materials for various levels of health functionaries, developing IEC material, guidelines, etc. Funds have been provided for manpower, equipments, medicines, construction of building, training etc.

Geriatric unit at district hospitals: The programme is approved for implementation in 2017–2018 in 520 districts, covering 35 states. There is provision for establishing 10 bedded geriatric wards and dedicated OPD services exclusively for geriatric patients. The grant-in-aid has been provided for contractual manpower, equipments, medicines, construction of building, training etc.

Rehabilitation Units at CHCs falling under identified districts : There is provision for dedicated health clinics for the elderly persons twice a week. A rehabilitation unit is being set up at all the CHCs falling under identified districts.The grant-in-aid has been provided for manpower, equipments, training. The rehabilitation worker is supposed to provide physiotherapy to the needy elderly persons.

Activity at PHCs under identified districts: Weekly geriatric clinics are arranged at the identified PHCs by a trained Medical Officer. For diseases needing further investigation and treatment, persons will be referred to the first referral unit i.e. the Community Health Centre or District Hospital as per need. One-time grant is given to PHCs for procurement of equipment.

Activity at Sub-centre under districts: The ANMs/Male Health Workers posted in sub-centre will make domiciliary visits to the elderly persons in area under their jurisdiction. She/he will arrange suitable calipers and supportive devices from the PHC and provide the same to the elderly disabled persons to make them ambulatory. Also, there will be a provision for treatment of minor ailments and rehabilitation equipment at the identified sub centers.

The tertiary component of the programme has been renamed as "Rashtriya Varishth Jan Swasthya Yojana" (RVJSY).

NATIONAL PROGRAMME FOR PREVENTION AND CONTROL OF CANCER, DIABETES, CARDIOVASCULAR DISEASES AND STROKE (NPCDCS)

India is experiencing a rapid health transition with large and rising burden of chronic non-communicable diseases (NCDs) especially cardiovascular disease, diabetes mellitus, cancer, stroke, and chronic lung diseases. It is estimated that in 2016 NCDs accounted for 60 per cent of deaths. Considering the fact that NCDs are surpassing the burden of communicable diseases in India and the existing health system is mainly focussed on communicable diseases, need for National Programme on Prevention and Control of Diabetes, Cardiovascular Diseases and Stroke was envisaged. Later on this programme was integrated with National Cancer Control Programme, and National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) came into existence. During the 11th Five Year Plan period, 100 identified districts in 21 states have been covered under the programme. During 12th Five Year Plan, the programme has covered all the districts of the country in a phased manner *(16)*.

A. Diabetes, Cardiovascular Disease and Stroke (DCS) Component under NPCDCS

The programme focuses on the health promotion, capacity building including human resource development, early diagnosis and management of these diseases with integration with the primary health care system.

The major objectives of the programme are as follows *(16)* :

- Prevent and control common NCDs through behaviour and lifestyle changes.
- Provide early diagnosis and management of common NCDs.
- Build capacity at various levels of health care for prevention, diagnosis and treatment of common NCDs.
- Train human resource within the public health set-up *viz* doctors, paramedics and nursing staff to cope with the increasing burden of NCDs, and
- Establish and develop capacity for palliative & rehabilitative care.

The programme is to be implemented in 20,000 sub-centres and 700 community health centres (CHCs) in 100 districts across 21 States/UTs and the strategies include promoting healthy lifestyle through massive health education and mass media efforts at country level, opportunistic screening of persons above the age of 30 years, establishment of Non-Communicable Disease (NCD) Clinic at Community Health Centre (CHC) and District level, development of trained manpower and strengthening of tertiary level health facilities. For long-term sustainability of the programme, service delivery will be through existing public health infrastructure and systems. The various approaches such as mass media, community education and interpersonal communication will be used for behavioural change focusing on the following messages :

- Increased intake of healthy foods
- Increased physical activity
- Avoidance of tobacco and alcohol
- Stress management.

Activities at Sub-Centre

Health promotion for behaviour and lifestyle change will be carried out by organizing various camps, interpersonal communications, posters, banners, etc. Opportunistic screening of population above 30 years will be carried out using BP measurement and blood glucose by strip method. The suspected cases of diabetes and hypertension will be referred to CHCs of higher health facility for further diagnosis and management. For screening of diabetes, glucometer optium xceed, optium test strips and auto disabled lancets are being procured at central level and provided to the concerned states as per their requirements from time to time.

Activities at CHC

NCD clinic at CHC shall do the diagnosis by required investigations/test like blood sugar measurement, lipid profile, ultrasound, X-ray and ECG etc., management and stabilization of common CVD, diabetes and stroke cases (out-patient as well as in-patients). One of the nurses appointed under the programme shall undertake home visits

for bedridden cases, supervise the work of health workers and attend monthly clinics being held in the villages on a random basis. Complicated cases of diabetes, high blood pressure etc. shall be referred from CHC to the district hospital for further investigations and management.

Activities at district hospital

NCD clinic at district hospital shall screen persons above the age of 30 years for diabetes, hypertension, cardiovascular diseases etc. to identify individuals who are at high-risk of developing diabetes, hypertension and CVDs warranting further investigation/action. Detailed investigation will be done in respect of persons those who are at high-risk of developing NCDs on screening and those who are referred from CHCs. They shall provide regular management and annual assessment of persons suffering from cancer, diabetes and hypertension. People with established cardiovascular diseases shall also be managed at district hospital. They shall provide home based palliative care for chronic, debilitating and progressive patients. Apart from clinical services, district hospital shall be involved in promotion of healthy lifestyle through health education and counselling to the patients and their attendants.

Urban health check-up scheme for diabetes and high blood pressure

The scheme has the following objectives :

1. To screen urban slum population for diabetes and high blood pressure.
2. To create database for prevalence of diabetes and high blood pressure in urban slums.
3. To sensitize the urban slum population about healthy lifestyle.

The blood sugar and blood pressure will be checked for all ≥ 30 years and all pregnant women of all age.

The NCD cells at the centre, state and district will implement and monitor the National Programme for Prevention and Control of Cancer, Diabetes, CVD and Stroke (NPCDCS) in various states. The national NCD cell has been established at the centre.

Achievements under the programme

As on 31st March 2021, the programme is under implementation in all 36 states/UTs. The facilities available are as shown in Table 16.

TABLE 16

Comparative progress in achievements 2014–2021

Facilities	As on 31st March, 2014	As on 31st March, 2021
State NCD Cells	21	36
District NCD Cells	96	684
District NCD Clinics	95	640
District CCU facilities	51	194
District Day Care Centres	38	239
CHC NCD Clinics	204	5148

Source : *(7)*

New initiatives under the programme

1. Intervention for prevention and control of Rheumatic Heart Disease under NPCDCS and Rashtriya Bal Swasthya Karyakram (RBSK).
2. Integration of AYUSH with NPCDCS.
3. Integration of RNTCP with NPCDCS to articulate a national strategy for management of TB and diabetes comorbidities in India.

Guidelines for referral and treatment *(68)*

Government of India has developed operational guidelines (2016) for prevention, screening and control of common non-communicable diseases. The guidelines for referral, treatment and for ensuring the continuity of care are as follows :

1. Those with a systolic blood pressure of over 140 and a diastolic blood pressure of over 90 mm of Hg, or random blood sugar of 140 mg/dl and above would be referred to a medical officer, at the nearest facility, for confirmation, conducting relevant laboratory investigations and initiation of treatment.
2. Those who are found positive for cancer/precancerous lesions will be referred by ANM/Staff Nurse in specified screening sites to the appropriate PHC/CHC/District Hospital for confirmation and treatment by trained specialist, as per the operational frame work developed for cancer screening and management.
3. Once the diagnosis of Hypertension/diabetes is established, the patient must receive at least a month's supply of drugs from the PHC. Once the condition is stable, the state could also decide to provide the patient with a three-month supply, with the ANM/ASHA visiting the patient each month for ensuring compliance, checking on diet and life style modification, and measuring the blood pressure/blood glucose. Alternatively, a three-month drug supply could be stocked with the ANM at sub-centre, to be given each month. Either way, sufficient drug supplies need to be made available at the PHC.
4. The patient will need to go to the PHC for the first follow up at the end of the first three months after diagnosis, and sooner if required. An annual specialist consultation at the nearest nodal CHC with NCD clinic, is also recommended, based on the decision of the MO at the PHC.
5. For those individuals who are already on treatment under the care of a private practitioner, they could be offered the choice of taking drugs from the public health system, after appropriate confirmation. However, these individuals would be visited regularly by the frontline workers, monitored for compliance with treatment/ lifestyle changes and recorded in the health card.
6. Community Follow up of these individuals would be by the ASHA making visits to enable positive behaviour modifications, treatment compliance, and encouraging patients to go the sub-centre for regular check-up of BP/ blood glucose. Some states have also provided the ASHA with BP apparatus and glucometers to undertake regular examinations at the village level. The ASHA will prioritize those households where there are treatment defaulters or those who experience complications. The aim is to minimize treatment defaulters and to achieve hypertension and glycaemic control at an individual and population level. The ANM would also conduct regular home visits.

WHO has developed a comprehensive global monitoring framework for prevention and control of NCDs (2013–2020), which was endorsed by World Health Assembly in May 2013. This includes nine voluntary targets to monitor the progress made in the implementation of the programme. India is committed to implementation of the action plan and take necessary steps to meet the objectives. The indicators and targets are as shown in Table 17 *(69)*.

TABLE 17

Indicators and targets for NCD prevention and control in India

Framework element	Outcome	Targets 2020	2025
Premature mortality from NCDs	Relative reduction in overall mortality from cardiovascular disease, cancer, diabetes, or chronic respiratory disease	10%	25%
Alcohol use	Relative reduction in alcohol use	5%	10%
Obesity and diabetes	Halt the rise of obesity and diabetes prevalence	No mid-term target set	Halt the rise in obesity and diabetes prevalence
Physical inactivity	Relative reduction in prevalence of insufficient physical activity	5%	10%
Raised blood pressure	Relative reduction in prevalence of raised blood pressure	10%	25%
Salt/sodium intake	Relative reduction in mean population intake of salt, with aim of achieving recommended level of less than 5 gms per day	20%	30%
Tobacco use	Relative reduction in prevalence of current tobacco use	15%	30%
Drug therapy to prevent heart attacks and strokes	Eligible people receiving drug therapy and counselling (including glycaemic control) to prevent heart attacks and strokes	30%	50%
Essential NCD medicines and basic technologies to treat major NCDs	Availability and affordability of quality, safe and efficacious essential NCD medicines including generics, and basic technologies in both public and private facilities	60%	80%
Household indoor air pollution	Relative reduction in household use of solid fuels as a primary source of energy for cooking	25%	50%

Source : *(69)*

B. Cancer component under NPCDCS

Cancer is an important public health problem in India, with nearly 10 lakh new cases occurring every year in the country. It is estimated that there are 2.8 million cases of cancer in the country at any given point of time. With the objectives of prevention, early diagnosis and treatment, the national cancer control programme was launched in 1975–76. In view of the magnitude of the problem and gaps in the availability of cancer treatment facilities across the country, the programme was revised in 1984–85 and subsequently in December 2004. During 2010, the programme was integrated with National Programme on Prevention and Control of Diabetes, Cardiovascular Disease and Stroke. The objectives of the programme are :

a. Primary prevention of cancers by health education;
b. Secondary prevention i.e. early detection and diagnosis of common cancer such as cancer of cervix, mouth, breast and tobacco related cancer by screening/self examination method; and
c. Tertiary prevention i.e. strengthening of the existing institutions of comprehensive therapy including palliative care.

The schemes under the revised programme are :

1. Regional Cancer Centre Scheme

The existing regional cancer centres are being further strengthened to act as referral centres for complicated and difficult cases at the tertiary level. One time assistance of Rs. 3 crores during the plan period is provided to Regional Cancer Centres except TMH, Mumbai and IRCH (AIIMS) for strengthening and to the CNCI, Kolkata on the approved pattern of funding.

2. Oncology Wing Development Scheme

This scheme had been initiated to fill up the geographic gaps in the availability of cancer treatment facilities in the country. Central assistance is provided for purchase of equipment, which include a cobalt unit besides other equipment. A part of the grant can be used for the civil work but the manpower is to be provided by the concerned state government/institution. The quantum of central assistance is Rs. 3 crores per institution under the scheme.

3. Decentralized NGO scheme

This scheme is meant for IEC activities and early detection of cancer. The scheme is operated by the nodal agencies and the NGOs are given financial assistance for undertaking health education and early detection activities of cancer.

4. IEC activities at central level

IEC activities at the central level are to be initiated in order to give wider publicity about the Anti-Tobacco Legislation for discouraging consumption of cigarettes and other tobacco related products, and for creating awareness among masses about the ill effects of consumption of tobacco and tobacco related products. Under this scheme wider publicity would also be given about the rules being formulated for implementation of various provisions of the anti-tobacco legislation. November 7th is observed as National Cancer Awareness Day in the country.

5. Research and training

Training programmes, monitoring and research activities will be organized at the central level under this scheme. Following training manuals have been developed under the NCCP for capacity building in cancer control at district level:

a. Manual for health professionals
b. Manual for cytology
c. Manual for palliative care
d. Manual for tobacco cessation

Cancer services under national programme for prevention and control of cancer, diabetes, CVD and stroke *(47)* :

1. Common diagnostic services, basic surgery, chemotherapy and palliative care for cancer cases is being made available at 100 district hospitals.
2. Each district is being supported with Rs. 1.66 crores per annum for the following :
   - Chemotherapy drugs are provided for 100 patients at each district hospital.
   - Day care chemotherapy facilities is being established at 100 district hospitals.
   - Facility for laboratory investigations including mammography is being provided at 100 district hospitals and if not available, this can be outsourced at government rates.
3. Home based palliative care is being provided for chronic, debilitating and progressive cancer patients at 100 districts.
4. Support is being provided for contractual manpower through 1 Medical Oncologist, 1 Cytopathologist, 1 Cytopathology technician, 2 Nurses for day care.
5. State Cancer Institutes will provide comprehensive cancer diagnosis, treatment and care services. SCI will be apex institution in the state for cancer treatment activities.
6. 45 centres were to be strengthened as Tertiary Cancer Centres (TCCs) to provide comprehensive cancer care services at a cost of Rs. 6.00 crore each during 2011–12.

NATIONAL TOBACCO CONTROL PROGRAMME

A comprehensive tobacco control legislation titled "The Cigarettes and other Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, Supply and Distribution) Act, 2003" was passed by the parliament in April, 2003 and notified in Gazette of India on 25th Feb, 2004. The important provisons of the Act are :

a. Prohibition of smoking in public places;
b. Prohibition of direct and indirect advertisement of cigarette and other products;
c. Prohibition of sale of cigarette and other tobacco products to a person below the age of 18 years,
d. Prohibition of sale of tobacco products near the educational institutions;
e. Mandatory depiction of statutory warnings (including pictorial warnings) on tobacco packs; and
f. Mandatory depiction of tar and nicotine contents alongwith maximum permissible limits on tobacco packs.

The rules related to prohibition of smoking in public places came into force from the 2nd October, 2008. As per rules, it is mandatory to display smoke free signages at all public places. Labelling and packaging rules mandating the depiction of specified health warnings on all tobacco product packs came into force from 31st May, 2009.

On account of sustained efforts on the part of Ministry of Health and Family Welfare, 34 States/UTs have issued orders for implementation of the Food Safety Regulations banning manufacture, sale and storage of gutka and pan masala containing tobacco or nicotine in the year 2014–15. Besides several states/UTs have banned all forms of smokeless tobacco products such as chewing tobacco, zarda, khaini and other flavoured and processed tobacco irrespective of name and form *(46)*.

On 24th September 2015, Government of India notified that the rules on "tobacco pack pictorial warnings" would come into effect from 1st April 2016. These rules mandate display of pictorial health warnings on 85 per cent of the principle display area of tobacco product pack on both sides (60 per cent of the picture and 25 per cent of the text).

National Tobacco Control Programme *(3)* : In order to facilitate the implementation of the Tobacco Control Laws, to bring about greater awareness about the harmful effects of tobacco, and to fulfill the obligations under the WHO–Framework convention on tobacco control, Govt. of India has launched a new National Tobacco Control Programme in the 11th Five Year Plan. Pilot phase was launched in 16 districts covering 9 states in 2007–08. It now covers 108 districts in 31 states in the country. The main components of the programme are :

1. Public awareness/mass media campaigns for awareness building and for behavioural change;
2. Establishment of tobacco product testing laboratories, to build regulatory capacity, as required under COTPA, 2003;
3. Mainstreaming the programme components as a part of the health delivery mechanism under the NRHM framework;
4. Mainstream research and training on alternate crops and livelihood, with other nodal ministries;
5. Monitoring and evaluation, including surveillance, e.g. adult tobacco survey;
6. Dedicated tobacco control cells for effective implementation and monitoring of anti–tobacco initiatives;
7. Training of health and social workers, NGOs school teachers etc;
8. School programme; and
9. Provision of tobacco cessation facilities.

NATIONAL MENTAL HEALTH PROGRAMME

The National Mental Health Programme was launched during 1982 with a view to ensure availability of Mental Health Care Services for all, especially the community at risk and underprivileged section of the population, to encourage application of mental health knowledge in general health care and social development. A National Advisory Group on mental health was constituted under the Chairmanship of the Secretary, Ministry of Health and Family Welfare for the effective implementation of the National Health Programme. Eleven institutions have been identified for imparting training in basic knowledge and skills in the field of mental health to the primary health care physicians and para-medical personnel. At present this programme covers 517 districts in 36 states.

The aims of the NMHP are : (a) Prevention and treatment of mental and neurological disorders and their associated disabilities; (b) Use of mental health technology to improve general health services; and (c) Application of mental health principles in total national development to improve quality of life *(70)*.

The objectives of the programme are :

1. To ensure availability and accessibility of minimum mental health care for all in the foreseeable future, particularly to the most vulnerable and underprivileged sections of population.
2. To encourage application of mental health knowledge in general health care and in the social development.

3. To promote community participation in the mental health services development, and to stimulate efforts towards self-help in the community.

The programme strategies are :

1. Integration of mental health with primary health care through the NMHP;
2. Provision of tertiary care institutions for treatment of mental disorders;
3. Eradicating stigmatization of mentally ill patients and protecting their rights through regulatory institutions like the Central Mental Health Authority, and State Mental Health Authority.

District Mental Health Programme components are : (a) Training programmes of all workers in the mental health team at the identified nodal institute in the state; (b) Public education in mental health to increase awareness and to reduce stigma; (c) For early detection and treatment, the OPD and indoor services are provided; and (d) Providing valuable data and experience at the level of community to the state and centre for future planning, improvement in service and research.

District Mental Health Programme has now incorporated promotive and preventive activities for positive mental health which includes :

- *School mental health services* : Life skills education in schools, counselling services.
- *College counselling services* : Through trained teachers/ councellors.
- *Work place stress management* : Formal & Informal sectors, including farmers, women etc.
- *Suicide prevention services* : Counselling center at district level, sensitization workshops, IEC, help lines etc.

The National Human Rights Commission also monitors the conditions in the mental hospitals along with the government of India, and the states are acting on the recommendations of the joint studies conducted to ensure quality in delivery of mental care.

Thrust areas *(47)*

1. District mental health programme in an enlarged and more effective form covering the entire country.
2. Streamlining/modernization of mental hospitals in order to modify their present custodial role.
3. Upgrading department of psychiatry in medical colleges and enhancing the psychiatric content of the medical curriculum at the undergraduate as well as postgraduate level.
4. Strengthening the central and state mental health authorities with a permanent secretariat. Appointment of medical officers at state headquarters in order to make the monitoring role more effective.
5. Research and training in the field of community mental health, substance abuse and child adolescent psychiatric clinics

The Mental Healthcare Act, 2017 *(16)*

The United Nations convention on the rights of persons with disabilities was ratified by the Government of India thus making it obligatory on the Government to align the policies and laws of the country with the convention. There was an increasing realization that persons with mental illness constitute a vulnerable section of society and are subject to discrimination in our society.

The Mental Healthcare Bill, 2013 was introduced in Parliament in order to protect and promote the right persons with mental illness during the delivery of health in institutions and in the community and to ensure he care, treatment and rehabilitation of persons with me illness, is provided in the least restrictive environm possible. Further, to regulate the public and private me health sectors within rights framework, to achieve greatest public health good and to promote principles equity, efficiency and active participation of all stakehold in decision making. Suicide has been decriminalized un the Act. The bill received assent of the Hon'ble President India on 07.04.2017. The Ministry has constituted committee of experts for formulating rules and regulati under the Act.

INTEGRATED DISEASE SURVEILLANCE PROJECT

Integrated disease surveillance project is a decentraliz state based surveillance system in the country. This project intended to detect early warning signals of impendi outbreaks and help initiate an effective response in a time manner in urban and rural areas. It will also provi essential data to monitor progress of ongoing disease contr programme and help allocate health resources mo efficiently. The project was launched in Nov. 2004. It was 5 year project up to March 2010. The project wa restructured and extended up to March 2012. It continues i the 12th Five Year Plan with domestic budget as integrate Disease Surveillance Programme under National Healt Mission for all states.

A Central Surveillance Unit (CSU) established an integrated in the National Centre for Disease Control, Delh State Surveillance Units (SSU) at all State/UT head quarter and District Surveillance Units (DSU) at all districts in th country have been established. IT network connecting 74 sites in states/district head quarters and premier institutes ha been established with the help of National Information Centr and ISRO (Indian Space Research Organization) for data entry, training, video conferencing and outbreak discussions

Under the project weekly disease surveillance data o epidemic prone diseases are being collected from reporting units such as sub-centres, PHCs, CHCs, hospitals including government and private sector hospitals and medical colleges. The data are being collected on 'S' syndromic; 'P' probable; and 'L' laboratory formats using standard case definitions. Presently more than 90 per cent districts report such weekly data through e-mail/portals. The weekly data are analysed by SSU/DSU for disease trends. Whenever there is rising trend of illness, it is investigated by the Rapid Response Team to diagnose and control the outbreak. It is a multi speciality team of an epidemiologist, a clinician, a microbiologist and other specialists as per requirement.

The surveillance is needed to recognize cases or cluster of cases to initiate interventions to prevent transmission of disease or reduce morbidity and mortality; access the public health impact of health events or determine and measure trends; demonstrate the need for public health intervention programmes and resources and allocate resources during public health planning; monitor effectiveness of prevention and control measures; identify high-risk groups or geographical areas to target interventions and guide analytic studies; and develop hypothesis that lead to analytic studies about risk factors for disease causation, propagation and progression *(71)*.

In this project, different types of integration are proposed. These include : (a) Sharing of surveillance information of disease control programmes; (b) Developing effective partnership with health and non-health sectors in surveillance; (c) Including non-communicable and communicable diseases in the surveillance system; (d) Effective partnership of private sector and NGOs in surveillance activities; and (e) Bringing academic institutions and medical colleges into the primary public health activity of disease surveillance.

The important information in disease surveillance are – who gets the disease, how many get the disease, where did they get the disease, why did they get the disease, and what needs to be done as public health response.

The components of the surveillance activity are :

(a) Collection of data

(b) Compilation of data

(c) Analysis and interpretation

(d) Follow-up action

(e) Feedback.

The prerequisite of the effective surveillance are – use of standard case definition, ensure regularity of reports and the action on reports.

The classification of surveillance in IDSP is as follows :

a. *Syndromic diagnosis* – diagnosis is made on the basis of clinical pattern by paramedical personnel and members of the community;
b. *Presumptive diagnosis* – diagnosis made on typical history and clinical examination by medical officer; and
c. *Confirmed diagnosis* – clinical diagnosis by a medical officer and or positive laboratory identification.

Syndromes under surveillance (71) :

The paramedical health staff will undertake disease surveillance based on broad categories of presentation. The following clinical syndromes will be under surveillance in IDSP :

1. Fever:
   a. Less than 7 days duration without any localizing signs
   b. With rash
   c. With altered sensorium or convulsions
   d. Bleeding from skin or mucus membrane
   e. Fever more than 7 days with or without localizing signs
2. Cough more than 3 weeks duration
3. Acute flaccid paralysis
4. Diarrhoea
5. Jaundice, and
6. Unusual events causing death or hospitalization.

These syndromes are intended to pick up all priority diseases listed under regular surveillance at the level of the community under the Integrated Disease Surveillance Project.

Fever with or without localizing signs	Malaria, Typhoid, JE, Dengue, Measles
Cough more than 3 weeks	Tuberculosis
Acute flaccid paralysis	Polio
Diarrhoea	Cholera
Jaundice	Hepatitis, Laptospirosis, Dengue, Malaria, Yellow fever
Unusual syndromes	Anthrax, Plague, Emerging epidemics

The core conditions under surveillance in IDSP are as follows *(71)* :

(i) Regular Surveillance:

Vector borne disease	:	Malaria
Water borne disease	:	Acute diarrhoeal disease (cholera)
	:	Typhoid
Respiratory diseases	:	Tuberculosis
Vaccine preventable diseases	:	Measles
Diseases under eradication	:	Polio
Other conditions	:	Road traffic accidents (Link-up with police computers)
Other international commitments	:	Plague
Unusual clinical syndromes (causing death/ hospitalization)	:	Meningoencephalitis / Respiratory distress, Haemorrhagic fevers, other undiagnosed conditions

(ii) Sentinel Surveillance:

Sexually transmitted diseases / blood borne	:	HIV / HBV, HCV
Other conditions	:	Water quality monitoring
	:	Outdoor air quality (Large urban centres)

(iii) Regular periodic surveys:

NCD risk factors	:	Anthropometry, Physical activity, Blood pressure, Tobacco, Nutrition etc.

(iv) Additional state priorities:

Each state may identify upto five additional conditions for surveillance.

Outbreak

In epidemiology, an outbreak is a sudden increase in occurrence of a disease in a particular time and place. A single case of a communicable disease long absent from a population, or caused by an agent (e.g. bacterium or virus) not previously recognized in that community or area, or emergence of a previously unknown disease, may also constitute an outbreak and should be reported and investigated.

Warning signs of an impending outbreak are as follows *(72)*:

- Clustering of cases or deaths in time and/or space
- Unusual increase in number of cases or deaths
- Even a single case of measles, AFP, cholera, plague, dengue or JE
- Acute febrile illness of unknown aetiology
- Occurrence of two or more epidemiologically linked cases of meningitis, measles

- Unusual isolate
- Shifting in age distribution of cases
- Sudden increase/high vector density
- Natural disasters

Summary of outbreak syndromes and trigger events for investigation *(72)* :

Syndrome	Trigger event
Acute watery stools	– A single case of severe dehydration/death in a patient > 5 years of age with diarrhoea. – More than 10 houses having at least one case of loose stools irrespective of age, per village or an urban ward.
Fever < 7 days duration	
(a) Only fever	5 cases in 1000 population.
(b) With rash (Measles / Dengue)	Two similar cases in a village (1000 population).
(c) Altered consciousness	Two cases of fever with altered consciousness in the village/1000 population.
(d) Fever with bleeding	Two cases of fever with bleeding in a village or 1000 population.
Fever with convulsions	Two cases of fever with convulsions in a village or 1000 population.
Fever more than 7 days	More than 2 cases in a village or 1000 population.
Jaundice	More than 2 cases in a village or in 1000 population.
Unusual event	More than 2 deaths or hospitalization.

The reporting units for disease surveillance are :

	Public Health Sector	Private Health Sector
Rural	CHCs, District hospitals	Sentinel private practitioners, and Sentinel hospitals.
Urban	Urban hospitals, ESI / Railway / Medical college hospitals.	Sentinel private nursing homes, sentinel hospitals, Medical colleges, Private and NGO laboratories

1. Sub-centre–health worker/ANM reports all patients fulfilling the clinical syndrome from PHC, private clinic, hospital etc.
2. PHC/CHC medical officers report as probable cases of interest, where this cannot be confirmed by laboratory tests at the peripheral reporting units, and as confirmed when the laboratory information is available as in case of blood smear +ve malaria and sputum AFB +ve tuberculosis.
3. Sentinel private practitioners, district hospitals, municipal hospitals, medical colleges, sentinel hospitals, NGOs – medical officers report as probable cases of interest.

AYUSHMAN BHARAT PROGRAMME

In February 2018, the Govt. of India announced two major initiatives in health sector, with aim to cover preventive and health promotive interventions at primary, secondary and tertiary care system. They are as follows (75) :

1. Ayushman *Arogya Mandir (AAM)* (Previously known as Health and Wellness Centre) : The National Health Policy 2017 has envisioned Health and Wellness Centres as the foundation of India's health system. Under this 1.5 lakh centres will bring health care system closer to homes of people. The health centres will provide comprehensive health care, including maternal and child health services, Communicable Diseases services, and services related to Non-Communicable Diseases. To begin with, the common NCDs such as hypertension, diabetes and 3 common cancers of oral, breast and cervix. It is also envisaged to incrementally add primary healthcare services for mental health, ENT, opthalmology, oral health, geriatric and palliative health care and trauma care, as well as health promotion and wellness activities like Yoga. A few States/UTs have already started rolling out these additional packages of services in a phased manner. The centres will also provide free essential drugs and diagnostic services.
2. The second component is the Ayushman Bharat - Pradhan Mantri Jan Arogya Yojana (AB-PMJAY) which provides health coverage upto Rs. 5.00 lakh per family per year to about 10.74 crore poor and vulnerable families identified on the basis of Socio Economic Caste Census data.

The first Health and Wellness Centre was inaugurated on 14th April 2018 in Bijapur district of Chhattisgarh. So far, 1,72,148 centres are operational in the country as on 31st March, 2024.

Primary healthcare team at the Sub Health Centre level AAM is headed by Community Health Officer (CHO) who is a BSc/GNM Nurse or an Ayurveda Practitioner trained in primary care and public health skills, and certified in a six months certificate programme in community health. Other members of the team being multi-purpose workers (Male and Female) and Accredited Social Health Activists (ASHAs).

The training programme is being carried out with support from IGNOU and state specific Public/Health Universities. 252 IGNOU Programme Study Centres (PSCs) have been notified so far, and another 111 PSCs have been notified under the state specific certificate programme in the state of Maharashtra, Tamil Nadu, Gujarat and West Bengal, taking the total of programme study centres to 393 across the country.

Since the screening, prevention and management of chronic illnesses including NCDs, TB and Leprosy have been introduced at AB-HWCs, training and skill upgradation of the primary health team in all the functional AAMs on NCDs and use of IT application is being done.

To promote wellness and healthy lifestyle, orientation of the public on wellness activities for lifestyle modification like increased physical activity (cyclathons and marathons), eating RIGHT and SAFE, cessation of tobacco and drugs, meditation, laughter clubs, open gyms, etc. is being done. Beside these, Yoga sessions are being conducted at these centres on regular basis. Through annual health calendar, planned activities at these centres on the health condition of the day are resulting in increased awareness and preventive measures to be adopted by the public.

The telemedicine guidelines have also been provided to the States to initiate specialist consultations from the PHCs to the Hub Hospitals and the pilot of the application is being conducted in Andhra Pradesh, Tamil Nadu and Maharashtra.

Expanded service packages planned to be provided at functional AAMs are as follows :

1. Care in pregnancy and child birth.
2. Neonatal and infant health care services.
3. Childhood and adolescent health care services.
4. Family planning, contraceptive services and other reproductive health care services.
5. Management of communicable diseases : National Health programmes.
6. General out-patient care for acute simple illnesses and minor ailments.
7. Screening, prevention, control and management of non-communicable diseases and chronic communicable diseases like tuberculosis and leprosy.
8. Basic oral health care.
9. Screening and basic management of mental health ailments.
10. Care for common ophthalmic and ENT problem.
11. Elderly and palliative health care services.
12. Emergency medical services including burns and trauma.

Expected outcome (7)

- Increasing the trust of people on the service provision by public healthcare facilities through health system strengthening and improvement.
- Availability of assured healthcare services to ensure continuum of care.
- Reduction in out of pocket expenditure of the common people.
- Increased awareness among the people about preventive and promotive healthcare.
- Benefits of healthy lifestyle including Yoga, and eat right & eat safe etc.
- Enabling environment to increase the health seeking behaviour of the poor people.

For further details please refer to chapter 9 for school health programme and chapter 10 for Health and Wellness Centres.

The Union Cabinet approved a major expansion of the Ayushman Bharat Pradhan Mantri Jan Arogya Yojana (AB PM-JAY) on September 11, 2024. Under this decision, all senior citizens aged 70 and above will receive health coverage, regardless of their income. This expansion is set to benefit around 4.5 crore families, including 6 crore senior citizens, by providing them with free health insurance coverage of up to Rs 5 lakh per family. With this approval, every senior citizen in this age group will have access to the scheme's benefits, regardless of their socio-economic status (74).

Key new developments of the AB PM-JAY is as follows :

- *New distinct card :* Eligible senior citizens aged 70 and above will receive a new, distinct card under the AB PM-JAY scheme.
- *Top-up coverage :* Senior citizens within families already covered by AB PM-JAY will receive an additional top-up cover of up to Rs 5 lakh per year. This top-up will be for them, and they will not have to share it with other family members under the age of 70.
- *Family coverage :* Senior citizens who are not part of an existing AB PM-JAY family coverage will be provided with a cover of up to Rs 5 lakh per year on a family basis.
- *Choice of schemes :* Senior citizens who are already benefiting from other public health insurance schemes like the Central Government Health Scheme (CGHS), Ex-Servicemen Contributory Health Scheme (ECHS), or Ayushman Central Armed Police Force (CAPF) have the option to either continue with their current scheme or opt for AB PM-JAY.
- *Eligibility with private insurance :* Senior citizens who are covered by private health insurance policies or the Employees' State Insurance scheme are also eligible to benefit from AB PM-JAY.

NATIONAL PROGRAMME FOR PREVENTION AND MANAGEMENT OF TRAUMA AND BURN INJURIES (NPPMTBI)

A. Trauma Care component : *(7)*

In India, road traffic crashes are one of the major causes of disability, morbidity and mortality. As per the Road Accident Report for 2019, a total number of 4,49,002 accidents took place in the country during the calendar year 2019 leading to 1,51,113 deaths and 4,51,361 injuries.

The programme for trauma care started during 9th and 10th Five Year Plans as "Pilot Project for Strengthening Emergency Facilities along the Highways". During the 11th FYP, the programme was approved as "Assistance for Capacity Building for Developing Trauma Care Facilities in Government Hospitals on National Highways" for developing a network of trauma care facilities (TCFs) in the Government Hospitals along the Golden Quadrilateral highway corridor as well as North-South & East-West Corridors wherein 116 TCFs were approved in 17 States on these corridors on 100% Central assistance. The scheme was further extended during 12th FYP as "Capacity Building for Developing Trauma Care Facilities in Govt. Hospitals on National Highways" wherein 80 Hospitals/Medical Colleges were approved for financial assistance in addition to other interventions. The scheme is being extended since then.

Objectives of the programme are as follows :

- To establish a network of Trauma Care Facilities on National/State Highways in order to reduce the incidence of preventable deaths and disabilities due to road traffic accidents by observing golden hour principle.
- To develop Surveillance, Trauma Registry and Capacity Building Centre for collection, compilation, analysis and dissemination of information for policy formulation and preventive interventions.
- To improve the awareness about trauma care among the general masses and vulnerable groups by developing and disseminating IEC material.

B. Burn Injuries component : *(7)*

India has one of the largest burdens of burns with an estimated 7,000,000 burn injuries per year, and an estimated 1.4 lakh deaths and 2.4 lakh disabilities, making burn injuries the second largest group of injuries after road accidents. These figures translate to a mortality rate of over

8.3/100,000 population, disfigurement and permanent disability in 250,000 people annually, and a loss of 5 million disability-adjusted life years (DALYs).

This high incidence has been attributed to illiteracy, poverty, and low safety consciousness in the population. The epidemiology of mortality after burns is unique in India; most burn injuries are in young adults and deaths are more common in women than men, contrasting trends observed in other low-and middle-income countries. Burns survivors are also known to be financially distressed, vocationally challenged and socially excluded. Death and disability due to burn injury are preventable to a great extent provided timely and appropriate treatment is provided by trained healthcare professionals.

Keeping in view the magnitude of the problem, a pilot programme on burn care was initiated in the year 2010 by Ministry of Health & Family Welfare in the name of "Pilot Programme for Prevention of Burn Injuries" (PPPBI). This was initiated in three Medical Colleges and six Districts Hospitals. The goal of PPPBI was to ensure prevention of Burn Injuries, provide timely and adequate treatment in case of burn injuries, so as to reduce mortality, complications and ensuing disabilities and to provide effective rehabilitative interventions if disability has set in.

The pilot project continued as full-fledged programme for tertiary care level during the 12th Five Year Plan period. The financial assistance towards District Hospital component was undertaken under National Health Mission (NHM). The scheme is being extended since then.

NATIONAL GUINEAWORM ERADICATION PROGRAMME

India launched its National Guineaworm Eradication Programme in 1984 with technical assistance from WHO. From the very beginning the programme was integrated into the national health system at village level. With well defined strategies, an efficient information and evaluation system, intersectoral coordination at all levels and close collaboration with WHO and UNICEF, India was able to significantly reduce the disease in affected areas. The country has reported zero cases since August 1996. In February 2000, the International Commission for the Certification of Dracunculiasis Eradication recommended that India be certified free of dracunculiasis transmission *(73)*.

The following activities are continuing as per recommendations of International Certification Team of International Commission for Certification of Dracunculiasis Eradication, Geneva :

a. Health education activities with special emphasis on school children and women in rural areas;
b. Rumour registration and rumour investigation;
c. Maintenance of guinea-worm disease on list of notifiable disease and continuation of surveillance in previously infected areas; and
d. Careful supervision of the functioning of hand pumps and other sources of safe drinking water, and provision of additional units, wherever necessary.

YAWS ERADICATION PROGRAMME

The disease has been reported in India from the tribal communities living in hilly forest and difficult to reach areas in 49 districts of 10 states, namely Andhra Pradesh, Assam, Chhattisgarh, Gujarat, Jharkhand, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu and Uttar Pradesh. National Institute of Communicable Diseases is the nodal agency for planning, guidance, coordination, monitoring and evaluation of the programme. The programme is implemented by the State Health Directorates of Yaws endemic states utilizing existing health care delivery system with the coordination and collaboration of department of tribal welfare and other related institutions.

The number of reported cases has come down from more than 3,500 to Nil during the period from 1996 to 2004, since then no new case has been reported *(53)*.

NATIONAL PROGRAMME FOR CONTROL AND TREATMENT OF OCCUPATIONAL DISEASES

Government of India launched a scheme called "National Programme for Control and Treatment of Occupational Diseases" in 1998–99. The National Institute of Occupational Health, Ahmedabad (ICMR) has been identified as the nodal agency for this programme.

The following research projects have been proposed by the government *(76)* :

1. Prevention, control and treatment of silicosis and silico-tuberculosis in agate industry;
2. Occupational health problems of tobacco harvesters and their prevention;
3. Hazardous process and chemicals, database generation, documentation, and information dissemination;
4. Capacity building to promote research, education, and training at National Institute of Occupational Disease;
5. Health Risk Assessment and development of intervention programme in cottage industries with high risk of silicosis; and
6. Prevention and control of occupational health hazards among salt workers in the remote desert areas of Gujarat and Western Rajasthan.

NUTRITIONAL PROGRAMME

Please refer to chapter 11, for details.

NATIONAL FAMILY WELFARE PROGRAMME

See chapter 8 for details.

NATIONAL WATER SUPPLY AND SANITATION PROGRAMME

The National Water Supply and Sanitation Programme was initiated in 1954 with the object of providing safe water supply and adequate drainage facilities for the entire urban and rural population of the country. In 1972 a special programme known as the **Accelerated Rural Water Supply Programme** was started as a supplement to the national water supply and sanitation programme. Inspite of increased financial outlay during the successive Five Year Plans, only a small dent was made on the overall problem. During the Fifth Plan, rural water supply was included in the Minimum Needs Programme of the State Plans. The Central Government is supporting the efforts of the States in identifying problem villages through assistance under

Accelerated Rural Water Supply Programme. A "problem village" has been defined as one where no source of safe water is available within a distance of 1.6 km, or where water is available at a depth of more than 15 metres, or where water source has excess salinity, iron, fluorides and other toxic elements, or where water is exposed to the risk of cholera.

The stipulated norm of water supply is 40 litres of safe water per capita per day, and at least one hand pump/spot-source for every 250 persons. Information, education and communication is an integral part of rural sanitation programme to adopt proper environmental sanitation practices including disposal of garbage, refuse and waste water, and to convert all existing dry latrines into low cost sanitary latrines. The priority is to evolve financially viable sewerage systems in big cities and important pilgrimage and tourist centres and recycling of treated effluents for horticulture, irrigation and other non-domestic purposes *(77)*.

The programme was subsequently renamed as the Rajiv Gandhi National Drinking Water Mission in 1991. In 1999-2000, Sector Reform Project was started to involve the community in planning, implementation and management of drinking water schemes which was in 2002 scaled up as the Swajaldhara Programme.

Swajaldhara (78)

Swajaldhara was launched on 25th December 2002. Swajaldhara has certain fundamental reform principles, which need to be adhered to by the state governments and the implementing agencies. Swajaldhara is a community led participatory programme, which aims at providing safe drinking water in rural areas, with full ownership of the community, building awareness among the village community on the management of drinking water projects, including better hygiene practices and encouraging water conservation practices along with rainwater harvesting.

Swajaldhara has two components : Swajaldhara I (First Dhara) is for a gram panchayat or a group of panchayats (at block / tahsil level) and Swajaldhara II (Second Dhara) has district as the project area. District water and sanitation mission sanctions swajaldhara I. The panchayats and communities have the power to plan, implement, operate, maintain and manage all water supply and sanitation schemes. There is an integrated service delivery mechanism, taking up conservation measures through rain water harvesting and ground water recharge systems for sustained drinking water supply and shifting the role of government from direct service delivery to that of planning, policy formulation, monitoring and evaluation and partial financial support. On completion of the project, gram panchayat or village water and sanitation committee manages the project.

The programme was revised from 1st April 2009 and named as National Rural Drinking Water Programme *(62)*. It is now a component of Bharat Nirman which focuses on the creation of rural infrastructure.

Bharat Nirman

Bharat Nirman was launched by the Government of India in 2005 as a programme to build rural infrastructure. While phase-I was implemented in the period of 2005-06 to 2008-09, the phase-II was implemented from 2009-10 to 2011-12. At the beginning of phase-I period, priority was given to cover water quality problem and other contaminants, e.g., arsenic and fluoride affected habitations followed by iron, salinity, nitrate.

New initiatives in 12th Five Year Plan

1. In order to raise coverage of piped water supply, toilet coverage and strengthening of institutions and systems in rural drinking water and rural sanitation sectors the Ministry has proposed a Rural Water Supply and Sanitation Project for low income states;
2. Enhancement of service levels for rural water supply from the norm of 40 lpcd to 55 lpcd for designing of system. The target being at least 50 per cent of rural population in the country to have access to water within their household premises or within 100 metres radius, with at least 30 per cent having individual household connections, as against 13 per cent today *(79)*.

The Nal Jal Yojana *(82)*

The Nal Jal Yojana, also known as the Jal Jeevan Mission (JJM), is a programme that aims to provide every rural household with access to safe and reliable tap water by 2024. The program's goal is to provide every rural household with a Functional Household Tap Connection (FHTC) that delivers at least 55 liters of tap water per person per day. The water must meet prescribed quality standards.

Rural Sanitation Programme *(79)*

Nirmal Bharat Abhiyan (NBA)

In 2012, a paradigm shift was made in the Total Sanitation Campaign, by launching the Nirmal Bharat Abhiyan, in the 12th Five Year Plan. The objective of NBA is to achieve sustainable behavioural change with provision of sanitary facilities in entire communities in a phased manner, saturation mode with "Nirmal Grams" as outcomes.

Swachh Bharat Mission

Swachh Bharat Abhiyan or Swachh Bharat Mission is a national campaign by the government of India to clean streets, roads and infrastructure of the country. The campaign was officially launched by Prime Minister of India on 2nd Oct, 2014, at Rajghat, New Delhi. It aims to eradicate open defecation by year 2019, by constructing 12 million toilets in rural India. Mission has two sub-missions, namely, Swachh Bharat Mission Urban, and Swachh Bharat Mission Gramin.

Swachh Bharat Mission Gramin (SBM-G) (80)

The Mission in rural India will mean improving the level of cleanliness in rural areas through solid and liquid waste management and making gram panchayats free of open defecation, clean and sanitized. The programme includes the key components of earlier sanitation schemes.

The key objectives of the programme are as follows:

(a) Bring about an improvement in the general quality of life in the rural areas, by promoting cleanliness, hygiene and eliminating open defecation;

(b) Accelerate sanitation coverage in rural area to achieve the vision of Swachh Bharat by 2nd October 2019;

(c) Motivate Communities and Panchayati Raj Institutions to adopt sustainable sanitation practices and facilities through awareness creation and health education;

(d) Encourage cost effective and appropriate technologies for ecologically safe and sustainable sanitation: and

(e) Develop wherever required, community managed sanitation systems focusing on scientific solid & liquid waste management systems for overall cleanliness in the rural areas.

The key components of SBM-G include, start up activities including preparation of state plan; construction of household toilets; construction of community sanitary complexes; and capacity building of functionaries etc. Under the programme, construction of toilets in government schools and anganwadi centres will be done by the Ministry of Human Resource Development and Ministry of Women and Child Development respectively. Rural School sanitation focusing on separate toilets for girls and boys is a major intervention which shall be implemented under the programmes of the Department of School Education.

A duly completed household sanitary toilet shall comprise of toilet unit including a substructure which is sanitary (that safely confines human faeces and eliminates the need of human handling before it is fully decomposed), a super structure, with water facility and hand wash unit for cleaning and hand washing. The Mission aims that all rural families have access to toilets. Incentives for construction of household toilets will be available for below poverty line households, and above poverty line households restricted to SCs/STs, small and marginal farmers, landless labourers, physically handicapped and women headed families.

Swachh Bharat Mission–Urban (81)

Swachh Bharat Mission–Urban (SBM-U) is being implemented by Ministry of Urban Development. The main objectives of the mission are as follows:

1. Elimination of open defecation;
2. Eradication of manual scavenging;
3. Modern and scientific municipal solid waste management;
4. To effect behavioural change regarding healthy sanitation practices;
5. Generate awareness about sanitation and its linkage with public health;
6. Capacity augmentation for ULB's; and
7. To create an enabling environment for private sector participation in Capex (capital expenditure) and Opex (operation and maintenance).

Mission components

The Mission has the following components:

1. Household toilets, including conversion of insanitary latrines into pour-flush latrines;
2. Community toilets;
3. Public toilets;
4. Solid waste management;
5. IEC & public awareness; and
6. Capacity building and administrative & office expenses.

By Public Toilets, it is implied that these are to be provided for the floating population/ general public in places such as markets, train station, tourist places, near office complexes, or other public areas where there are considerable number of people passing by.

By Community Toilets, it is implied that a shared facility provided by and for a group of residents or an entire settlement. Community toilet blocks are used primarily in low-income and/or informal settlements / slums, where space and/or land are constraints in providing a household toilet, These are for a more or less fixed user group.

All statutory towns will be covered under the mission. The special focus group under the mission are as follows:

i. All manual scavengers in urban areas are identified, insanitary toilets linked to their employment are upgraded to sanitary toilets, and the manual scavengers are adequately rehabilitated;

ii. In their efforts to streamline and formalize SWM systems it shall be the endeavor of ULBs that the informal sector workers in waste management (rag pickers) are given priority to upgrade their work conditions and are enumerated and integrated into the formal system of SWM in cities;

iii. All temporary accommodation for migrants and the homeless in urban areas have adequate provision for toilets either on the premises or linked to a public community toilet;

iv. Mandating that construction labour in urban areas have access to temporary toilets at all sites in urban areas, buildings, parks and roads where construction / maintenance work is taking place or where construction labour is temporarily housed; and

v. Priority shall be accorded pro-actively to cover households with vulnerable sections such as pensioners, girl children, pregnant and lactating mothers.

Household toilet component of SBM-Urban

SBM (Urban) aims to ensure that –

(a) No households engage in the practice of open defecation;

(b) No new insanitary toilets are constructed during the mission period; and

(c) Pit latrines are converted to sanitary latrines.

The target group for construction of household units of toilets, thus, is:

(i) 80% of urban households engaging in open defecation;

(ii) All households with insanitary latrines; and

(iii) All households with single-pit latrines.

These will be targeted under this component for the construction of household toilets or individual household latrines during the mission period. The remaining 20% of households practicing open defecation will be catered by community toilets, due to constraints of space.

Household toilets constructed under SBM (Urban) will have two main structures – the toilet superstructure (including the pan and water closet), and the sub- structure, either an on-site treatment system or a connection to existing underground sewerage system.

Clean Toilets Campaign - 2024

Over the last 10 years, Swachh Bharat Mission has brought toilets and sanitation to the centre stage. The mission is committed to ensuring that all citizens have access to well maintained, clean and hygienic toilet facilities. To ensure the same, the mission launched the Clean Toilets Campaign in 2023 to nudge cleanliness drives across all CTs

and PTs. Over 800 Toilet Blocks were retrofitted and upgraded and 400+ new toilet blocks were constructed. Additionally, over 10,000+ toilets were nominated as adhering to FACES (Functional, Accessible, Clean, Eco-friendly, Safe) parameters with 1,500+ women-led SHGs (approx. 1.5 lakh women) completing the FACES-based assessment of 42,000+ CTs/PTs during the campaign period. On World Toilet Day 2024, the Mission is set to launch a 5-week 'Clean Toilets Campaign' from 19th November, World Toilet Day to 25th December, Good Governance Day 2024 to transform all Community and Public Toilets (about 70,000+) across the country in terms of their cleaning and maintenance *(83)*.

Solid waste management component of SBM–Urban

Municipal Solid Waste Management (MSWM) refers to a systematic process that comprises of waste segregation and storage at source, primary collection, secondary storage, transportation, secondary segregation, resource recovery, processing, treatment, and final disposal of solid waste.

PRADHAN MANTRI AWAS YOJNA (URBAN)

Ministry of Housing and Urban Affair (MOHUA) launched the Pradhan Mantri Awas Yojna-Urban (PMAY-U) on 25th June, 2015, as a flagship mission of Government of India. It addresses urban housing shortage among the Economically Weaker Section (EWS)/Low Income Group (LIG) category including slum dwellers by ensuring a pucca house to eligible urban households. An eligible beneficiary family will comprise of a husband, wife, unmarried sons and or unmarried daughters. The beneficiary family should not own a Pakka House (an all whether dwelling unit) either in his/ her name or in the name of any member of his/her family in any part of India. An adult earning member (irrespective of marital status) can be treated as separate household.

PMAY-U adopts a demand driven approach wherein the housing shortage is decided based on demand assessment by States/Union territories (UTs). All houses built or acquired or purchased under the mission have basic amenities like kitchen, water supply, electricity and toilet. The mission promotes woman empowerment by providing the ownership of houses in the name of female members or in joint name. Preference is also given to women (with overriding preference to widows, single woman) persons belonging to Scheduled Caste/Scheduled Tribes/Other Backward Classes, Minorities, Persons with disability and Transgender *(85)*.

MINIMUM NEEDS PROGRAMME

The Minimum Needs Programme (MNP) was introduced in the first year of the Fifth Five Year Plan (1974–78). The objective of the programme is to provide certain basic minimum needs and thereby improve the living standards of the people. It is the expression of the commitment of the government for the "social and economic development of the community particularly the underprivileged and underserved population". The programme includes the following components :

a. Rural Health
b. Rural Water Supply
c. Rural Electrification
d. Elementary Education
e. Adult Education
f. Nutrition
g. Environmental Improvement of Urban Slums
h. Houses for landless labourers

There are two basic principles which are to be observed in the implementation of MNP : (a) the facilities under MNP are to be first provided to those areas which are at present underserved so as to remove disparities between different areas; (b) the facilities under MNP should be provided as a package to an area through intersectoral area projects, to have a greater impact.

In the field of **rural health**, the objectives to be achieved by the end of the Eighth Five Year Plan, under the minimum needs programme were : one PHC for 30,000 population in plains and 20,000 population in tribal and hilly areas; one sub-centre for a population of 5,000 people in the plains and for 3000 in tribal and hilly areas, and one community health centre (rural hospital) for a population of one lakh or one C.D. Block by the year 2000. The establishment of PHCs, sub-centres, upgradation of PHCs, and construction of buildings thereof are all included in the State sector of the minimum needs programme.

In the field of **nutrition**, the objectives are: (a) to extend nutrition support to 11 million eligible persons; (b) to expand "special nutrition programme" to all the ICDS projects; and (c) to consolidate the mid-day meal programme and link it to health, potable water and sanitation.

20-POINT PROGRAMME

In addition to the Five Year Plans and Programmes, in 1975, the Govt. of India initiated a special activity. This was the 20-Point programme – described as an **agenda** for national action to promote social justice and economic growth.

On August 20, 1986, and again in 2006, the existing 20-Point Programme was restructured. Its objectives are spelt out by the Government as "eradication of poverty, raising productivity, reducing inequalities, removing social and economic disparities and improving the quality of life".

The 20 points of twenty point programme 2006 are as follows *(84)* :

1. Poverty eradication
2. Power to people
3. Support to farmers
4. Labour welfare
5. Food security
6. Housing for all
7. Clean drinking water
8. Health for all
9. Education for all
10. Welfare of scheduled castes, scheduled tribes, minorities and OBCs
11. Women welfare
12. Child welfare
13. Youth development
14. Improvement of slums
15. Environment protection and afforestation

16. Social security
17. Rural roads
18. Energization of rural area
19. Development of backward areas
20. IT enabled E-Governance

The restructured 20-Point Programme constitutes the Charter for the country's socio-economic development. It has been described as "the cutting edge of the plan for the poor".

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8 Demography and Family Planning

"Delay the first, postpone the second and prevent the third"

Demography, as understood today, is the scientific study of human population. It focuses its attention on three readily observable human phenomena : (a) *changes* in population size (growth or decline); (b) the *composition* of the population; and (c) the *distribution* of population in space. It deals with five "demographic processes", namely fertility, mortality, marriage, migration and social mobility. These five processes are continuously at work within a population determining size, composition and distribution.

Community medicine is vitally concerned with population, because health in the group depends upon the dynamic relationship between the numbers of people, the space which they occupy and the skill that they have acquired in providing for their needs. The main sources of demographic statistics in India are population censuses, National Sample Surveys, registration of vital events, and adhoc demographic studies.

Demographic cycle

The history of world population since 1650 suggests that there is a demographic cycle of 5 stages through which a nation passes:

(1) FIRST STAGE (High stationary)

This stage is characterized by a high birth rate and a high death rate which cancel each other and the population remains stationary. India was in this stage till 1920.

(2) SECOND STAGE (Early expanding)

The death rate begins to decline, while the birth rate remains unchanged. Many countries in South Asia and Africa are in this phase. Birth rates have increased in some of these countries possibly as a result of improved health conditions and shortening periods of breast-feeding *(1)*.

(3) THIRD STAGE (Late expanding)

The death rate declines still further, and the birth rate tends to fall. The population continues to grow because births exceed deaths. India has entered this phase. In a number of developing countries (e.g., China, Singapore) birth rates have declined rapidly.

(4) FOURTH STAGE (Low stationary)

This stage is characterized by a low birth and low death rate with the result that the population becomes stationary. Zero population growth has already been recorded in Austria during 1980–85. Growth rates as little as 0.1 were recorded in UK, Denmark, Sweden and Belgium during 1980–85. In short, most industrialized countries have undergone a demographic transition shifting from a high birth and high death rates to low birth and low death rates.

(5) FIFTH STAGE : (Declining)

The population begins to decline because birth rate is lower than the death rate. Some East European countries notably Germany and Hungary are experiencing this stage.

WORLD POPULATION TRENDS

At the beginning of the Christian era, nearly 2,000 years ago, world population was estimated to be around 250 million. Subsequent estimates of the world population and rates of increase are given in Table 1.

TABLE 1
World population

Year	Population (million)	Average annual growth rate (per cent)
1750	791	–
1800	978	0.4
1850	1,262	0.5
1900	1,650	0.6
1950	2,526	1.1
1960	3,037	1.79
1970	3,696	1.92
1975	4,066	1.89
1980	4,432	1.72
1987	5,000	1.63
1991	5,385	1.7
1998	5,884	1.6
2000	6,054	1.4
2003	6,313	1.1
2007	6,655	1.4
2008	6,734	1.2
2010	6,908	1.23
2014	7,238	1.2
2016	7,418	1.2
2018	7,621	1.2
2019	7,715	1.1
2022	7,948	1.23
2023	8,091	0.88
2024	8,195	0.87

It required all the human history up to the year 1800 for the world population to reach one billion. The second billion came in 130 years (around 1930), the third billion in 30 years (around 1960), the fourth billion in 15 years (in 1974), the fifth billion in 12 years (in 1987), and the sixth billion in 12 years (1999). The 7th billion came by 31st Oct. 2011 (after 15 years). The world's population reached 8 billion on 15th Nov. 2022. It took 12 years for population to grow from 7 to 8 billion.

About three fourths of the world's population lives in the developing countries. The population of the ten most populous countries of the world and their relative share is shown in Fig. 1. Although, in terms of population USA ranks third in the

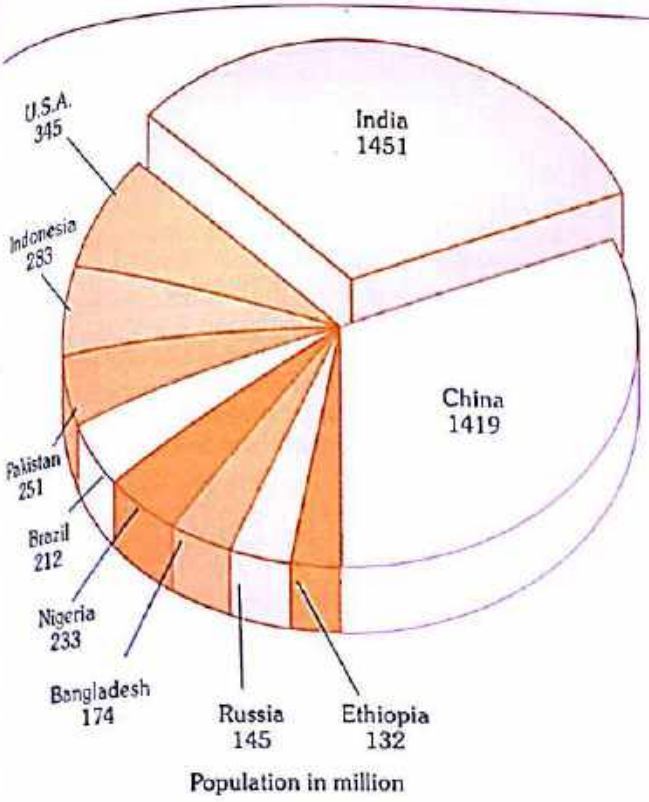

FIG. 1

Ten most populated countries of the world (mid-2024)

Source : *(2, 2A)*

world after India, there is a yawning gap of 1076 million between the population of these two countries. The United Nations has estimated that world's population is growing at an annual rate of 0.87 per cent in the year mid 2024.

Three countries of SEAR, i.e. India (1451 million), Indonesia (283 million), and Bangladesh (174 million) are among the most populous ten countries of the world. At present India's population has superceded to that of China. According to UN projections, India's population will reach 1.53 billion by the year 2050, and will be the highest population country in the world. The trend of population increase in South East Asia Region countries is as shown in Table 2.

TABLE 2

Trends in increase of population of SEAR countries (in million)

Country	1991	mid-2024
India	843.9	1,450.93
Bangladesh	118	174.0
Bhutan	1.5	0.79
Indonesia	187.7	283.4
Maldives	0.221	0.527
Myanmar	42.5	54.5
Nepal	19.6	29.65
Sri Lanka	17.4	23.1
Thailand	56.4	71.6

Source : *(2, 2B)*

Birth and death rates

The glaring contrasts in birth and death rates in selected countries are as shown in Table 3.

TABLE 3

Birth and death rates in selected developed and developing countries in mid-2024

Country	Birth rate	Death rate
India	16	7
Bangladesh	20	5
Pakistan	28	7
Sri Lanka	14	7
Thailand	7	9
Myanmar	16	7
Nepal	20	7
China	6	8
Japan	6	13
Singapore	7	6
UK	10	10
USA	11	9

Source : *(2, 2B)*

The world's birth rate fell below 30 for the first time around 1975 and had declined to about 16 during mid-2024 *(3)*. In most of the world the decline reflected falling birth rates and a global trend towards smaller families. The outstanding examples are Singapore and Thailand. In Singapore, in 50 years, the birth rate fell from 23 per thousand in 1970 to 7 in 2024; and in Thailand from 37 per thousand to 7 during the same period.

TABLE 4

Reduction in the birth and death rates in selected countries, 1990 – mid-2024

Country	Birth rate		Death rate	
	1990	mid-2024	1990	mid-2024
Bangladesh	35	20	10	5
Nepal	38	20	13	7
India	31	16	11	7
Sri Lanka	21	14	7	7
Thailand	19	7	8	9
Singapore	18	7	5	6
China	23	6	8	8
Pakistan	40	28	11	7

Source : *(2, 2B)*

In all these countries, key factors in fertility decline included changes in government attitudes towards growth, the spread of education, increased availability of contraception and the extension of services offered through family planning programmes, as well as the marked change in marriage patterns.

Death rates have also declined worldwide over the last decades. The global death rate declined from 11.0 (between 1975–1980) to 8 per thousand population in mid 2024, a reduction of 30.2 per cent. The decline in the death rate of the South-East Asia Region has been more marked, from 14.1 to 6 per 1000 population.

In countries with a relative young population, crude death rates are mainly affected by infant and child mortality. With improvement in maternal and child health services, successful implementation of the expanded programme on immunization, diarrhoeal disease and acute respiratory infection control programmes, as well as with the control of other infectious diseases, there has been marked reduction in infant and child mortality rates, which are reflected in the declining crude death rates.

Growth rates

When the crude death rate is substracted from the crude birth rate, the net residual is the current annual growth rate, exclusive of migration. The relation between the growth rate and population increase is as shown in Table 5.

TABLE 5
Relation between growth rate and population

Rating	Annual rate of growth %	Number of years required for the population to double in size
Stationary population	No growth	
Slow growth	Less than 0.5	More than 139
Moderate growth	0.5 to 1.0	139–70
Rapid growth	1.0 to 1.5	70–47
Very rapid growth	1.5 to 2.0	47–35
"Explosive" growth	2.0 to 2.5	35–28
——"——	2.5 to 3.0	28–23
——"——	3.0 to 3.5	23–20
——"——	3.5 to 4.0	20–18

Source : *(4)*

It is said that population growth rates, like railway trains, are subject to momentum. They start slowly and gain momentum. Once in motion, it takes time to bring the momentum under control. In case of the train the control factors are mass and inertia; in population, they are age distribution, marriage customs and numerous cultural, social and economic factors.

The world population growth rate was at, or near to its peak, around 1970, when the human population grew by an estimated 1.92 per cent. The most recent data shows a slight decline since then to 1.1 per cent in mid 2022.

The growth rate is not uniform in the world. There are many countries in the world (e.g., European countries) where the growth rate is less than 0.3 per cent per year. In developing countries, the growth rates are excessive – it is around 2.6 per cent in Africa, 1.0 per cent in Latin America, 0.3 per cent in Europe and industrialized countries, and 0.9 per cent in Asia. A population growing at 0.5 per cent per year will double in about 140 years, a population growing at 3 per cent per year will double in about 20–25 years (Table 5). These differences in growth rates are largely the result of fertility and mortality patterns. The salient features of population growth at a glance are as follows *(5)*:

1. The world's population continues to grow, albeit at a slower pace than at any time since 1950, owing to reduced levels of fertility. From an estimated 7.7 billion people worldwide in 2019 to around 8.5 billion in 2030, 9.7 billion in 2050 and 10.9 billion in 2100.
2. Countries of Sub-Saharan Africa could account for more than half of the growth of the world's population between 2019 and 2050.
3. More than half of the projected increase in global population will be concentrated in just nine countries: The Democratic Republic of the Congo, Egypt, Ethiopia, India, Indonesia, Nigeria, Pakistan, United Republic of Tanzania, and the USA. India is projected to surpass China as world's most populous country around 2027.
4. In most of Sub-Saharan Africa, as well as in parts of Asia, Latin America and Caribbean, recent reductions of fertility means that the population at working ages (25–64 years) is growing faster than in other age groups, providing an opportunity for accelerated economic growth known as the "demographic dividend".
5. In 2018, for the first time in history, persons aged 65 years or over, worldwide, outnumbered children under age 5 years.
6. It is estimated that ten countries are experiencing a net outflow of more than 1 million migrants between 2010 and 2020. For many of these countries losses of population due to migration are dominated by temporary labour movements.
7. Life expectancy at birth for the world's population reached 72.6 years in 2019. Life expectancy in under developed countries is 7.4 years behind global average, due largely to persistently high levels of child and maternal mortality, and in some countries, to violence and conflict, or the continuing impact of the HIV epidemic.

The rampant population growth has been viewed as the greatest obstacle to the economic and social advancement of the majority of people in the underdeveloped world.

DEMOGRAPHIC TRENDS IN INDIA

Demographic indicators

Demographic characteristics provide an overview of its population size, composition, territorial distribution, changes therein and the components of changes such as nativity, mortality and social mobility. Demographic indicators have been divided into two parts–population statistics and vital statistics.

Population statistics include indicators that measure the population size, sex ratio, density and dependency ratio.

Vital statistics include indicators such as birth rate, death rate, natural growth rate, life expectancy at birth, mortality and fertility rates.

These indicators help in identifying areas that need policy and programmed interventions, setting near and far-term goals and deciding priorities, besides understanding them in an integrated structure.

With a population of 1,412 million in the year mid 2022, India is the second most populous country in the world, next only to China, whereas seventh in land area. With only 2.4 per cent of the world's land area, India is supporting about 17.5 per cent of the world's population. The population of India since 1901, averaged annual exponential growth rate (%), and the decadal growth of population (%) was as shown in Table 6.

TABLE 6
Population of India, 1901–2011 (As per census)

Year	Total population (in million)	Average annual exponential growth rate (%)	Decadal growth rate (%)
1901	238.4	–	–
1911	252.1	0.56	0.75
1921	251.3	(–) 0.03	(–) 0.31
1931	279.0	1.04	11.00
1941	318.7	1.33	14.22
1951	361.1	1.25	13.31
1961	439.2	1.96	21.64
1971	548.2	2.20	24.80
1981	683.3	2.22	24.66
1991	846.4	2.16	23.87
2001	1,028.6	1.7	21.52
2011	1,210.1	1.64	17.64

Source : *(6)*

India's population has been steadily increasing since 1921. The year 1921 is called the "big divide" because the absolute number of people added to the population during each decade has been on the increase since 1921 (Table 6). India's population is currently increasing at the rate of 16 million each year.

India's population numbered 238 million in 1901, doubled in 60 years to 439 million (1961); doubled again, this time in only 30 years to reach 846 million by 1991. It crossed 1 billion mark on 11 May 2000, and is projected to reach 1.53 billion by the year 2050. This will then make India the most populous country in the world, surpassing China.

With the division of some states the rank of most populous states have changed. Table 7 shows the ten most populous states in the country by rank. It is seen that Uttar Pradesh comes first with about 231.425 million people, Maharashtra comes second with 128.711 million people and Bihar comes third with 108.377 million people. These ten states account for about 71 per cent of the total population of India *(7)*.

TABLE 7

Ranking of most populous states by projected population size 2020

Rank	State	Population 2020 (000)	Per cent to total population of India 2020
1.	Uttar Pradesh	231,425	16.7
2.	Maharashtra	128,711	9.0
3.	Bihar	108,377	7.8
4.	Andhra Pradesh	90,949	6.5
5.	Madhya Pradesh	82,134	5.9
6.	Rajasthan	76,759	5.5
7.	Tamil Nadu	70,617	5.0
8.	Gujarat	65,532	4.7
9.	Karnataka	64,410	4.6
10.	Odisha	43,732	3.1

Source : *(8)*

It has been estimated that with current trends, the population in India will increase from 1.210 billion to 1.4 billion during the period 2011 to 2026. There is a substantial difference in total fertility rate in between and within states. At one end of spectrum are southern states like Kerala, Tamil Nadu, Karnataka and Andhra Pradesh with total fertility rate at or below replacement levels. At the other end are high fertility states like Uttar Pradesh, Chhattisgarh, Uttarakhand, Rajasthan, Jharkhand, Bihar, Madhya Pradesh and Orissa, with an estimated total fertility rate of more than 2.2.

The Government of India has categorized states according to total fertility rate (TFR) level into very high-focus (more than or equal to 3.0), high-focus (more than 2.1 and less than 3.0) and non-high focus (less than or equal to 2.1) categories. The states categorized as very high-focus and high focus are as follows *(9)*:

TFR 2.2-3.0 – Assam–2.3, Dadra & Nagar Haveli–2.3, Mizoram–2.3, Chhattisgarh–2.5, Jharkhand–2.6, Manipur–2.6, Rajasthan–2.7, Nagaland–2.7, Madhya Pradesh–2.8

TFR more than or equal to 3.0 – Bihar–3.3, Uttar Pradesh–3.1 and Meghalaya–3.0

It is matter of concern that these states will delay the attainment of replacement level of fertility in India. These high fertility states are anticipated to contribute about 50 per cent to the nation-wide increase in population. Demographic outcomes in these states will determine the timing and size of population at which India achieves population stabilization.

Age and sex composition

The age–sex composition of India's population is as shown in Table 8. In the age group 0–14 years male population is about 1.1 per cent more than female, whereas in the age group 60+, percentage of female population is 0.6 per cent more than male population. The proportion of population in the age group 0–14 years is higher in rural areas (26.5 per cent) than in urban areas (21.5 per cent), for both male and female population *(10)*.

The proportion of population below 14 years of age is showing decline, whereas the proportion of elderly in the country is increasing. This trend is to continue in the time to come. The increase in the elderly population will impose a greater burden on the already outstretched health services in the country.

TABLE 8

Per cent distribution of estimated population by age and sex, India (2020)

Age group	Population percentage		
	Total	Males	Females
0–4	7.5	7.7	7.4
5–9	8.3	8.4	8.1
10–14	9.0	9.2	8.9
15–19	10.2	10.4	9.9
20–24	11.2	11.0	11.4
25–29	10.5	10.4	10.7
30–34	8.8	8.8	8.7
35–39	7.4	7.4	7.5
40–44	6.2	6.2	6.2
45–49	5.2	5.2	5.3
50–54	4.2	4.2	4.1
55–59	3.4	3.3	3.5
60–64	2.9	2.9	3.0
65–69	2.1	2.1	2.2
70–74	1.4	1.4	1.5
75–79	0.9	0.8	0.9
80–84	0.5	0.4	0.5
85+	0.3	0.2	0.3
Total	100.0	100.0	100.0

Note : * Total may not add upto 100 due to rounding off.

Source : *(10)*

Population pyramid

Population pyramid is also known as "Age and Sex" pyramid. It is a graphical representation of the age and sex of a population. It shows the distribution of ages across a population divided down the center between male and female members of the population. The graphic starts from the youngest at the bottom to oldest at the top. It is called a pyramid because when a population is growing (there are more babies being born then there are people dying) the graphic forms the shape of a triangle. A population pyramid can be used to compare difference between male and female population of an area. They also show the number of dependents and general structure of the population at any given time *(11)*.

Fig. 2 shows age and sex pyramid of India and Switzerland. The pyramid is typical of developing countries, with a broad base and a tapering top.

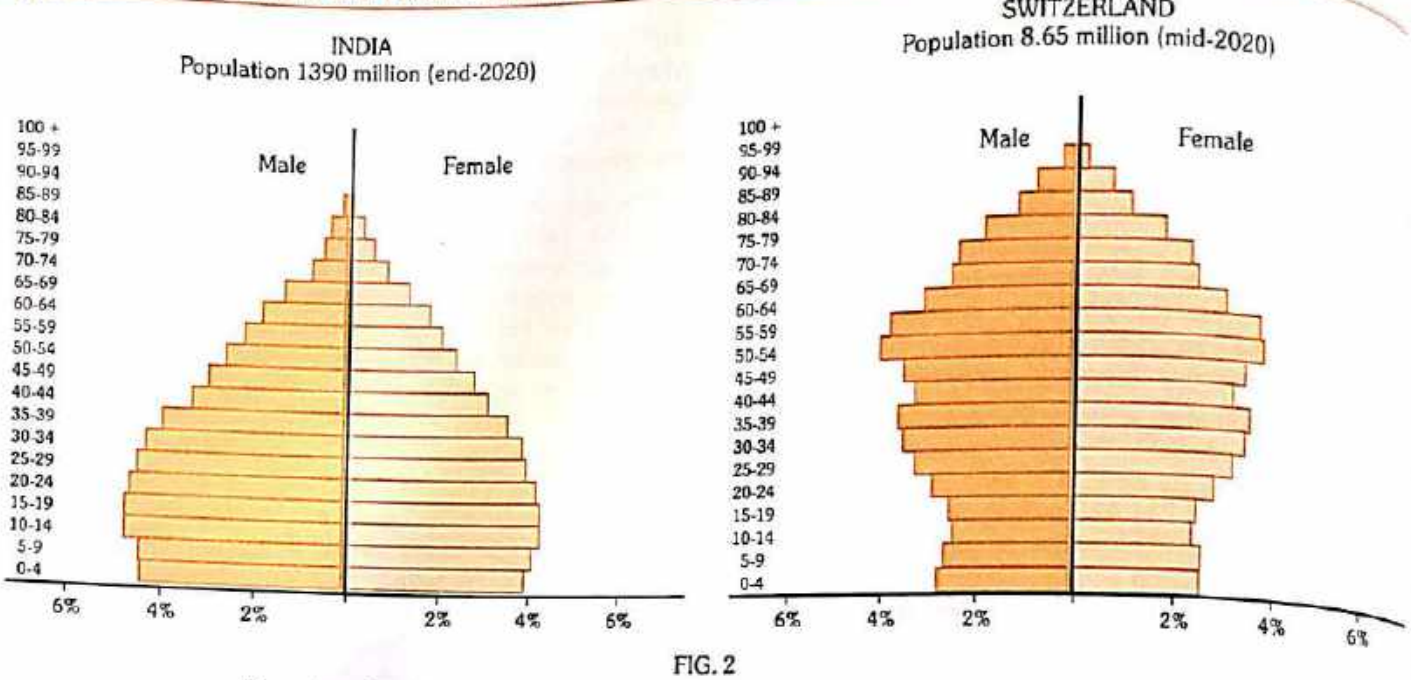

FIG. 2

Percentage distribution by age of the population of India and of the population of Switzerland.

Sex ratio

Sex ratio is defined as "the number of females per 1000 males". One of the basic demographic characteristics of the population is the sex composition. In any study of population, analysis of the sex composition plays a vital role. The sex composition of the population is affected by the differentials in mortality conditions of males and females, sex selective migration and sex ratio at birth. "Female deficit syndrome" is considered adverse because of social implications. A low sex ratio indicates strong male-child preference and consequent gender inequities, neglect of the girl child resulting in higher mortality at younger age, female infanticide, female foeticide, higher maternal mortality and male bias in enumeration of population. Easy availability of the sex determination tests and abortion services may also be proving to be catalyst in the process, which may be further stimulated by preconception sex selection facilities.

The trends in the sex ratio in the country from 1901 onwards are as shown in Table 9.

TABLE 9

Sex ratio in India

Year	Females per 1000 males
1901	972
1911	964
1921	955
1931	950
1941	945
1951	946
1961	941
1971	930
1981	934
1991	927
2001	933
2011	940

Source : *(6)*

The sex ratio in India has been generally adverse to women, i.e., the number of women per 1,000 men has generally been less than 1,000. Apart from being adverse to women, the sex ratio has also declined over the decades.

Sex ratio at birth : The sex ratio at birth for the country for the period 2018–20 (3-years average) has been estimated at 907. At National level, it is 907 in rural areas and 910 in urban areas. Among the bigger States/UTs, the sex ratio at birth varies from 974 in Kerala to 844 in Uttarakhand. In the rural areas, the highest and the lowest sex ratio at birth are in the States of Kerala (973) and Uttarakhand (853) respectively. The sex ratio at birth in urban areas varies from 975 in Kerala to 821 in Uttarakhand. Table 10 shows the variation in sex ratio at birth by residence among bigger States/UTs in the country.

TABLE 10

Sex Ratio (female per 1000 male) at birth by residence, India and bigger states/UTs, 2018–2020

Bigger states	Total	Rural	Urban
Andhra Pradesh	926	930	919
Assam	923	923	930
Bihar	895	894	897
Chhattisgarh	958	970	910
Delhi	860	972	857
Gujarat	877	882	869
Haryana	870	868	874
Himachal Pradesh	950	952	920
Jammu & Kashmir	921	918	930
Jharkhand	914	915	910
Karnataka	916	942	871
Kerala	974	973	975
Madhya Pradesh	919	908	960
Maharashtra	876	881	870
Odisha	925	928	907
Punjab	897	874	932
Rajasthan	911	914	901
Tamil Nadu	917	902	930
Telangana	892	903	875
Uttar Pradesh	905	890	960
Uttaranchal	844	853	821
West Bengal	936	941	920
India	907	907	910

Source : *(10)*

Child sex ratio (0–6 years) : Census 2011 marks a considerable fall in child sex ratio in the age group of 0–6 years and has reached an all time low of 914 since 1961. The fall has been 13 points from 927 to 914 for the country during 2001 to 2011. In rural areas, the fall has been significant – 15 points from 934 to 919 and in urban areas it has been 4 points from 906 to 902 over the decade *(6)*.

Dependency ratio

The proportion of persons above 65 years of age and children below 15 years of age are considered to be dependant on the economically productive age group (15–64 years). The ratio of the combined age groups 0–14 years plus 65 years and above to the 15–65 years age group is referred to as the total dependency ratio. It is also referred to as the **societal dependency ratio** and reflects the need for a society to provide for their younger and older population groups. The dependency ratio can be subdivided into **young age dependency ratio** (0–14 years); and **old age dependency ratio** (65 years and more). These ratios are, however, relatively crude, since they do not take into consideration elderly or young persons who are employed or working age persons who are unemployed. It is given by the formula :

$$\text{Total dependency ratio} = \frac{\text{Children 0–14 years age + Population more than 65 years of age}}{\text{Population of 15 to 64 years}} \times 100$$

For India, the dependency ratio for the year mid-2023 is calculated as :

% of population in 0–14 years age group – 25.68 per cent
% of population above 65 years of age – 6.83 per cent
% of population in 15–64 years age group – 67.49 per cent

$$\text{Total dependency ratio} = \frac{25.68 + 6.83}{67.49} \times 100$$

$$= 48.17 \text{ per cent}$$

The young age dependency ratio is 38.0 per cent, and old age dependency ratio is 10.1 per cent for the year mid 2023 *(12)*.

For international comparison, the child, old and total dependency ratios are used to study the dependency burden of the population. The total dependency ratio tends to decrease in the earlier stages of development when rapid decline in fertility reduces the child population more than the increase in the older persons, but subsequently the increase in older persons far out-weighs the decline in the child population. There is a shift from child dependency to old age dependency, as fertility declines and life expectancy increases.

The rapid decline in dependency ratios, especially the child dependency ratio, has been identified to be a key factor underlying rapid economic development. The term "*demographic bonus*" connotes the period when the dependency ratio in a population declines because of decline in fertility, until it starts to rise again because of increasing longevity. This period depends on the pace of decline in fertility level of a population. If the switch to small families is fast, the demographic bonus can give a considerable push to development. If investment in health care and education for skill development are made during this period, maximum advantage is taken of the demographic transition with high economic growth rates *(13)*.

The term "*demographic burden*" is used to connote the increase in the total dependency ratio during any period of time, mostly caused by increased old age dependency ratio. This is an inevitable consequence of demographic transition, and the country has to face this problem sooner or later *(13)*.

Density of population

One of the important indices of population concentration is the density of population. It is the ratio between (total) population and surface (land) area. This ratio can be calculated for any territorial unit for any point in time, depending on the source of the population data *(13)*. In the Indian census, density is defined as the number of persons living per square kilometre. The trends of the density in the country from 1901 onwards are as shown in Table 11. For the year 2020 the density of population per sq. km. in India was 464.

TABLE 11
Density of population in India 1901–2011

Year	Per sq.km
1901	77
1911	82
1921	81
1931	90
1941	103
1951	117
1961	142
1971	177
1981	216
1991	267
2001	325
2011	382

Source : *(6)*

Urbanization

By definition, urban population is the number of persons residing in urban localities. The definition of urban locality varies from country to country. In Indian context, the urban areas are the "Towns (places with municipal corporation, municipal area committee, town committee, notified area committee or cantonment board); also, all places having 5,000 or more inhabitants, a density of not less than 1,000 persons per square mile or 390 per square kilometre, pronounced urban characteristics and at least three fourths of the adult male population employed in pursuits other than agriculture" *(13)*.

The population in India continues to be predominantly rural with agriculture as the main occupation for the majority of the people.

As per population totals for the year 2024, the urban population stands at 36 per cent. Delhi the largest, home for over 33.8 million people, surpassing Mumbai with 21.7 million population followed by Kolkata with 15.6 million population, Bengaluru with 14.0 million, Chennai 12 million, Hyderabad with 11.06 million, Ahmedabad 8.85 million, Surat 8.3 million, Pune 7.34 million and Jaipur 4.3 million population. These are the top ten populated cities of the country *(10A)*. Fig. 3 indicates the level of urbanization in the country *(14)*.

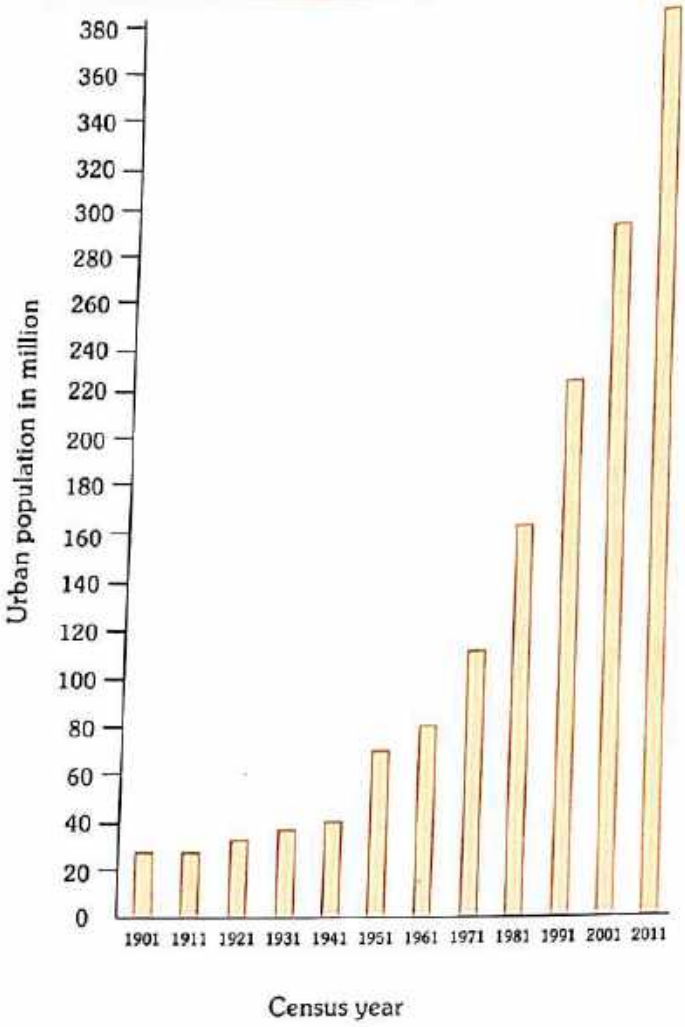

FIG. 3
INDIA – Growth of urban population 1901–2011

The increase in urban population has been attributed both to natural growth (through births) and migration from villages because of employment opportunities, attraction of better living conditions and availability of social services such as education, health, transport, entertainment etc. The continuous migration of people from country side to urban areas in India constitute a social crisis, the ramification of which may eventually impair the quality of life.

The urban-rural scenario in India is as follows :

Administrative Units	Census 2011	2020	Increase
No. of States/UTs	35	37	2
No. of Districts	640	779	139
No. of Sub-Districts	5,924	6,562	638
No. of Villages	640,867	664,369	23,502

Family size

While in common parlance, family size refers to the total number of persons in a family, in demography, family size means the **total number of children** a woman has borne at a point in time *(15)*. The completed family size indicates the total number of children borne by a woman during her child-bearing age, which is generally assumed to be between 15 and 45 years. The **total fertility rate** gives the approximate magnitude of the completed family size.

The family size depends upon numerous factors, viz. duration of marriage, education of the couple, the number of live births and living children, preference of male children, desired family size, etc.

The question of family size is undoubtedly important from the demographic point of view. The family planning programme's campaign is currently based on the theme of a "two-child" family norm, with a view to reach the long-term demographic goal of NRR=1. Family planning involves both decision regarding the "desired family size" and the effective limitation of fertility once that size has been reached.

Table 12 shows the total fertility rates (completed family size) in India and selected countries. The decrease in family size does not appear to be due to any reduction in fertility; rather it appears to be due to the result of deliberate family planning.

TABLE 12

Total fertility rates in selected developed and developing countries : 1994 and mid 2024

Country	1994	mid 2024
India	3.7	2.0
Bangladesh	3.9	2.2
Nepal	4.8	2.1
Sri Lanka	2.3	2.0
Myanmar	3.6	2.0
China	1.9	1.0
Pakistan	5.5	3.6
UK	1.8	1.6
USA	2.0	1.6
Japan	1.5	1.2
Switzerland	1.5	1.3

Source : *(16, 17)*

Literacy and education

In 1948, the Declaration of Human Rights stated that everyone has a right to education. Yet, even today, this right is being denied to millions of children. Education is a crucial element in economic and social development. Without education, development can neither be broad based nor sustained. The benefits that accrue to a country by having a literate population are multidimensional. Spread of literacy is generally associated with modernization, urbanization, industrialization, communication and commerce. It forms an important input in the overall development of individuals enabling them to comprehend their social, political and cultural environment better, and respond to it appropriately. Higher levels of education and literacy lead to a greater awareness and also contribute to improvement of economic conditions, and is a pre-requisite for acquiring various skills and better use of health care facilities.

It was decided in 1991 census to use the term literacy rate for the population relating to seven years age and above. A person is deemed as literate if he or she can read and write with understanding in any language. A person who can merely read but cannot write is not considered literate. The same concept has been continued in census 2001 and 2011 also. The literacy rate taking in account the total population in the denominator has now been termed as *"crude literacy rate"*, while the literacy rate calculated taking into account the 7 years and above population in the denominator is called the effective literacy rate. The formula for computing crude literacy rate and effective literacy rate are as follows:

$$\text{Crude literacy rate} = \frac{\text{Number of literate persons} \times 100}{\text{Total population in a given year}}$$

$$\text{Effective literacy rate} = \frac{\text{Number of literate persons aged 7 and above} \times 100}{\text{Population aged 7 and above in a given year}}$$

A significant milestone reached in Census 2011 is that the total number of illiterates has come down from 304.1 million in 2001 to 272.9 million in 2011 showing a decline of 31.1 million. The reverse trend was noted during 1991–2001 period. The decadal increase in the number of literates among males is of 31.9 per cent points and the corresponding increase among females is of 49.1 per cent points *(6)*. These two changes are a clear indication that the gender gap in literacy is shrinking in the country. It will have far reaching consequence on the development of the society. Fig. 4 shows the literacy rates in India after independence.

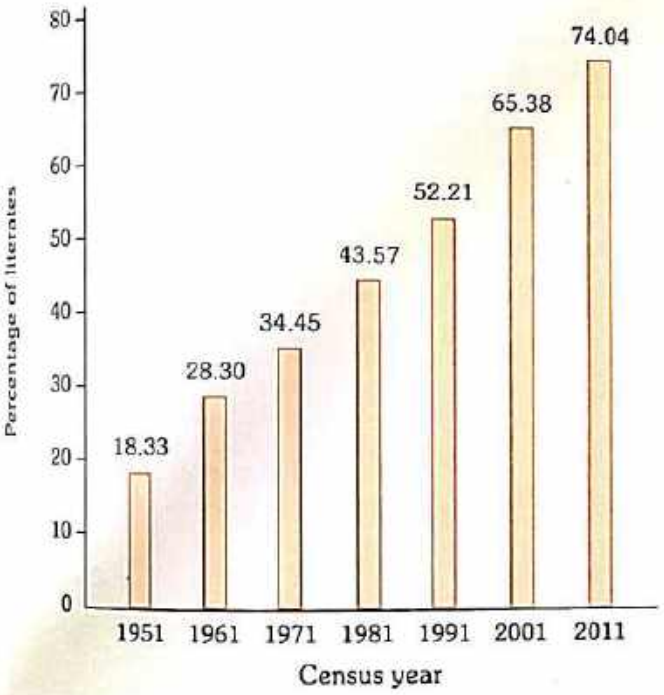

FIG. 4

Literacy rates in India 1951–2011

Source : *(18)*

The national average of literacy rate is misleading as wide variations exist between the states. Table 13 shows the literacy rates in different states in India. The national percentage of literates in the population above 7 years of age is about 74.04 with literate males about 82.14 per cent and females lagging behind with about 65.46 per cent.

Table 13 shows that Kerala continues to occupy the top rank in the country with about 93.91 per cent literates. Mizoram (91.58 per cent, and Lakshadweep (92.28 per cent) closely follow Kerala. On the other end is Bihar and Arunachal Pradesh with literacy rate of only 63.82 and 66.9 per cent respectively. The states which have literacy rates below the national average are Arunachal Pradesh, Andhra Pradesh, Bihar and Jharkhand, Jammu & Kashmir, Uttar Pradesh, Madhya Pradesh, Rajasthan and Odisha etc.

TABLE 13

State-wise literacy rate in India – 2011

State/ Union Territory*	Literacy rate		
	Total	Males	Females
Jammu & Kashmir	68.74	78.26	58.01
Himachal Pradesh	83.78	90.83	76.60
Punjab	76.68	81.48	71.34
Chandigarh*	86.43	90.54	81.38
Uttarakhand	79.63	88.33	70.70
Haryana	76.64	85.38	66.77
NCT of Delhi*	86.34	91.03	80.93
Rajasthan	67.06	80.51	52.66
Uttar Pradesh	69.72	79.24	59.26
Bihar	63.82	73.39	53.33
Sikkim	82.20	87.29	76.43
Arunachal Pradesh	66.95	73.69	59.57
Nagaland	80.11	83.29	76.69
Manipur	79.85	86.49	73.17
Mizoram	91.58	93.72	89.40
Tripura	87.75	92.18	83.15
Meghalaya	75.48	77.17	73.78
Assam	73.18	78.81	67.27
West Bengal	77.08	82.67	71.16
Jharkhand	67.63	78.45	56.21
Odisha	73.45	82.40	64.36
Chhattisgarh	71.04	81.45	60.59
Madhya Pradesh	70.63	80.53	60.02
Gujarat	79.31	87.23	70.73
Daman & Diu*	87.07	91.48	79.59
Dadra & Nagar Haveli*	77.65	86.46	65.93
Maharashtra	82.91	89.82	75.48
Andhra Pradesh	67.66	75.56	59.74
Karnataka	75.60	82.85	68.13
Goa	87.40	92.81	81.84
Lakshadweep*	92.28	96.11	88.25
Kerala	93.91	96.02	91.98
Tamil Nadu	80.33	86.81	73.86
Puducherry*	86.55	92.12	81.22
Andaman & Nicobar Islands*	86.27	90.11	81.84
INDIA	74.04	82.14	65.46

Source : *(6)*

Government of India has made education compulsory up to the age of 14 years in the country. Though considerable progress has been made in expanding primary education, a major concern is high drop out rates in the first few years of schooling.

Life expectancy

Life expectancy – or expectation of life – at a given age is the average number of years which a person of that age may expect to live, according to the mortality pattern prevalent in that country. Demographers consider it as one of the best indicators of a country's level of development and of the overall health status of its population.

Life expectancy at birth has continued to increase globally over the years. For 1950–1955, the combined life expectancy at birth for both sexes was 46.5 years. Five decades later by 2024, it was 73 years – an increase of 26.5 years. The increase has been more marked in less developed regions of the world than in the developed regions *(16)*.

Most countries in the world exhibit a sex differential in mortality favouring women – females live longer than males as shown in Table 14 and 15.

Trends in life expectancy show that people are living longer, and they have a right to a long life in good health, rather than one of pain and disability. Health policy makers thus need to recognize this changing demographic pattern and plan for prevention and control of diseases associated with old age.

Tables 14 and 15 present life expectancy at birth in India and those in selected countries. Japan leads in life expectancy for both males and females, 81 and 87 years respectively for the year 2024.

TABLE 14

Expectation of life at birth, years in India

Year	Males	Females
1901	23.63	23.96
1911	22.59	23.31
1921	19.42	20.91
1931	26.91	26.56
1941	32.09	31.37
1951	32.45	31.66
1961	41.89	40.55
1971	46.40	44.70
1981	54.10	54.70
1991	59.70	60.90
2001	63.90	66.90
2011	64.00	67.00

Source : *(6)*

TABLE 15

Expectation of life at birth, years, in selected countries, mid 2024

Developing countries	2024		Developed countries	mid 2024	
	Male	Female		Male	Female
Nepal	69	72	UK	79	83
Bangladesh	73	76	USA	75	80
Myanmar	68	72	Sweden	81	85
India	71	74	Switzerland	82	86
Sri Lanka	74	80	Russian Federation	68	78
Thailand	72	80	Japan	81	87
Pakistan	65	70	Singapore	81	85

Source : *(2B)*

FERTILITY

By fertility is meant the actual bearing of children. Some demographers prefer to use the word natality in place of fertility. A woman's reproductive period is roughly from 15 to 45 years – a period of 30 years. A woman married at 15 and living till 45 with her husband is exposed to the risk of pregnancy for 30 years, and may give birth to 15 children, but this maximum is rarely achieved.

Fertility depends upon several factors. The higher fertility in India is attributed to universality of marriage, lower age at marriage, low level of literacy, poor level of living, limited use of contraceptives and traditional ways of life. National Family Health Survey-5 conducted in India during 2019–2021 provides some detailed information of fertility trends, as shown in Table 16.

TABLE 16

Total fertility rate by selected background characteristics (2019–21)
National Family Health Survey–5

Background characteristics	Total fertility rate
Residence	
Urban	1.63
Rural	2.14
Education	
No education	2.8
<5 years complete	2.30
5-7 years complete	2.21
8-9 years complete	2.12
10-11 years complete	1.88
12 or more years complete	1.78
Religion	
Hindu	1.94
Muslim	2.36
Christian	1.88
Sikh	1.61
Buddhist/Neo-Buddhist	1.39
Jain	1.60
Other	2.15
Caste/tribe	
Scheduled caste	2.08
Scheduled tribe	2.09
Other backward class	2.02
Others	1.78
Don't know	2.54
Wealth index	
Lowest	2.63
Second	2.12
Middle	1.89
Fourth	1.74
Highest	1.57
Total	1.99

Source : *(20)*

Some of the factors which have engaged attention of demographers since long are discussed below.

1. Age at marriage

The age at which a female marries and enters the reproductive period of life has a great impact on her fertility. The Registrar General of India collected data on fertility on a national scale and found that females who marry before the age of 18 gave birth to a larger number of children than those who married after *(21)*. In India some demographers have estimated that if marriages were postponed from the age of 16 to 20–21, the number of births would decrease by 20–30 per cent *(21)*.

Early marriage is a long-established custom in India. As early as 1929, the Sarada Act was enacted forbidding the practice of child marriage. The census data reveals that prior to 1951, the average age at marriage for girls in India was 13 years. There is however, a gradual rise in the age at marriage in the country. The Child Marriage Restraint Act of 1978 raises the legal age at marriage from 15 to 18 years for girls, and from 18 to 21 years for boys. Studies indicate that in many States, the mean age at marriage for girls has already moved upto 20 years in 2006, and many others are very close to this. For the year 2020, the national average for effective marriage is 22.7 years. The exceptions are the rural areas, where a substantial proportion of marriages continue to take place when the girl is around 16 years of age *(10)*.

2. Duration of married life

Studies indicate that 10–25 per cent of all births occur within 1-5 years of married life; 50–55 per cent of all births within 5-15 years of married life. Births after 25 years of married life are very few *(21)*. This suggests that family planning efforts should be concentrated in the first few years of married life in order to achieve tangible results.

3. Spacing of children

Studies have shown that when all births are postponed by one year, in each age group, there was a decline in total fertility. It follows that spacing of children may have a significant impact on the general reduction in the fertility rates.

4. Education

There is an inverse association between fertility and educational status. Education provides knowledge; increased exposure to information and media; builds skill for gainful employment; increases female participation in family decision making; and raises the opportunity costs of women's time. The National Family Health Survey–5 shows that the total fertility rate is 1.02 children higher for illiterate women than for women with at least a high school education (Table 16).

5. Economic status

Operational Research studies support the hypothesis that economic status bears an inverse relationship with fertility. The total number of children born declines with an increase in per capita expenditure of the household. The World Population Conference at Bucharest in fact stressed that economic development is the best contraceptive. It will take care of population growth and bring about reductions in fertility.

6. Caste and religion

Muslims have a higher fertility than Hindus. The National Family Health Survey-5 reported a total fertility rate of 2.36 among Muslims as compared to 1.94 among Hindus. The total fertility rate among Christians was found to be 1.88. Among Hindus, the lower castes seem to have a higher fertility rate than the higher castes *(20)*.

7. Nutrition

There appears to be some relationship between nutritional status and fertility levels. Virtually, all well-fed societies have low fertility, and poorly-fed societies high fertility. The effect of nutrition on fertility is largely indirect.

8. Family planning

Family planning is another important factor in fertility reduction. In a number of developing countries, family planning has been a key factor in declining fertility (Table 4). Family planning programmes can be initiated rapidly and require only limited resources, as compared to other factors.

9. Other factors

Fertility is affected by a number of physical, biological, social and cultural factors such as place of women in society, value of children in society, widow remarriage, breast-feeding, customs and beliefs, industrialization and urbanization, better health conditions, housing, opportunities for women and local community involvement. Attention to these factors requires long-term government programmes and vast sums of money.

FERTILITY RELATED STATISTICS

Fertility may be measured by a number of indicators, as given below. Stillbirths, foetal deaths and abortions, however, are not included in the measurement of fertility in a population *(22)*.

1. Birth Rate

Birth rate is the simplest indicator of fertility and is defined as "the number of live births per 1000 estimated mid-year population, in a given year". It is given by the formula :

$$\text{Birth Rate} = \frac{\text{Number of live births during the year}}{\text{Estimated mid-year population}} \times 1000$$

The birth rate is an unsatisfactory measure of fertility because the total population is not exposed to child bearing. Therefore it does not give a true idea of the fertility of a population.

2. General Fertility Rate (GFR)

It is the "number of live births per 1000 women in the reproductive age-group (15–44 or 49 years) in a given year".

$$\text{GFR} = \frac{\text{Number of live births in an area during the year}}{\text{Mid-year female population age 15–44 (or 49) in the same area in same year}} \times 1000$$

General fertility rate is a better measure of fertility than the crude birth rate because the denominator is restricted to the number of women in the child–bearing age, rather than the whole population. The major weakness of this rate is that not all women in the denominator are exposed to the risk of childbirth.

3. General Marital Fertility Rate (GMFR)

It is the "number of live births per 1000 married women in the reproductive age group (15–44 or 49) in a given year".

$$\text{GMFR} = \frac{\text{Number of live births in a year}}{\text{Mid-year married female population in the age-group 15–49 years}} \times 1000$$

4. Age-specific Fertility Rate (ASFR)

A more precise measure of fertility is age-specific fertility rate, defined as the "number of live births in a year to 1000 women in any specified age-group". The age-specific fertility rates throw light on the fertility pattern. They are also sensitive indicators of family planning achievement.

$$\text{ASFR} = \frac{\text{Number of live births in a particular age group}}{\text{Mid-year female population of the same age-group}} \times 1000$$

5. Age-specific Marital Fertility Rate (ASMFR)

It is the number of live births in a year to 1000 married women in any specified age group.

$$\text{ASMFR} = \frac{\text{Number of live births in a particular age group}}{\text{Mid-year married female population of the same age group}} \times 1000$$

6. Total Fertility Rate (TFR)

Total fertility rate represents the average number of children a woman would have if she were to pass through her reproductive years bearing children at the same rates as the women now in each age group *(23)*. It is computed by summing the age-specific fertility rates for all ages; if 5-year age groups are used, the sum of the rates is multiplied by 5. This measure gives the approximate magnitude of "completed family size".

$$\text{TFR} = \frac{5 \times \sum_{15\text{-}19}^{45\text{-}49} \text{ASFR}}{1000}$$

7. Total Marital Fertility Rate (TMFR)

Average number of children that would be born to a married woman if she experiences the current fertility pattern throughout her reproductive span.

$$\text{TMFR} = \frac{5 \times \sum_{15\text{-}19}^{45\text{-}49} \text{ASMFR}}{1000}$$

8. Gross Reproduction Rate (GRR)

Average number of girls that would be born to a woman if she experiences the current fertility pattern throughout her reproductive span (15–44 or 49 years), assuming no mortality.

$$\text{GRR} = \frac{5 \times \sum_{15\text{-}19}^{45\text{-}49} \text{ASFR for female live births}}{1000}$$

9. Net Reproduction Rate (NRR)

Net Reproduction Rate (NRR) is defined as the number of daughters a newborn girl will bear during her lifetime assuming fixed age-specific fertility and mortality rates *(24)*.

NRR is a demographic indicator. NRR of 1 is equivalent to attaining approximately the 2-child norm. If the NRR is less than 1, then the reproductive performance of the population is said to be below replacement level.

10. Child-woman Ratio

It is the number of children 0–4 years of age per 1000 women of child-bearing age, usually defined as 15–44 or 49 years of age. This ratio is used where birth registration statistics either do not exist or are inadequate. It is estimated through data derived from censuses *(6)*.

11. Pregnancy Rate

It is the ratio of number of pregnancies in a year to married women in the ages 15–44 (or 49) years. The "number of pregnancies" includes all pregnancies, whether these had terminated as live births, stillbirths or abortions or had not yet terminated.

12. Abortion Rate

The annual number of all types of abortions, usually per 1000 women of child-bearing age (usually defined as age 15–44) *(25)*.

13. Abortion Ratio

This is calculated by dividing the number of abortions performed during a particular time period by the number of live births over the same period *(26)*.

14. Marriage Rate

It is the number of marriages in the year per 1000 population :

$$\text{Crude Marriage Rate} = \frac{\text{Number of marriages in the year}}{\text{Mid-year population}} \times 1000$$

Demographers consider this a very unsatisfactory rate, because the denominator is comprised primarily of population that is not eligible to marry. A more sensitive rate is the general marriage rate :

$$\text{General Marriage Rate} = \frac{\text{Number of marriages within one year}}{\text{Number of unmarried persons age 15–49 years}} \times 1000$$

This rate is more accurate when computed for women than for men because more men than women marry at the older ages *(6)*.

Fertility trends

Researches indicate that the level of fertility in India is beginning to decline. The crude birth rate which was about 49 per thousand population during 1901–11 has declined to about 25.0 per thousand population in 2002, and was 20.4 per thousand population in 2016. The rural urban differential has narrowed. However, the crude birth rate has continued to be higher in rural areas as compared to urban areas in the last 3 decades.

The total fertility rate has declined from 3.6 in 1991 to 2.0 in 2020. The TFR in rural areas has declined from 5.4 in 1971 to 2.2 in 2020, whereas the corresponding decline in urban areas has been from 4.1 to 1.6 during the same period. There are considerable inter-state variations in total fertility rate as shown in Fig. 5. In bigger states it varies from 1.4 in West Bengal and Tamil Nadu to 3.0 in Bihar *(7)*.

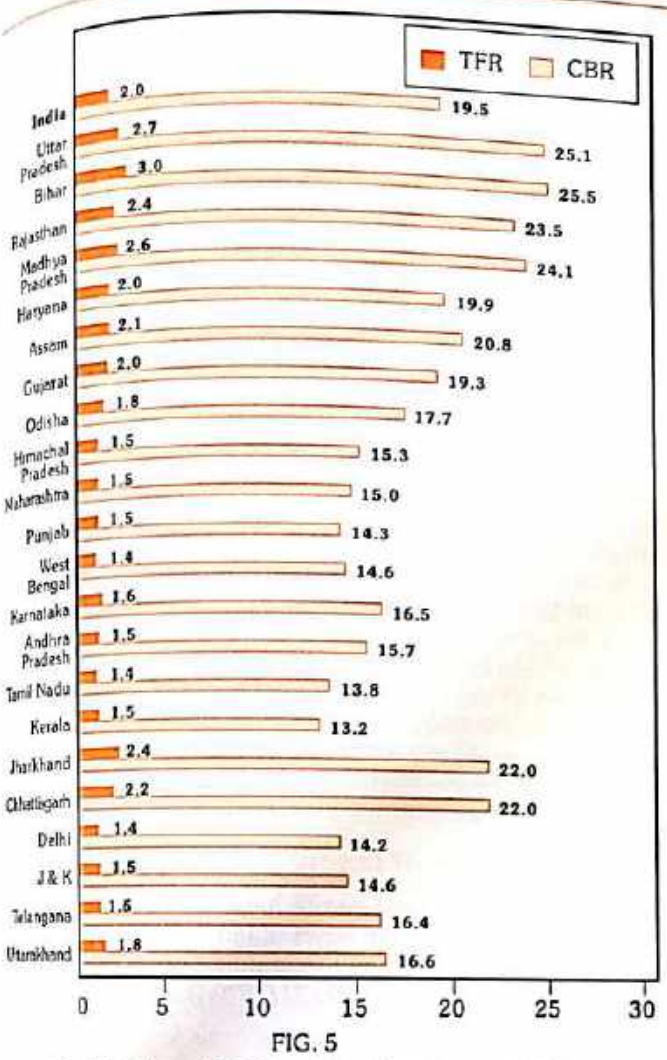

FIG. 5

Crude birth rate (2020) and Total fertility rate (2020) for major states

Source : *(10)*

Recent estimates of the fertility indicators and age-specific fertility rates in India are given in Table 17.

TABLE 17

Fertility indicators of India, 2020

Indicators	Age group	Total	Rural	Urban
Age-specific fertility rate	15–19	11.3	13.2	6.6
	20–24	113.6	128.1	81.8
	25–29	139.6	152.5	115.2
	30–34	84.4	89.4	75.5
	35–39	35.6	38.9	29.5
	40–44	11.7	13.5	8.5
	45–49	4.7	5.2	3.9
Age-specific marital fertility rate	15–19	353.0	361.2	318.2
	20–24	339.1	350.0	306.5
	25–29	199.3	206.2	183.9
	30–34	95.1	98.4	88.8
	35–39	38.1	41.2	32.1
	40–44	12.6	14.5	9.2
	45–49	5.2	5.6	4.4
Crude birth rate		19.5	21.1	16.1
General fertility rate		67.0	73.7	53.7
Total fertility rate		2.0	2.2	1.6
Gross reproduction rate		0.9	1.0	0.8
General marital fertility rate		108.3	118.0	88.5
Total marital fertility rate		5.2	5.4	4.7

Source : *(10)*

Birth and death rates

The birth and death rates are important components of population growth. The birth and death rates in India are shown in Table 18. A look at Table 18 shows that whereas the death rate has considerably declined from 27.4 in 1951 to an estimated 7.2 per thousand population in 2020, the birth rate has declined niggardly from 39.9 in 1951 to an estimated 18.7 per thousand in 2020.

The Fifth Five Year (1974–79) Plan's objective was to reduce the birth rate from 35 per thousand at the beginning of the Plan to 30 per thousand by 1978–79. During 1979–84, the birth rate was stagnating around 33 per thousand with no obvious decline. During 1990, however, the birth rate showed a slight decline, to an estimated 30.2, further declining to 26.4 by the year 1998. The current picture indicates that birth and death rates are both declining in India.

TABLE 18

Birth and death rates in India

Year	Birth rate	Death rate
1941–1950	39.9	27.4
1951–1960	41.7	22.8
1961–1970	41.2	19.0
1971–1980	37.2	15.0
1981	33.9	12.5
1991	29.5	9.8
1995	28.3	9.0
1998	26.8	9.0
1999	26.1	8.7
2002	25.0	8.1
2004	24.1	7.5
2006	23.5	7.5
2008	22.8	7.4
2010	22.1	7.2
2012	21.6	7.0
2015	20.0	7.0
2016	20.4	6.4
2018	20.0	6.2
2022	18.7	7.2

Source : *(7)*

HIGH BIRTH RATE : India like other developing countries is faced with the dilemma of a high birth rate and a declining death rate. This is a vicious circle, not easy to break. The causes of high birth rate are :- (1) *Universality of marriage* : Marriages are universal and sacramental. Everyone, sooner or later (usually sooner) gets married and participates in reproduction. The individual's economic security or emotional maturity are seldom a pre-requisite to marriage. (2) *Early marriage* : Marriages are performed early. Data indicate that about 60 per cent of the girls aged 15–19 years are already married. (3) *Early puberty* : Indian girls attain puberty early, between 12 and 14 years. (4) *Low standard of living* : Where standards of living are low, birth rates are high. (5) *Low level of literacy* : The 2011 census showed that only 74.04 per cent of the population was literate. The female literacy is still lower, especially in the rural areas. (6) *Traditional customs and habits* : Customs dictate that every woman must marry and every man must have a son. Children are considered a gift of God and their birth should not be obstructed. (7) *Absence of family planning habit* : Family planning is of recent origin. It has not yet become part of the marital mores of the people.

DECLINING DEATH RATE : The declining death rate has been attributed to : (1) absence of natural checks, e.g., famines and large scale epidemics, (2) mass control of

diseases, e.g., smallpox, plague, cholera, malaria etc., (3) advances in medical science, e.g., extensive use of chemotherapeutics, antibiotics, and insecticides, (4) better health facilities, e.g., establishment of primary health centres and more treatment centres, (5) impact of national health programmes, (6) improvements in food supply, (7) international aid in several directions, and (8) development of social consciousness among the masses.

Demographers opine that further rapid decline in India's death rate may not continue in future. The reason is that most of the "easy" conquest of mortality has been accomplished through the widespread use of vaccines, antibiotics, insecticides, and other life-saving measures. The tasks that remain now are the most difficult ones such as improvements in environmental sanitation and nutrition; and control of non-communicable and genetic diseases.

Growth rate

The population growth rates in India are presented in Table 6. Prior to 1921, the population of India grew at a slow rate. This was due to the operation of natural checks (e.g., famines and epidemics) which took a heavy toll of human life. After 1921, the "great divide", the occurrence of famines and epidemics was effectively controlled through better nutrition and improved health care services, with the result that the death rate declined more steeply than the birth rate. Consequently, there was a net gain in births over deaths, leading to rapid growth in population, which rose from 1.25 per cent in 1951 to 1.96 in 1961, 2.20 in 1971, 2.22 in 1981, 2.16 in 1991, 1.7 in 2001 and 1.64 in 2011 (Table 6).

India is now the most populous country in the world, adding 17.5 million every year to her 1210 million at the time of 2011 census. However, the most recent data indicates a decline in India's population growth rate. The estimates for the year 2024 is 1.2.

FAMILY PLANNING

Definition

There are several definitions of family planning. An Expert Committee (1971) of the WHO defined family planning as "a way of thinking and living that is adopted voluntarily, upon the basis of knowledge, attitudes and responsible decisions by individuals and couples, in order to promote the health and welfare of the family group and thus contribute effectively to the social development of a country" *(27)*.

Another Expert Committee *(28)* defined and described family planning as follows : "Family planning refers to practices that help individuals or couples to attain certain objectives :

(a) to avoid unwanted births;
(b) to bring about wanted births;
(c) to regulate the intervals between pregnancies;
(d) to control the time at which births occur in relation to the ages of the parent; and
(e) to determine the number of children in the family.

Basic human rights

The United Nations Conference on Human Rights at Tehran in 1968 recognized family planning as a basic human right. The Bucharest Conference *(29)* on the World Population held in August 1974 endorsed the same view and stated in its 'Plan of Action' that "all couples and individuals have the basic human right to decide freely and responsibly the number and spacing of their children and to have the information, education, and means to do so". The World Conference of the International Women's Year in 1975 also declared "the right of women to decide freely and responsibly on the number and spacing of their children and to have access to the information and means to enable them to exercise that right" *(30)*. Thus during the past few decades, family planning has emerged from whispers in private quarters to the focus of international concern as a basic human right, and a component of family health and social welfare.

Scope of family planning services

Family planning is not synonymous with birth control; it is more than mere birth control. A WHO Expert Committee (1970) has stated that family planning includes in its purview:- (1) the proper spacing and limitation of births, (2) advice on sterility, (3) education for parenthood, (4) sex education, (5) screening for pathological conditions related to the reproductive system (e.g., cervical cancer), (6) genetic counselling, (7) premarital consultation and examination, (8) carrying out pregnancy tests, (9) marriage counselling, (10) the preparation of couples for the arrival of their first child, (11) providing services for unmarried mothers, (12) teaching home economics and nutrition, and (13) providing adoption services *(29)*. These activities vary from country to country according to national objectives and policies with regard to family planning. This is the modern concept of family planning.

Health aspects of family planning *(31, 32, 33)*

Family planning and health have a two-way relationship. The principal health outcomes of family planning were listed and discussed by a WHO Scientific Group on the Health Aspects of Family Planning *(31)*. These can be summarized under the following headings.

Women's health

maternal mortality, morbidity of women of child-bearing age, nutritional status (weight changes, haemoglobin level, etc.) preventable complications of pregnancy and abortion.

Foetal health

foetal mortality (early and late foetal death); abnormal development.

Infant and child health

neonatal, infant and pre-school mortality; health of the infant at birth (birth weight); vulnerability to diseases.

(a) WOMEN'S HEALTH : Pregnancy can mean serious problems for many women. It may damage the mother's health or even endanger her life. In developing countries, the risk of dying as a result of pregnancy is much greater than in developed countries. The risk increases as the mother grows older and after she has had 3 or 4 children. Family planning by intervening in the reproductive cycle of women, helps them to control the number, interval and timing of pregnancies and births, and thereby reduces maternal mortality and morbidity and improves health. The health impact of family planning occurs primarily through : (i) the avoidance of unwanted pregnancies; (ii) limiting the number of births and proper spacing, and (iii) timing the births, particularly the first and last, in relation to the age of the mother. It is estimated that guaranteeing access to family

planning alone could reduce the number of maternal deaths by 25 per cent, and child mortality by 20 per cent *(13)*.

(i) *Unwanted pregnancies* : The essential aim of family planning is to prevent the unwanted pregnancies. An unwanted pregnancy may lead to an induced abortion. From the point of view of health, abortion outside the medical setting (criminal abortion) is one of the most dangerous consequence of unwanted pregnancy. Particular mention must be made of the unmarried mother who faces significantly higher health risks. There is also evidence of higher incidence of mental disturbances among mothers who have had unwanted pregnancies.

(ii) *Limiting the number of births and proper spacing* : Repeated pregnancies increase the risk of maternal mortality and morbidity. These risks rise with each pregnancy beyond the third, and increase significantly with each pregnancy beyond the fifth. The incidence of rupture of the uterus and uterine atony increases with parity as does the incidence of toxaemia, eclampsia and placenta previa. Anaemia is a common problem in mothers with many children and the rate of stillbirths tends to increase significantly with high parity. The somatic consequences of repeated pregnancies may also be exemplified in the clear association between the incidence of cancer of the cervix and high parity. Family planning is the only way to limit the size and control the interval between births with a view to improving the health of the mother.

(iii) *Timing of births* : Generally mothers face greater risk of dying below the age of 20 and above the age of 30–35. In many countries, complications of pregnancy and delivery show the same pattern of risk, with the highest rate below 20 and over 35 years of age.

(b) FOETAL HEALTH : A number of congenital anomalies (e.g., Down's syndrome) are associated with advancing maternal age. Such congenital anomalies can be avoided by timing the births in relation to the mother's age. Further, the "quality" of population can be improved only by avoiding completely unwanted births. In the present state of our knowledge, it is very difficult to weigh the overall genetic effects of family planning.

(c) CHILD HEALTH : Issues relating to family planning are highly relevant to paediatrics. It would seem that family size and birth spacing, if practised by all, will yield substantial child health benefits. These are : (a) *Child mortality* : It is well known that child mortality increases when pregnancies occur in rapid succession. A birth interval of 2 to 3 years is considered desirable to reduce child mortality. Family planning is, therefore, an important means of ensuring the survival of all children in a family. (b) *Child growth, development and nutrition* : Birth spacing and family size are important factors in child growth and development. The child is likely to receive his full share of love and care, including nutrition he needs, when the family size is small and births are properly spaced. Family planning, in other words, is effective prevention against malnutrition. (c) *Infectious diseases* : Children living in large-sized families have an increase in infection, especially infectious gastroenteritis, respiratory and skin infections.

The welfare concept

Family planning is associated with numerous misconceptions – one of them is its strong association in the minds of people with sterilization. Others equate it with birth control. The recognition of its welfare concept came only a decade and half after its inception, when it was named Family Welfare Programme.

The concept of welfare is very comprehensive and is basically related to quality of life. The Family Welfare Programme aims at achieving a higher end – that is, to improve the quality of life of the people.

Small-family norm

Small differences in the family size will make big differences in the birth rate. The difference of only one child per family over a decade will have a tremendous impact on the population growth.

The objective of the Family Welfare Programme in India is that people should adopt the "small family norm" to stabilize the country's population at the level of some 1,533 million by the year 2050 AD. Symbolized by the inverted red triangle, the programme initially adopted the model of the 3-child family. In the 1970s, the slogan was the famous *Do Ya Teen Bas*. In view of the seriousness of the situation, the 1980s campaign has advocated the 2-child norm. The current emphasis is on three themes : "Sons or Daughters – two will do"; "Second child after 3 years", and "Universal Immunization".

A significant achievement of the Family Welfare Programme in India has been the decline in the fertility rate from 6.4 in the 1950s to 2.2 in 2018. The national target was to achieve a Net Reproduction Rate of '1' by the year 2006, which is equivalent to attaining approximately the 2-child norm, which could not be attained. All efforts are being made through mass communication that the concept of small family norm is accepted, adopted and woven into lifestyle of the people.

Eligible couples

An "eligible couple" refers to a currently married couple wherein the wife is in the reproductive age, which is generally assumed to lie between the ages of 15 and 45. There will be at least 150 to 180 such couples per 1000 population in India. These couples are in need of family planning services. About 20 per cent of eligible couples are found in the age group 15–24 years. On an average 2.5 million couples are joining the reproductive group every year. The "Eligible Couple Register" is a basic document for organizing family planning work. It is regularly updated by each functionary of the family planning programme for the area falling within his jurisdiction.

Target couples

In order to pin-point the couples who are a priority group within the broad definition of "eligible couples", the term "target couple" was coined. Hitherto, the term target couple was applied to couples who have had 2–3 living children, and family planning was largely directed to such couples. The definition of a target couple has been gradually enlarged to include families with one child or even newly married couples *(34)* with a view to develop acceptance of the idea of family planning from the earliest possible stage. In effect, the term target couple has lost its original meaning. The term eligible couple is now more widely used and has come to stay.

Couple protection rate (CPR)

Couple protection rate (CPR) is an indicator of the prevalence of contraceptive practice in the community. It is defined as the per cent of eligible couples effectively protected against childbirth by one or the other approved methods of family planning, viz. sterilization, IUD, condom or oral pills. Sterilization accounts for over 60 per cent of

effectively protected couples *(35)*. Demographers are of the view that the demographic goal of NRR=1 can be achieved only if the CPR exceeds 60 per cent.

Couple protection rate is based on the observation that 50 to 60 per cent of births in a year are of birth order 3 or more. Thus attaining a 60 per cent CPR will be equivalent to cutting off almost all third or higher order births, leaving 2 or less surviving children per couple *(35)*. Therefore, in India, the previous National Population Policy was to attain a CPR of 42 per cent by 1990 (end of Seventh Five Year Plan), and 60 per cent by the year 2000. In short CPR is a dominant factor in the reduction of net reproduction rate.

NATIONAL POPULATION POLICY 2000

Population policy in general refers to policies intended to decrease the birth rate or growth rate. Statement of goals, objectives and targets are inherent in the population policy.

In April 1976 India formed its first – "National Population Policy". It called for an increase in the legal minimum age of marriage from 15 to 18 for females, and from 18 to 21 years for males. However, for the most part, the 1976 statement became irrelevant and the policy was modified in 1977. New policy statement reiterated the importance of the small family norm without compulsion and changed the programme title to "family welfare programme". The National Health Policy approved by the parliament in 1983 had set the long-term demographic goals of achieving a Net Reproductive Rate (NRR) of one by the year 2000 (which was not achieved).

"National Population Policy 2000" is the latest in this series. It reaffirms the commitment of the government towards target free approach in administering family planning services. It gives informed choice to the people to voluntarily avail the reproductive health care services.

The new NPP 2000 is more than just a matter of fertility and mortality rates. It deals with women education; empowering women for improved health and nutrition; child survival and health; the unmet needs for family welfare services; health care for the under-served population groups like urban slums, tribal community, hill area population and displaced and migrant population; adolescent's health and education; increased participation of men in planned parenthood; and collaboration with NGOs.

The objective of NPP 2000 is to bring the TFR to replacement level by 2010. The long term objective is to achieve requirements of suitable economic growth, social development and environment protection.

The National Socio-Demographic Goals to be achieved by the year 2010 were as follows *(36)*:

(1) Address the unmet needs for basic reproductive and child health services, supplies and infrastructure.

(2) Make school education upto the age 14 free and compulsory, and reduce drop-outs at primary and secondary school levels to below 20 per cent for both boys and girls.

(3) Reduce infant mortality rate to below 30 per 1000 live births.

(4) Reduce maternal mortality ratio to below 100 per 100,000 live births.

(5) Achieve universal immunization of children against all vaccine preventable diseases.

(6) Promote delayed marriage for girls, not earlier than age 18 and preferably after 20 years of age.

(7) Achieve 80 per cent institutional deliveries and 100 per cent deliveries by trained persons.

(8) Achieve universal access to information/counselling and services for fertility regulation and contraception with a wide basket of choices.

(9) Achieve 100 per cent registration of births, deaths, marriage and pregnancy.

(10) Contain the spread of Acquired Immunodeficiency Syndrome (AIDS), and promote greater integration between the management of reproductive tract infections (RTI) and sexually transmitted infections (STI) and the National AIDS Control Organization.

(11) Prevent and control communicable diseases.

(12) Integrate Indian Systems of Medicine (ISM) in the provision of reproductive and child health services, and in reaching out to households.

(13) Promote vigorously the small family norm to achieve replacement levels of TFR.

(14) Bring about convergence in implementation of related social sector programmes so that family welfare becomes a people centred programme.

If the NPP 2000 was fully implemented, it was anticipated that in the year 2010 the population may be 1107 million instead of 1162 million projected by the Technical Group of Population Projections. However, the provisional population (1210 million) in 2011 is higher by about 110 million compared to the target set for the year 2010. Efforts at population stabilization will be effective only if an integrated package of essential services is directed at village and household levels. Inadequacies in the existing health infrastructure have led to a unmet need of 28 per cent of contraception services and obvious gap in coverage and outreach. The NPP 2000 is to be largely implemented and managed at panchayat and nagar palika levels in coordination with the concerned state/UT administration.

CONTRACEPTIVE METHODS

(Fertility Regulating Methods)

Contraceptive methods are, by definition, preventive methods to help women avoid unwanted pregnancies. They include all temporary and permanent measures to prevent pregnancy resulting from coitus.

The last few years have witnessed a contraceptive revolution, that is, man trying to interfere with the ovulation cycle.

It is now generally recognized that there can never be an ideal contraceptive – that is, contraceptive that is safe, effective, acceptable, inexpensive, reversible, simple to administer, independent of coitus, long-lasting enough to obviate frequent administration and requiring little or no medical supervision. Further, a method which may be quite suitable for one group may be unsuitable for another because of different cultural patterns, religious beliefs and socio-economic milieu. As there is no single method likely to meet the social, cultural, aesthetic and service needs of all individuals and communities, the search for an "ideal contraceptive" has been given up. The present approach in family planning programmes is to provide a "cafeteria choice" that is to offer all methods from which an individual can choose according to his needs and wishes and to promote family planning as a way of life.

The term conventional contraceptives is used to denote those methods that require action at the time of sexual intercourse, e.g., condoms, spermicides, etc. Each

contraceptive method has its unique advantages and disadvantages. The success of any contraceptive method depends not only on its effectiveness in preventing pregnancy but on the rate of continuation of its proper use.

The contraceptive methods may be broadly grouped into two classes – spacing methods and terminal methods, as shown below :

I. Spacing methods

1. Barrier methods
   (a) Physical methods
   (b) Chemical methods
   (c) Combined methods
2. Intra-uterine devices
3. Hormonal methods
4. Post-conceptional methods
5. Miscellaneous.

II. Terminal methods

1 Male sterilization
2 Female sterilization.

BARRIER METHODS

A variety of barrier or "occlusive" methods, suitable for both men and women are available. The aim of these methods is to prevent live sperm from meeting the ovum. Barrier methods have increased in popularity quite recently because of certain contraceptive and non-contraceptive advantages. The main contraceptive advantage is the absence of side-effects associated with the "pill" and IUD. The non-contraceptive advantages include some protection from sexually transmitted diseases, a reduction in the incidence of pelvic inflammatory disease and possibly some protection from the risk of cervical cancer *(37)*. Barrier methods require a high degree of motivation on the part of the user. In general they are less effective than either the pill or the loop. They are only effective if they are used consistently and carefully.

a. PHYSICAL METHODS

1. Condom *(38, 39)*

Condom is the most widely known and used barrier device by the males around the world. In India, it is better known by its trade name NIRODH, a sanskrit word, meaning prevention. Condom is receiving new attention today as an effective, simple "spacing" method of contraception, without side effects. In addition to preventing pregnancy, condom protects both men and women from sexually transmitted diseases.

The condom is fitted on the erect penis before intercourse. The air must be expelled from the teat end to make room for the ejaculate. The condom must be held carefully when withdrawing it from the vagina to avoid spilling seminal fluid into the vagina after intercourse. A new condom should be used for each sexual act.

Condom prevents the semen from being deposited in vagina. The effectiveness of a condom may be increased by using it in conjunction with a spermicidal jelly inserted into the vagina before intercourse. The spermicide serves as additional protection in the unlikely event that the condom should slip off or tear.

Condoms can be a highly effective method of contraception, if they are used correctly at every coitus. Failure rates for the condom vary enormously. Surveys have reported pregnancy rates varying from 2–3 per 100 women–years to more than 14 in typical users *(40)*. Most failures are due to incorrect use.

The ADVANTAGES of condom are : (a) they are easily available (b) safe and inexpensive (c) easy to use; do not require medical supervision (d) no side effects (e) light, compact and disposable, and (f) provides protection not only against pregnancy but also against STD. The DISADVANTAGES are : (a) it may slip off or tear during coitus due to incorrect use, and (b) interferes with sex sensation locally about which some complain while others get used to it. The main limitation of condoms is that many men do not use them regularly or carefully, even when the risk of unwanted pregnancy or sexually transmitted disease is high.

Condoms are manufactured in India by the Hindusthan Latex in Trivandrum, London Rubber Industries in Chennai and others. Besides commercial outlets, condoms are supplied under social marketing programme.

Female condom

The female condom is a pouch made of polyurethane, which lines the vagina. An internal ring in the close end of the pouch covers the cervix and an external ring remains outside the vagina. It is prelubricated with silicon, and a spermicide need not be used. It is an effective barrier to STD infection. However, high cost and acceptability are major problems. The failure rates during the first year use vary from 5 per 100 women-years pregnancy rate to about 21 in typical users *(41)*.

2. Diaphragm

The diaphragm is a vaginal barrier. It was invented by a German physician in 1882. Also known as "Dutch cap", the diaphragm is a shallow cup made of synthetic rubber or plastic material. It ranges in diameter from 5–10 cm (2–4 inches). It has a flexible rim made of spring or metal. It is important that a woman be fitted with a diaphragm of the proper size. It is held in position partly by the spring tension and partly by the vaginal muscle tone. This means, for successful use, the vaginal tone must be reasonable. Otherwise, in the case of a severe degree of cystocele, the rim may slip down.

The diaphragm is inserted before sexual intercourse and must remain in place for not less than 6 hours after sexual intercourse. A spermicidal jelly is always used along with the diaphragm. The diaphragm holds the spermicide over the cervix. Side-effects are practically nil. Failure rate for the diaphragm with spermicide vary between 6 to 12 per 100 women–years *(40)*.

ADVANTAGES : The primary advantage of the diaphragm is the almost total absence of risks and medical contraindications. DISADVANTAGES : Initially a physician or other trained person will be needed to demonstrate the technique of inserting the diaphragm into the vagina and to ensure a proper fit. After delivery, it can be used only after involution of the uterus is completed. Practice at insertion, privacy for this to be carried out and facilities for washing and storing the diaphragm precludes its use in most Indian families, particularly in the rural areas. Therefore, the extent of its use has never been great.

If the diaphragm is left in the vagina for an extended period, there is a remote possibility of a toxic shock syndrome, which is a state of peripheral shock requiring resuscitation *(42)*.

Variations of the diaphragm include the cervical cap, vault cap and the vimule cap. These devices are not recommended in the National Family Welfare Programme.

3. Vaginal sponge

Another barrier device employed for hundreds of years is the sponge soaked in vinegar or olive oil, but it is only recently one has been commercially marketed in USA under the trade name **TODAY** for the sole purpose of preventing conception. It is a small polyurethane foam sponge measuring 5 cm × 2.5 cm, saturated with the spermicide, nonoxynol–9. The sponge is far less effective than the diaphragm, but it is better than nothing *(43)*. The failure rate in parous women is between 20 to 40 per 100 women-years and in nulliparous women about 9 to 20 per 100 women-years *(41)*.

b. CHEMICAL METHODS

In the 1960s, before the advent of IUDs and oral contraceptives, spermicides (vaginal chemical contraceptives) were used widely. They comprise four categories *(44)*:

a) Foams : foam tablets, foam aerosols
b) Creams, jellies and pastes – squeezed from a tube
c) Suppositories – inserted manually, and
d) Soluble films – C-film inserted manually.

The spermicides contain a base into which a spermicide is incorporated. The commonly used modern spermicides are "surface-active agents" which attach themselves to spermatozoa and inhibit oxygen uptake and kill sperms *(45)*.

The main drawbacks of spermicides are : (a) they have a high failure rate (b) they must be used almost immediately before intercourse and repeated before each sex act (c) they must be introduced into those regions of the vagina where sperms are likely to be deposited, and (d) they may cause mild burning or irritation, besides messiness. The spermicide should be free from potential systemic toxicity. It should not have an inflammatory or carcinogenic effect on the vaginal skin or cervix. No spermicide which is safe to use has yet been found to be really effective in preventing pregnancy when used alone *(44)*. Therefore, spermicides are not recommended by professional advisers. They are best used in conjunction with barrier methods. Recently there has been some concern about possible teratogenic effects on foetuses, following their use. However, this risk is yet to be confirmed *(42)*.

INTRA-UTERINE DEVICES

Types of IUD

There are two basic types of IUD : **non-medicated** and **medicated**. Both are usually made of polyethylene or other polymers; in addition, the medicated or bioactive IUDs release either metal ions (copper) or hormones (progestogens).

The non-medicated or inert IUDs are often referred to as **first generation IUDs**. The copper IUDs comprise the **second** and the hormone-releasing IUDs the **third** generation IUDs. The medicated IUDs were developed to reduce the incidence of side-effects and to increase the contraceptive effectiveness. However, they are more expensive and must be changed after a certain time to maintain their effectiveness *(46)*. Fig. 6 shows different types of IUDs currently in use.

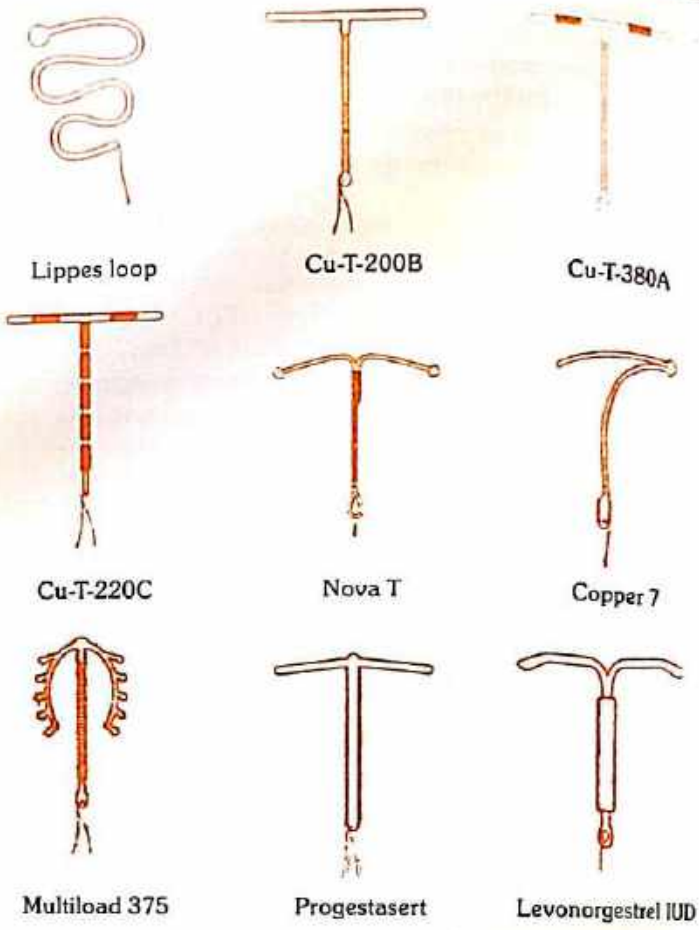

FIG. 6
Types of IUDs

FIRST GENERATION IUDs

The first generation IUDs comprise the inert or non-medicated devices, usually made of polyethylene, or other polymers. They appeared in different shapes and sizes – loops, spirals, coils, rings, and bows. Of all the models, the Lippes Loop is the best known and commonly used device in the developing countries.

Lippes Loop

Lippes Loop is double–"S" shaped device made of polyethylene, a plastic material that is non-toxic, non-tissue reactive and extremely durable. It contains a small amount of barium sulphate to allow X-ray observation. The Loop has attached threads or "tail" made of fine nylon, which project into the vagina after insertion. The tail can be easily felt and is a reassurance to the user that the Loop is in its place. The tail also makes it easy to remove the Loop when desired.

The Lippes Loop exists in four sizes A,B,C, and D, the latter being the largest. A larger sized device usually has a greater anti-fertility effect and a lower expulsion rate but a higher removal rate because of side-effects such as pain and bleeding. The larger Loops (C and D) are more suitable for multiparous women.

SECOND GENERATION IUDs

It occurred to a number of research workers that the ideal IUD can never be developed simply as a result of obtaining changes in the usual shape or size *(43)*. A new approach was tried in the 1970s by adding copper to the IUD. It was found

that metallic copper had a strong anti-fertility effect *(47)*. The addition of copper has made it possible to develop smaller devices which are easier to fit, even in nulliparous women. A number of copper bearing devices are now commercially available :

Earlier devices :
- Copper-7
- Copper T-200

Newer devices :
- Variants of the T device
  - (i) Cu-T 220 C
  - (ii) Cu-T 380 A or Ag
- Nova T
- Multiload devices
  - (i) ML-Cu-250
  - (ii) ML-Cu-375

The numbers included in the names of the devices refer to the surface area (in sq. mm) of the copper on the device. Nova T and Cu-T 380 Ag are distinguished by a silver core over which the copper wire is wrapped.

The newer copper devices are significantly more effective in preventing pregnancy than the earlier copper ones or the inert IUDs. The newer copper IUDs – Multiload devices and variants of the T device – offer the further advantage of having an effective life of at least 5 years. They can be left in place safely for the time, unless specific medical or personal reasons call for earlier removal.

Advantages of copper devices

- Low expulsion rate
- Lower incidence of side-effects, e.g., pain and bleeding
- easier to fit even in nulliparous women
- better tolerated by nullipara
- increased contraceptive effectiveness
- effective as post-coital contraceptives, if inserted within 3–5 days of unprotected intercourse

THIRD GENERATION IUDs

A third generation of IUDs based on still another principle, i.e., release of a hormone have become available on a limited scale. The most widely used hormonal device is **progestasert**, which is a T-shaped device filled with 38 mg of progesterone, the natural hormone. The hormone is released slowly in the uterus at the rate of 65 mcg daily. It has a direct local effect on the uterine lining, on the cervial mucus and possibly on the sperms. Because the hormone supply is gradually depleted, regular replacement of the device is necessary.

Another hormonal device LNG-20 (Mirena) is a T-shaped IUD releasing 20 mcg of **levonorgestrel** (a potent synthetic steroid); it has a low pregnancy rate (0.2 per 100 women) and less number of ectopic pregnancies *(41)*. Long-term clinical experience with levonorgestrel releasing IUD has shown to be associated with lower menstrual blood loss and fewer days of bleeding than the copper devices. The levonorgestrel releasing IUD has an effective life of 10 years (41). The hormonal devices would be particularly valuable for women in developing countries in whom excess blood loss caused by inert devices have been shown to result in significant anaemia. But these devices are more expensive, to be introduced on a wide scale.

Mechanism of action of IUDs

At present, the most widely accepted view is that the IUD causes a foreign body reaction in the uterus causing cellular and biochemical changes in the endometrium and uterine fluids, and it is believed that these changes impair the viability of the gamete and thus reduce its chances of fertilization, rather than its implantation.

Medicated IUDs produce other local effects that may contribute to their contraceptive action. Copper seems to enhance the cellular response in the endometrium *(48)*. It also affects the enzymes in the uterus. By altering the biochemical composition of cervial mucus, copper ions may affect sperm motility, capacitation and survival *(48)*.

Hormone-releasing devices increase the viscosity of the cervical mucus and thereby prevent sperm from entering the cervix. They also maintain high levels of progesterone in the endometrium and thus, relatively low levels of oestrogen, thereby sustaining an endometrium unfavourable to implantation *(48)*.

Effectiveness

The IUD is one of the most effective reversible contraceptive methods. The "theoretical effectiveness" of IUD is less than that of oral and injectable hormonal contraceptives. But since IUDs have longer continuation rates than the hormonal pills or injections, the overall effectiveness of IUDs and oral contraceptives are about the same in family planning programmes *(49)*.

Table 19 shows the rates of pregnancy, expulsion and removal of some of the IUDs. It can be seen from Table 19 that copper devices are more effective than the Lippes Loop in preventing pregnancy, with fewer expulsions. Studies have shown that the effectiveness of copper devices is directly related to the amount of copper surface area (usually this is 200 or 220 sq. mm.)

TABLE 19

First year clinical trial experience in parous women

Device	Pregnancy rate (%)	Explusion rate (%)	Removal rate (%)
Lippes Loop	3	12-20	12-15
Cu-7	2-3	6	11
TCu-200	3	8	11
TCu-380A	0.5-0.8	5	14
Progesterone IUD	1.3-1.6	2.7	9.3
Levonorgestrel IUD	0.2	6	17

Source : *(41)*

Change of IUD

Inert IUDs such as Lippes Loop may be left in place as long as required, if there are no side-effects. Copper devices cannot be used indefinitely because copper corrodes and mineral deposits build up on the copper affecting the release of copper ions. They have to be replaced periodically. The same applies to the hormone-releasing devices. This is an inherent disadvantage of medicated devices when they are used in large national family planning programmes.

The Cu-T 380A is approved for use for 10 years. However, the Cu-T 380A has been demonstrated to maintain its efficacy over at least 12 years of use. The Cu-T-200 is approved for 4 years and the Nova T for 5 years. The progesterone-releasing IUD must be replaced

every year because the reservoir of progesterone is depleted in 12–18 months. The levonorgestrel IUD can be used for at least 7 years, and probably 10 years. The progesterone IUD has a slightly higher failure rate, but the levonorgestrel device that releases 15–20 µg levonorgestrel per day is as effective as the new copper IUDs *(41)*.

Advantages

The IUD has many advantages : (a) simplicity, i.e., no complex procedures are involved in insertion; no hospitalization is required (b) insertion takes only a few minutes (c) once inserted IUD stays in place as long as required (d) inexpensive (e) contraceptive effect is reversible by removal of IUD (f) virtually free of systemic metabolic side-effects associated with hormonal pills (g) highest continuation rate, and (h) there is no need for the continual motivation required to take a pill daily or to use a barrier method consistently; only a single act of motivation is required. However, as with most contraceptive methods, the IUD can produce side-effects such as heavy menstruation and/or pain.

Contraindications

ABSOLUTE : (a) suspected pregnancy (b) pelvic inflammatory disease (c) vaginal bleeding of undiagnosed aetiology (d) cancer of the cervix, uterus or adnexia and other pelvic tumours (e) previous ectopic pregnancy *(50)*.

RELATIVE : (a) anaemia (b) menorrhagia (c) history of PID since last pregnancy (d) purulent cervical discharge (e) distortions of the uterine cavity due to congenital malformations, fibroids (f) unmotivated person *(46)*.

The ideal IUD candidate

The Planned Parenthood Federation of America (PPFA) has described the ideal IUD candidate as a woman :

- who has borne at least one child
- has no history of pelvic disease
- has normal menstrual periods
- is willing to check the IUD tail
- has access to follow-up and treatment of potential problems, and
- is in a monogamous relationship.

The federation does not, however, rule out women who do not conform to this profile *(51)*.

An important finding that has recently emerged is that the IUD is not a method of first choice for nulliparous women. They have more problems with IUD such as expulsions, low abdominal pain and pelvic infection, than other women. IUDs such as copper-T, which are smaller and more pliable are better suited to the small uterus of the nulliparous women, if they cannot use or accept alternative methods of contraception.

In 1985, the American College of Obstetricians and Gynaecologists stated that IUDs are "not recommended for women who have not had children or who have multiple partners, because of the risk of PID and possible infertility" *(51)*.

Timing of insertion

Although the loop can be inserted at almost anytime during a woman's reproductive years (except during pregnancy), the most propitious time for loop insertion is during menstruation or within 10 days of the beginning of a menstrual period *(43)*. During this period, insertion is technically easy because the diameter of the cervical canal is greater at this time than during the secretory phase. The uterus is relaxed and myometrial contractions which might tend to cause expulsion are at a minimum *(45)*. In addition, the risk that a woman is pregnant is remote at this time.

The IUD insertion can also be taken up during the first week after delivery before the woman leaves the hospital ("immediate postpartum insertion"). Special care is required with insertions during the first week after delivery because of the greater risk of perforation during this time. Furthermore, immediate postpartum insertion is associated with a high expulsion rate. A convenient time for loop insertion is 6–8 weeks after delivery ("post-puerperal insertion"). Post-puerperal insertion of an IUD has several advantages. It can be combined with the follow-up examination of the women and her child. IUD insertion can also be taken up immediately after a legally induced first trimester abortion. But IUD insertion immediately after a second trimester abortion is not recommended *(46)*. Since there is a risk of infection, most physicians still do not approve of an IUD insertion after an illegal abortion *(46)*.

Follow-up

An important aspect of IUD insertion is follow-up which is sadly neglected. The objectives of the follow-up examination are : (a) to provide motivation and emotional support for the woman (b) to confirm the presence of the IUD, and (c) diagnose and treat any side-effect or complication *(51)*. The IUD wearer should be examined after her first menstrual period, for the chances of loop expulsion are high during this period; and again after the third menstrual period to evaluate the problems of pain and bleeding; and thereafter at six-month or one-year intervals depending upon the facilities and the convenience of the patient.

The IUD wearer should be given the following instructions : (a) she should regularly check the threads or "tail" to be sure that the IUD is in the uterus; if she fails to locate the threads, she must consult the doctor (b) she should visit the clinic whenever she experiences any side-effects such as fever, pelvic pain and bleeding, and (c) if she misses a period, she must consult the doctor.

SIDE-EFFECTS AND COMPLICATIONS

1. Bleeding

The commonest complaint of women fitted with an IUD (inert or medicated) is increased vaginal bleeding. It accounts for 10–20 per cent of all IUD removals *(51)*. The bleeding may take one or more of the following forms : greater volume of blood loss during menstruation, longer menstrual periods or mid-cycle bleeding *(48)*. From the woman's point of view, irregular bleeding constitutes a source of personal inconvenience; from a medical point of view, the concern is iron-deficiency anaemia. Usually bleeding or spotting between periods settles within 1–2 months *(49)*. The patient who is experiencing the bleeding episodes should receive iron tablets (ferrous sulphate 200 mg, three times daily).

Studies have shown that the greatest blood loss is caused by the larger non-medicated devices. Copper devices seem to cause less average blood loss. Menstrual blood loss is consistently lower when hormone-releasing devices are used *(46)*.

If the bleeding is heavy or persistent or if the patient develops anaemia despite the iron supplement, the IUD should be removed. Since there is often a direct relationship between the bleeding and the size and configuration of the IUD *(50)*, a change of IUD from the Lippes Loop to one of copper devices is advised. In most women, removal of the device is rapidly followed by a return to the normal menstrual pattern. If an abnormal pattern persists, a full gynaecological examination is required to ensure that there is no pelvic pathology *(46)*.

2. Pain

Pain is the second major side-effect leading to IUD removal. WHO estimates that 15–40 per cent of IUD removals appear to be for pain only *(46)*. Pain may be experienced during IUD insertion and for a few days thereafter, as well as during menstruation *(51)*. It may manifest itself in low backache, cramps in the lower abdomen and occasionally pain down the thighs. These symptoms usually disappear by the third month *(49)*.

If during insertion, the pain is particularly severe, it is possible that the device may have been incorrectly placed in the uterus or there is a disparity in size between the device and the uterine cavity. Severe pain can also indicate a uterine perforation *(46)*. Pain could also be due to infection. Pain is more commonly observed in nullipara and those who have not had a child for a number of years *(52, 53)*.

Slight pain during insertion can be controlled by analgesics such as aspirin and codein. If pain is intolerable, the IUD should be removed. In place of a Lippes Loop, a copper device can be tried. If the woman decides not to have an IUD, another method of contraception should be prescribed.

3. Pelvic infection

Pelvic inflammatory disease (PID) is a collective term that includes acute, subacute and chronic conditions of the ovaries, tubes, uterus, connective tissue and pelvic peritoneum and is usually the result of infection *(50)*. Studies suggest that IUD users are about 2 to 8 times more likely to develop PID than non-contraceptors *(54)*. Risk associated with IUD use is greater among women who have a number of sexual partners *(55)* possibly because of greater potential for exposure to STDs. The greater risk of PID with IUD use may be due to introduction of bacteria into the uterus during IUD insertion. Recent work has focused on PID as being caused by organisms ascending the IUD tail from the lower genital tract to uterus and tubes *(56)*. The organisms include Gardnerella, Anaerobic streptococci, Bacteroides, Coliform bacilli and Actinomyces. The risk of PID appears to be the highest in the first few months after IUD insertion.

The clinical manifestations of PID are vaginal discharge, pelvic pain and tenderness, abnormal bleeding, chills and fever. In many cases, the infection may be asymptomatic or low grade. Even one or two episodes of PID can cause infertility permanently blocking the fallopian tubes. Therefore, young women should be fully counselled on the risks of PID before choosing an IUD.

When PID is diagnosed, it should be treated promptly with broad-spectrum antibiotics. Most clinicians recommend removing IUD if infection does not respond to antibiotics within 24–48 hours *(48)*. The risk of PID calls for proper selection of cases for IUD insertion, better sterilization and insertion techniques, and modified devices without tails.

4. Uterine perforation

Many workers have reported uterine perforation by the IUD *(57)*. The reported incidence ranges from 1:150 to 1 : 9000 insertions *(57)*, depending upon the time of insertion, design of the IUD, technique of insertion and operator's experience. In the hands of trained physicians, it should not be higher than 0.3 per cent *(58)*. The device may migrate into the peritoneal cavity causing serious complications such as intestinal obstruction. Copper devices produce an intense tissue reaction leading to peritoneal adhesions. Perforations occur more frequently when insertions are performed between 48 hours and 6 weeks postpartum. Interestingly, the perforation may be completely asymptomatic and discovered only when searching for a missing IUD. The conclusive diagnosis of perforation is usually made by a pelvic X-ray. Evidence suggests that any IUD that has perforated the uterus should be removed because the risks of intra-abdominal inflammatory response leading to adhesions or perforation of organs within the abdominal cavity outweigh the risks associated with removal *(51)*.

5. Pregnancy

Considering all IUDs together, the actual use failure rate in the first year is approximately 3 per cent *(41)*. It differs, in different types of IUDs. About 50 per cent of uterine pregnancies occurring with the device *in situ* end in a spontaneous abortion *(51)*. Removal of the IUD in early pregnancy has been found to reduce this abortion rate by half. In women who continue the pregnancy with the device *in situ*, a 4–fold increase in the occurrence of premature births compared with other women has been reported *(46)*.

The earlier teaching that pregnancy with an IUD *in situ* is not unsafe is no longer accepted. Pregnancy with an IUD should be regarded as a potential medical complication with the dangers of infection and spontaneous abortion. The options left open are *(45)* :

(a) If the woman requests an induced abortion, this is legally available.

(b) If the woman wishes to continue with the pregnancy and the threads are visible, the device should be removed by gently pulling the threads.

(c) If the woman wishes to continue with the pregnancy and the threads are not visible, there should be careful examination for possible complications. If there are any signs of intrauterine infection and sepsis, evacuation of the uterus under broad–spectrum antibiotic cover is mandatory.

If the woman becomes pregnant with the IUD, she should be advised that only 25 per cent of pregnancies will have a successful outcome if the IUD is left in place.

6. Ectopic pregnancy

The possibility of ectopic pregnancy must be considered when an IUD user becomes pregnant. The ectopic pregnancy rate per 1000 women year in levonorgestrel IUD and Cu-T 380A is about 0.2 as compared to non-contraceptive users, where it is about 3–4.5. With progesteron IUD it is higher–about 6.8, because its action is limited to a local effect on endometrium. With levonorgestrel IUD the chances of ectopic pregnancy are less, because it is associated with a partial suppression of gonadotrophins with subsequent disruption of normal follicular growth and inhibition of ovulation in significant number of cycles *(41)*.

Women using IUDs should be taught to recognize the symptoms of ectopic pregnancy – lower abdominal pain, dark and scanty vaginal bleeding or amenorrhoea. Women at high risk of ectopic pregnancy – because of previous PID, tubal pregnancy or other ectopic pregnancy – should not use an IUD if other methods are feasible *(51)*.

7. Expulsion

Expulsion rates vary between 12–20 per cent (Table 19). Expulsion can be partial or complete. Partial expulsion is diagnosed on speculum examination by observing the stem of the IUD protruding through the cervix. Clinical skill, timing of insertion and the age and parity of the user all influence the likelihood of expulsion.

An expulsion usually occurs during the first few weeks following insertion or during menstruation. Expulsion is most common among young women, nulliparous women and women who have a postpartum insertion. Expulsion rates are somewhat lower for copper than for inert devices. As many as 20 per cent of all expulsions go undetected. In general, expulsion in itself is not a serious problem, but if expulsion is unnoticed, pregnancy may occur.

8. Fertility after removal

Fertility does not seem to be impaired after removal of a device provided there has been no episode of PID, whilst the device was *in situ (48)*. Over 70 per cent of previous IUD users conceive within one year of stopping use *(51)*. It is now established that PID is a threat to woman's fertility. There is no meaningful data available on the long-term use of IUD on subsequent fertility *(46)*.

9. Cancer and teratogenesis

There is no evidence to date that IUD use increases cancer risks. Nor is there any evidence of developmental abnormality or congenital malformations among the offspring of either former users of IUDs or those who conceive with an IUD *in situ (46)*.

10. Mortality

Mortality associated with IUD use is extremely rare and has been estimated to be one death per 100,000 woman-years of use, the deaths usually following complications such as septic spontaneous abortion or ectopic pregnancy *(46)*. In fact, IUD is safer than oral contraceptives in this regard, particularly in older or high-risk patients *(46)*.

Of all the available spacing methods of contraception, IUDs are among the most effective, with an average pregnancy rate after one year of about 3–5 per 100 typical users *(51)*. In comparison with other methods, the IUD is a relatively inexpensive form of contraception, because of its long life. Unlike use of barrier methods, IUD use is independent of the time of intercourse. IUDs have a relatively high continuation rates. Inert devices, as well as those with copper lack the systemic metabolic effects associated with oral pills. Women who cannot tolerate the adverse effects of oral pills may find the IUD an acceptable alternative. It does not interfere with lactation. However, because of expulsion and possible side-effects like menstrual irregularities, IUDs should preferably be used in settings where follow-up facilities are available. Evidence to date shows that for a fully informed woman, the IUD can provide a satisfactory, highly effective, relatively low-risk method of contraception.

HORMONAL CONTRACEPTIVES

Hormonal contraceptives when properly used are the most effective spacing methods of contraception. Oral contraceptives of the combined type are almost 100 per cent effective in preventing pregnancy. They provide the best means of ensuring spacing between one childbirth and another. More than 65 million in the world are estimated to be taking the "pill" of which about 9.52 million are estimated to be in India.

Gonadal steroids

To physicians in general medicine, the term "steroid" refers to adrenocortical hormones, while to those in gynaecology, it implies gonadal steroids, i.e., oestrogens and progestogens.

a. *Synthetic oestrogens* : Two synthetic oestrogens are used in oral contraceptives. These are *ethinylestradiol* and *mestranol*. Both are effective. In fact, mestranol is inactive until converted into ethinylestradiol in the liver *(59)*.

b. *Synthetic progestogens* : These are classified into three groups – pregnanes, oestranes and gonanes. (i) *Pregnanes* : These include megestrol, chlormadinone and medroxy-progesterone acetate. The pregnane progestogens are now not recommended in oral contraceptives because of doubts raised by the occurrence of breast tumours in beagle dogs. (ii) *Oestrones* : These are also known as 19-nortestosterones, e.g., norethisterone, norethisterone acetate, lynestrenol, ethynodiol diacetate and norethynodrel. These are all metabolized to norethisterone before becoming active. For some women, oestranes are more acceptable than gonanes. (iii) *Gonanes* : The most favoured gonane is levonorgestrel *(59)*.

Classification

Hormonal contraceptives currently in use and/or under study may be classified as follows :

A. Oral pills
   1. Combined pill
   2. Progestogen only pill (POP)
   3. Post-coital pill
   4. Once-a-month (long-acting) pill
   5. Male pill

B. Depot (slow release) formulations
   1. Injectables
   2. Subcutaneous implants
   3. Vaginal rings

A. ORAL PILLS

1. Combined pill

The combined pill is one of the major spacing methods of contraception. The "original pill" which entered into the market in the early 1960s contained 100–200 mcg of a synthetic oestrogen and 10 mg of a progestogen. Since then, a number of improvements have been made to reduce the undesirable side-effects of the pill by reducing the dose of both the oestrogen and progestogen. At the present time, most formulations of the combined pill contain no more than 30–35 mcg of a synthetic oestrogen, and 0.5 to 1.0 mg of a progestogen. The debate continues about the minimum effective dose of the progestogen in the pill which will produce the least metabolic disturbances.

The pill is given orally for 21 consecutive days beginning on the 5th day of the menstrual cycle (for a few preparations

20 or 22 days are advised), followed by a break of 7 days during which period menstruation occurs. When the bleeding occurs, this is considered the first day of the next cycle. The bleeding which occurs is not like normal menstruation, but is an episode of uterine bleeding from an incompletely formed endometrium caused by the withdrawal of exogenous hormones. Therefore it is called "withdrawal bleeding" rather than menstruation. Further, the loss of blood which occurs is about half that occurring in a woman having ovulatory cycle. If bleeding does not occur, the woman is instructed to start the second cycle one week after the preceding one. Ordinarily, the woman "menstruates" after the second course of pill intake.

The pill should be taken everyday at a fixed time, preferably before going to bed at night. The first course should be started strictly on the 5th day of the menstrual period, as any deviation in this respect may not prevent pregnancy. If the user forgets to take a pill, she should take it as soon as she remembers, and that she should take the next day's pill at the usual time.

Types of pills

The Department of Family Welfare, in the Ministry of Health and Family Welfare, Government of India has made available 2 types of low-dose oral pills under the brand names of MALA-N and MALA-D. It contains Levonorgestrel 0.15 mg and Ethinyl estradiol 0.03 mg. Mala-D in a package of 28 pills (21 of oral contraceptive pills and 7 brown film coated 60 mg ferrous fumarate tablets) is made available to the consumer under social marketing at a price of Rs. 3 per packet. Mala-N is supplied free of cost through all PHCs, urban family welfare centres, etc. Some of the combined pills are as shown in Table 20.

TABLE 20
Some combination oral contraceptives

Name	Progestin	(mg)
(A) *With EE 0.02 mg*		
Loestrin 1/20	Norethisterone acetate	1.00
Femilon	Desogestrel	0.15
(B) *With EE 0.03 mg*		
Eugynon 30	Levonorgestrel	0.25
Microgynon, Ovral L, Triquilar (Varying E E and levonorgestrel), Primovlar 30, Mala D,	Levonorgestrel	0.15
Choice	Norgestrel	0.30
Novelon	Desogestrel	0.15
Yasmin	Drospirenone	3.00
(C) *With EE 0.05 mg and less progestogenic*		
Eugynon 50, Duoluton, Ovral G	Norgestrel	0.50
Ovral, Primovlar 50	Levonorgestrel	0.25
Minovlar Ed, Orlest	Norethisterone acetate	1.00
Orthonovin 1/50	Norethisterone	1.00
(D) *With EE 0.05 mg and more progestogenic*		
Orgalutin	Lynestrenol	2.50
Norlestrin 2.5/50	Norethisterone acetate	2.50
Gynovlar 21	-Do-	3.00
Anovlar 21	-Do-	4.00

2. Progestogen-only pill (POP)

This pill is commonly referred to as "minipill" or "micropill". It contains only progestogen, which is given in small doses throughout the cycle. The commonly used progestogens are norethisterone and levonorgestrel.

The progestogen-only pills never gained widespread use because of poor cycle control and an increased pregnancy rate *(60)*. However, they have a definite place in modern-day contraception. They could be prescribed to older women for whom the combined pill is contraindicated because of cardiovascular risks. They may also be considered in young women with risk factors for neoplasia *(61)*. The evidence that the progestogens may lower the high-density lipoproteins may be of some concern.

3. Post-coital contraception

Post-coital (or "morning after") contraception is recommended within 72 hours of an unprotected intercourse. Two methods are available :

(a) *IUD* : The simplest technique is to insert an IUD, if acceptable, especially a copper device within 5 days.

(b) *Hormonal* : More often a hormonal method may be preferable. In India Levonorgestrel 0.75 mg tablet is approved for emergency contraception. It is used as one tablet of 0.75 mg within 72 hours of unprotected sex and the 2nd tablet after 12 hours of 1st dose.

or

Two oral contraceptive pills containing 50 mcg of ethinyl estradiol within 72 hours after intercourse, and the same dose after 12 hours.

or

Four oral contraceptive pills containing 30 or 35 mcg of ethinyl estradiol within 72 hours and 4 tablets after 12 hours.

or

Mifepristone 10 mg once within 72 hours.

Post-coital contraception is advocated as an emergency method; for example, after unprotected intercourse, rape or contraceptive failure. Opinion is divided about the effect on foetus, should the method fail. Although the failure rate for post-coital contraception is less than 1 per cent, some experts think a woman should not use the hormonal method unless she intends to have an abortion, if the method fails. There is no evidence that foetal abnormalities will occur. But some doubts remain *(62)*.

4. Once-a-month (long-acting) pill

Experiments with once-a-month oral pill in which quinestrol, a long-acting oestrogen is given in combination with a short-acting progestogen, have been disappointing *(63)*. The pregnancy rate is too high to be acceptable. In addition, bleeding tends to be irregular.

5. Male pill

The search for a male contraceptive began in 1950 *(64)*. Research is following 4 main lines of approach : (a) preventing spermatogenesis (b) interfering with sperm storage and maturation (c) preventing sperm transport in the vas, and (d) affecting constituents of the seminal fluid. Most

of the research is concentrated on interference with spermatogenesis. An ideal male contraceptive would decrease sperm count while leaving testosterone at normal levels. But hormones that suppress sperm production tend to lower testosterone and affect potency and libido.

A male pill made of gossypol – a derivative of cotton-seed oil, has been very much in the news. It is effective in producing azoospermia or severe oligospermia, but as many as 10 per cent of men may be permanently azoospermic after taking it for 6 months. Further gossypol could be toxic. Animal studies show a narrow margin between effective and toxic doses. At present it does not seem that gossypol will ever be widely used as a male contraceptive *(65)*.

MODE OF ACTION OF ORAL PILLS

The mechanism of action of the combined oral pill is to prevent the release of the ovum from the ovary. This is achieved by blocking the pituitary secretion of gonadotropin that is necessary for ovulation to occur. Progestogen–only preparations render the cervical mucus thick and scanty and thereby inhibit sperm penetration. Progestogens also inhibit tubal motility and delay the transport of the sperm and of the ovum to the uterine cavity *(63)*.

EFFECTIVENESS

Taken according to the prescribed regimen, oral contraceptives of the combined type are almost 100 per cent effective in preventing pregnancy *(50)*. Some women do not take the pill regularly, so the actual rate is lower. In developed countries, the annual pregnancy rate is less than 1 per cent but in many other countries, the pregnancy rate is considerably higher *(63)*.

Under clinical trial conditions, the effectiveness of progestogen–only pills is almost as good as that of the combination products. However, in large family planning programmes, the effectiveness and continuation rates are usually lower than in clinical trials. The effectiveness may also be affected by certain drugs such as rifampicin, phenobarbital and ampicillin *(63)*.

RISKS AND BENEFITS

a. Adverse effects

1. *Cardiovascular effects*

Data from the earlier case control studies *(66, 67)* and the Oral Contraceptive Study of the RCGP *(68)* and the Oxford Study in UK *(68, 69)* provided conclusive evidence that the use of the combined pill was associated with an excess mortality. Women who had used the pill were reported to have a 40 per cent higher death rate than women who had never taken the pill. Virtually, all the excess mortality was due to cardiovascular causes, that is myocardial infarction, cerebral thrombosis and venous thrombosis, with or without pulmonary embolus *(70, 71)*. The risk increased substantially with age and cigarette smoking. The evidence was convincing that the cardiovascular complications were positively associated with the oestrogen content of the pill.

The above findings led to the progressive reduction of the oestrogen content to the minimum levels necessary to maintain contraceptive effect. In spite of this reduction, it became clear by 1980 that some of the untoward vascular effects (e.g., hypertension) persisted, in addition to metabolic effects which are attributed to the progestogen content of the pill. It became clear that progestogen levels must also be minimal to avoid the complications of pill use.

2. *Carcinogenesis*

A review prepared by WHO *(72)* concluded that there was no clear evidence of a relationship, either positive or negative between the use of combined pill and the risk of any form of cancer. However, the WHO Multicentre case-control study on the possible association between the use of hormonal contraceptives and neoplasia indicated a trend towards increased risk of cervical cancer with increasing duration of use of oral contraceptives; this finding is being further explored *(73)*.

3. *Metabolic effects*

A great deal of attention has been focused recently on the metabolic effects induced by oral contraceptives. These have included the elevation of blood pressure, the alteration in serum lipids with a particular effect on decreasing high-density lipoproteins, blood clotting and the ability to modify carbohydrate metabolism with the resultant elevations of blood glucose and plasma insulin *(74)*. These effects are positively related to the dose of the progestogen component *(75)*. Family planning specialists have voiced a growing concern that the adverse effects associated with oral contraceptives could be a potential long–range problem for the users in that they may accelerate atherogenesis and result in clinical problems such as myocardial infarction and stroke.

4. *Other adverse effects*

(i) *Liver disorders* : The use of the pill may lead to hepatocellular adenoma and gall bladder disease. Cholestatic jaundice can occur in some pill users. (ii) *Lactation* : Preparations containing a relatively high amount of oestrogen adversely affect the quantity and constituents of breast milk *(73)*, and less frequently cause premature cessation of lactation. In a WHO study *(73)* users of the combined pill experienced a 42 per cent decline in milk volume after 18 weeks, compared with a decline of 12 per cent for users of progestogen-only minipills and 0.16 per cent for controls using non-hormonal preparations. Women taking oral contraceptives, no matter what type, excrete small quantities of hormones in their breast milk, but little is known about the long-term impact, if any, on the child *(71)*. (iii) *Subsequent fertility*: In general, oral contraceptive use seems to be followed by a slight delay in conception *(76)*. The proportion of women becoming pregnant within 2 months of discontinuing the pill may range from 15–35 per cent *(77)*. It is not known whether the prolonged use of the pill beyond 5–10 years affects subsequent fertility. (iv) *Ectopic pregnancies* : These are more likely to occur in women taking progestogen-only pills, but not in those taking combined pills. (v) *Foetal development* : Several reports have suggested that oral pills taken inadvertently during (or even just before) pregnancy might increase the incidence of birth defects of the foetus, but this is not yet substantiated *(78)*.

5. Common unwanted effects

(i) *Breast tenderness* : Breast tenderness, fullness and discomfort have been observed in women taking oral pills. Breast engorgement and fullness are said to be dependent on progestogen; pain and tenderness are attributed to oestrogen. (ii) *Weight gain* : About 25 per cent of users complain of weight gain. It is usually less than 2 kg, and occurs during the first 6 months of use. This is attributed to water retention, in which case restriction of salt intake is usually effective. (iii) *Headache and migraine* : Migraine may be aggravated or triggered by the pill. Women, whose migraine requires treatment with vasoconstrictors such as ergotamine, should not take oral pills. (iv) *Bleeding disturbances* : A small minority of women using oral contraceptives may complain of break-through bleeding or spotting in the early cycles. A few women may not have a withdrawal bleeding at the end of a cycle. Women should be forewarned of these possibilities.

b. Beneficial effects

The single most significant benefit of the pill is its almost 100 per cent effectiveness in preventing pregnancy and thereby removing anxiety about the risk of unplanned pregnancy. Apart from this, the pill has a number of non-contraceptive health benefits *(79)*. Both the Royal College of General Practitioners' and the Oxford Family Planning Association's long-term prospective studies of pill use in Britain have shown that using the pill may give protection against at least 6 diseases: benign breast disorders including fibrocystic disease and fibroadenoma, ovarian cysts, iron-deficiency anaemia, pelvic inflammatory disease, ectopic pregnancy and ovarian cancer.

Contraindications

(a) *Absolute* : Cancer of the breast and genitals; liver disease; previous or present history of thromboembolism; cardiac abnormalities; congenital hyperlipidaemia; undiagnosed abnormal uterine bleeding.

(b) *Special problems requiring medical surveillance* : Age over 40 years; smoking and age over 35 years; mild hypertension; chronic renal disease; epilepsy; migraine; nursing mothers in the first 6 months; diabetes mellitus; gall bladder disease; history of infrequent bleeding, amenorrhoea, etc. *(63)*.

Duration of use

The pill should be used primarily for spacing pregnancies in younger women. Those over 35 years should go in for other forms of contraception. Beyond 40 years of age, the pill is not to be prescribed or continued because of the sharp increase in the risk of cardiovascular complications *(63)*.

Medical supervision *(80)*

Women taking oral contraceptives should be advised annual medical examinations. An examination before prescribing oral pills is required (a) to identify those with contraindications, and (b) those with special problems that require medical intervention or supervision. A check-list (Table 21) has been developed for screening women who can be given oral pills by the health workers.

TABLE 21

Check-list for prescription of oral contraceptives

Check the following by history and examination	Yes	No
Above 40 years of age	....	....
Above 35 years of age and a heavy smoker	....	....
Seizures	....	....
Severe pain in the calves or thighs	....	....
Symptomatic varicose veins in the legs	....	....
Severe chest pains	....	....
Unusual shortness of breath after examination	....	....
Severe headaches and/or visual disturbances	....	....
Lactating (yes = for less than 6 months)	....	....
Intermenstrual bleeding and/or bleeding after sexual intercourse	...	....
Amenorrhoea	....	....
Abnormally yellow skin, eyes	....	....
Blood pressure (yes = above 140 mm Hg systolic and/or 90 mm Hg diastolic)	....	....
Mass in the breast	....	....
Swollen legs (oedema)	....	....
Instructions : If all the above are negative, the woman may be given oral contraceptives. If any are positive, she must first be seen by a doctor.		

Source : *(71)*

B. DEPOT FORMULATIONS

The need for depot formulations which are highly effective, reversible, long-acting and oestrogen-free for spacing pregnancies in which a single administration suffices for several months or years cannot be stressed. The injectable contraceptives, subdermal implants and vaginal rings come in this category.

1. Injectable contraceptives

There are two types of injectable contraceptives. Progestogen-only injectables and the newer once-a-month combined injectables. The formulation and injection schedules of injectable contraceptives are as shown in Table 22.

A. PROGESTOGEN-ONLY INJECTABLES

Thus far, only two injectable hormonal contraceptives – both based on progestogen – have been found suitable. They offer more reliable protection against unwanted pregnancies than the older barrier techniques. These are :

a. DMPA (Depot-medroxyprogesterone acetate)
b. NET-EN (Norethisterone enantate)
c. DMPA-SC

a. DMPA *(81)*

Depot-medroxyprogesterone acetate (DMPA or Depo-provera) has been in use since 1960s. The standard dose is an intramuscular injection of 150 mg every 3 months. It

Formulations and injection schedules of injectio

Common trade names	Formulation	Injection type and schedule
Progestin - Only Injectables		
Depo-Provera®, Megestron®, Contracep®, Depo-Prodasone®	Depot medroxyprogesterone acetate (DMPA) 150 mg	One intramuscular (IM) injection every 3 months
depo-subQ provera 104® (DMPA-SC)	DMPA 104 mg	One subcutaneous injection every 3 months
Noristerat®, Norigest®, Doryxas®	Norethisterone enanthate (NET-EN) 200 mg	One IM injection every 2 months
Combined Injectable (progestin + estrogen)[1]		
Cyclofem®, Ciclofeminina®, Lunelle®[2]	Medroxyprogesterone acetate 25 mg + Estradiol cypionate 5 mg (MPA/E_2C)	One IM injection every month
Mesigyna®, Norigynon®	NET-EN 50 mg + Estradiol valerate 5 mg ($NET\text{-}EN/E_2V$)	One IM injection every month
Deladroxale®, Perlutal®, Topasel®, Patectro®, Deproxone®, Nomagest®	Dihydroxyprogesterone (algestone) acetophenide 150 mg + Estradiol enanthate 10 mg	One IM injection every month
Anafertin®, Yectames®	Dihydroxyprogesterone (algestone) acetophenide 75 mg + Estradiol enanthate 5 mg	One IM injection every month, except 2 injections in first month
Chinese Injectable No. 1®	17α-hydroxyprogesterone caproate 250 mg + Estradiol valerate 5 mg	

[1] Also called monthly injectables.
[2] The U.S. Food and Drug Administration approved Lunelle, but it is currently not available in the United States.

Source : *(81)*

gives protection from pregnancy in 99 per cent of women for at least 3 months. It exerts its contraceptive effect primarily by suppression of ovulation. However, it also has an indirect effect on the endometrium and direct action on the fallopian tubes and on the production of cervical mucus, all of which may play a role in reducing fertility. DMPA has been found to be a safe, effective and acceptable contraceptive which requires a minimum of motivation or none at all. Another advantage is that it does not affect lactation. Therefore in the experience of several countries, DMPA has proved acceptable during the postpartum period as a means of spacing pregnancies. However, the side-effects of DMPA (viz. weight increase, irregular menstrual bleeding and prolonged infertility after its use) are disadvantages limiting the age groups for which the drug could regularly be used. As now practiced in a number of countries, this contraceptive should find good use among multiparae of age over 35 years who have already completed their families.

b. NET-EN

Norethisterone enantate (NET-EN) has been in use as a contraceptive since 1966. However, it has been less extensively used than DMPA. It is given intramuscularly in a dose of 200 mg every 60 days. Contraceptive action appears to include inhibition of ovulation, and progestogenic effects on cervical mucus. A slightly higher (0.4) pregnancy rate (failure rate) has been reported as compared to DMPA.

Administration

The initial injection of both DMPA and NET-EN should be given during the first 5 days of the menstrual period. This timing is very important to rule out the possibility of pregnancy. Both are given by deep intramuscular injection into the gluteus maximus. The injection site should never be massaged following injections. *(82)*. Although compliance with regular injection intervals should be encouraged, both DMPA and Net-EN may be given two weeks early or two weeks late *(83)*.

c. DMPA-SC 104 mg *(81)*

A new lower-dose formulation of DMPA, *depo-subQ provera 104* (also called DMPA-SC), is injected under the skin rather than in the muscle. It contains 104 mg of DMPA rather than the 150 mg in the intramuscular formulation. Like the intramuscular formulation, DMPA-SC is given at 3-month intervals.

DMPA-SC is just as effective as the formulation injected into the muscle, and the patterns of bleeding changes and amount of weight gain are similar.

Injections of DMPA-SC are given in the upper thigh or abdomen. DMPA-SC should not be injected intramuscularly, and the intramuscular formulation should not be injected subcutaneously. The intramuscular formulation cannot be diluted to make the lower-dose subcutaneous formulation.

Side-effects

Both DMPA and NET-EN have similar side effects, the most common being disruption of the normal menstrual cycle, manifested by episodes of unpredictable bleeding, at times prolonged and at other times excessive. In addition, many women using DMPA or NET-EN may become amenorrhoeic. The unpredictable bleeding may be very inconvenient to the user; and amenorrhoea can be alarming, causing anxiety. Studies showed that women discontinuing DMPA became pregnant some 5.5 months (average) after the treatment period. At 2 years, more than 90 per cent of previous users became pregnant *(82)*. A study is in progress in India to examine the return of fertility among women who discontinued NET-EN. The potential long-term effects of DMPA and NET-EN are not yet known.

Contraindications

These include cancer of the breast; all genital cancers; undiagnosed abnormal uterine bleeding; and a suspected malignancy. Women usually should not start using a progestin-only injectable if they have high blood pressure

(systolic ≥ 160 mm Hg or diastolic ≥ 100), certain conditions of the heart, blood vessels, or liver including history of stroke or heart attack and current deep vein thrombosis. Also, a woman breast-feeding a baby less than 6 weeks old should not use progestin-only injectables *(81)*.

The particular advantage of DMPA and NET-EN is that they are highly effective, long-lasting and reversible contraceptives. Check-lists have been developed for auxiliaries primarily for the screening of women who can be given injectable contraceptives without being examined by the physician; they can also be utilized in follow-up visits.

B. COMBINED INJECTABLE CONTRACEPTIVES

These injectables contain a progestogen and an oestrogen. They are given at monthly intervals, plus or minus three days. Combined injectable contraceptives act mainly by suppression of ovulation. The cervical mucus is affected, mainly by progestogen, and becomes an obstacle to sperm penetration. Changes are also produced in endometrium which makes it unfavourable for implantation if fertilization occurs, which is extremely unlikely.

In clinical trials, Cyclofem/Cycloprovera and Mesigyna have both been found to be highly effective with 12 month failure rates of 0.2 per cent or less for Cyclofem/Cycloprovera and 0.4 per cent for Mesigyna. The side-effects are similar to progestogen only injectables, but are much less. Data on return to ovulation and fertility are limited.

The contraindications are confirmed or suspected pregnancy; past or present evidence of thromboembolic disorders; cerebrovascular or coronary artery disease; focal migraine; malignancy of the breast; and diabetes with vascular complications. Combined injectables are not suitable for women who are fully breast feeding until 6 months postpartum. It is less suitable for women with risk factors for oestrogen.

2. Subdermal implants

The Population Council, New York has developed a subdermal implant known as **Norplant** for long-term contraception. It consists of 6 silastic (silicone rubber) capsules containing 35 mg (each) of levonorgestrel *(84)*. More recent devices comprise fabrication of levonorgestrel into 2 small rods, **Norplant (R)-2**, which are comparatively easier to insert and remove. The silastic capsules or rods are implanted beneath the skin of the forearm or upper arm. Effective contraception is provided for over 5 years. The contraceptive effect of Norplant is reversible on removal of capsules. A large multicentre trial conducted by International Committee for Contraception Research (ICCR) reported a 3-year pregnancy rate of 0.7. The main disadvantages, however, appear to be irregularities of menstrual bleeding and surgical procedures necessary to insert and remove implants.

3. Vaginal rings

Vaginal rings containing levonorgestrel have been found to be effective. The hormone is slowly absorbed through the vaginal mucosa, permitting most of it to bypass the digestive system and liver, and allowing a potentially lower dose. The ring is worn in the vagina for 3 weeks of the cycle and removed for the fourth *(85)*.

4. Centchroman non-hormonal pill (Chhaya) :

Centchroman is commonly known as weekly pill as for the first three months it is taken biweekly and from 4th month onwards, once weekly. It can be initiated anytime during the menstrual cycle if it is reasonably certain that the woman is not pregnant.

However, the following timing of initiation can be opted by the women to start the package after proper screening by health-care provider :

- on first day of period
- on the day of abortion itself
- within 4 weeks after childbirth, whether breastfeeding or not

To start with, take one pill at the correct time (mentioned above) and take another pill three days later (2 pills in a week). Then the schedule of these 2 pills per week to be followed for three months. From fourth month onwards, only one pill per week to be taken (the first pill day to be repeated every week) This weekly regime to be continued, regardless of menstrual cycle, till protection from pregnancy is needed *(86)*.

POST-CONCEPTIONAL METHODS

(Termination of pregnancy)

Menstrual regulation

A relatively simple method of birth control is "menstrual regulation". It consists of aspiration of the uterine contents 6 to 14 days of a missed period, but before most pregnancy tests can accurately determine whether or not a woman is pregnant *(45)*. Cervical dilatation is indicated only in nullipara or in apprehensive subjects. No after-care is necessary as a rule.

The immediate complications are uterine perforation and trauma. Late complications (after 6 weeks) include a tendency to abortion or premature labour, infertility, menstrual disorders, increase in ectopic pregnancies and Rh-immunization *(87)*.

Some regard menstrual regulation as very early abortion, others view it as a treatment for delayed periods. Menstrual regulation differs from abortion in 3 respects *(88)* : (a) the lack of certainty if a pregnancy is being terminated. Microscopic examination of the aspirated material can confirm pregnancy *post facto*, but it is not obligatory (b) the lack of legal restrictions, and (c) the increased safety of the early procedure.

Menstrual induction

This is based on disturbing the normal progesterone–prostaglandin balance by intrauterine application of 1–5 mg solution (or 2.5–5 mg pellet) of prostaglandin F2. Within a few minutes of the prostaglandin impact, performed under sedation, the uterus responds with a sustained contraction lasting about 7 minutes, followed by cyclic contractions continuing for 3–4 hours. The bleeding starts and continues for 7–8 days *(87)*.

Oral abortifacient

Mifepristone (RU 486) in combination with misoprostol is 95 per cent successful in terminating pregnancies of upto 9 week's duration with minimum complications. The commonly used regimen is mifepristone 200 mg orally on day 1, followed by misoprostol 800 mcg vaginally either immediately or within 6–8 hours. Commercially it comes as MTP kit having combipack tablets of mifepristone 200 mg one tablet and misoprostol 200 mcg 4 tablets (800 mcg).

The other regimen is a dose of mifepristone 600 mg on day one, followed by 400 mcg orally of misoprostol on day three.

The patient should return for a follow-up visit approximately 14 days after the administration of mifepristone to confirm by clinical examination or ultrasonographic scan that a complete termination of pregnancy has occurred. Patients who have an ongoing pregnancy at this visit have a risk of foetal malformation resulting from the treatment. Surgical termination is recommended to manage medical abortion treatment failures.

Contraindications

Administration of mifepristone and misoprostol is contraindicated in following conditions : (1) History of allergy or known hypersensitivity to mifepristone, misoprostol or other prostaglandin; (2) Confirmed or suspected ectopic pregnancy or undiagnosed adnexal mass; (3) IUD in place; (4) Chronic adrenal failure; (5) Haemorrhagic disorder or concurrent anticoagulant therapy; (6) Inherited porphyria; and (7) If a patient does not have adequate access to medical facilities equipped to provide emergency treatment of incomplete abortion and blood transfusion.

ABORTION

Abortion is theoretically defined as termination of pregnancy before the foetus becomes viable (capable of living independently). This has been fixed administratively at 28 weeks, when the foetus weighs approximately 1000 g. Abortion is sought by women for a variety of reasons including birth control. In fact, in some countries (e.g., Hungary) the legal abortions exceed live births.

Abortions are usually categorized as spontaneous and induced. Spontaneous abortions occur once in every 15 pregnancies *(89)*. They may be considered "Nature's method of birth control". Induced abortions, on the other hand, are deliberately induced – they may be legal or illegal. Illegal abortions are hazardous; they are usually the last resort of women determined to end their pregnancies at the risk of their own lives.

Abortion hazards

On an average, 73 million induced (safe and unsafe) abortions take place worldwide each year. About 61 per cent of all unintended pregnancies and 29 per cent of all pregnancies, end in induced abortion *(90)*. The rate of abortion was higher in developing regions than in developed world. About 45 per cent unsafe abortions were estimated to have taken place worldwide each year, almost all in developing world. Among these, 8 million were carried out in the least safe or dangerous conditions. Over half of all estimated unsafe abortions globally were in Asia. 3 out of 4 abortions that occurred in Africa and Latin America were unsafe. Each year between 4.7 per cent to 13.2 per cent of maternal deaths can be attributed to unsafe abortion. Around 7 million women are hospitalized every year in developing countries as a result of unsafe abortion.

Abortions are safe if they are done with a method recommended by WHO that is appropriate to the pregnancy duration and if the person providing abortion is trained. Unsafe abortion occurs when a pregnancy is terminated either by a person lacking the necessary skills or in an environment that does not conform to minimal medical standards, or both. The people, skills and medical standards considered safe in the provision of induced abortion are different for medical abortion (which is performed by drugs alone and/or surgical abortion) and that which is performed with a manual or electric aspirator. In developed regions it is estimated that 30 women die for every 100,000 unsafe abortions. This number rises to 220 deaths, per 100,000 unsafe abortions in developing regions and 520 deaths in sub-Saharan Africa *(91)*.

In India an ICMR study documented that the rates of safe (legal) and unsafe (illegal) abortion were 6.1 and 13.5 per 1000 pregnancies respectively. It is evident that perhaps two thirds of all abortions take place outside authorized health service by unauthorized and often unskilled persons *(92)*.

The EARLY COMPLICATIONS of abortion include haemorrhage, shock, sepsis; uterine perforation, cervical injury, thromboembolism and anaesthetic and psychiatric complications. The LATE SEQUELAE include infertility, ectopic gestation, increased risk of spontaneous abortion and reduced birth weight.

Data indicates that the seventh and eighth week of gestation is the optimal time for termination of pregnancy *(93)*. Studies indicate that the risk of death is 7 times higher for women who wait until the second trimester to terminate pregnancy. The Indian Law (MTP Act, 1971) allowed abortion only upto 20 weeks of pregnancy. In the year 2020 the MTP Bill was amended, to increase the duration of pregnancy upto 24 weeks.

Legalization of abortion

During the last 25 years there have been gradual liberalization of abortion laws throughout the world. Until 1971, abortions in India were governed exclusively by the Indian Penal Code 1860 and the Code of Criminal Procedure 1898, and were considered a crime except when performed to save the life of a pregnant woman. The Medical Termination of Pregnancy Act was passed by the Indian Parliament in 1971 and came into force from April 1, 1972 (except in Jammu and Kashmir, where it came into effect from November 1, 1976). Implementing rules and regulations initially written in 1971 were revised again in 1992 *(94)*. The Medical Termination of Pregnancy Act is a health care measure which helps to reduce maternal morbidity and mortality resulting from illegal abortions. It also affords an opportunity for motivating such women to adopt some form of contraception.

THE MEDICAL TERMINATION OF PREGNANCY ACT 1971

The Medical Termination of Pregnancy Act, 1971 lays down :

1. The conditions under which a pregnancy can be terminated.
2. The person or persons who can perform such terminations, and
3. The place where such terminations can be performed.

1. The conditions under which a pregnancy can be terminated under the MTP Act. 1971 :

There are 5 conditions that have been identified in the Act :

a. *Medical* – where continuation of the pregnancy might endanger the mother's life or cause grave injury to her physical or mental health.
b. *Eugenic* – where there is substantial risk of the child being born with serious handicaps due to physical or mental abnormalities.

c. *Humanitarian* – where pregnancy is the result of rape.

d. *Socio-economic* – where actual or reasonably foreseeable environments (whether social or economic) could lead to risk of injury to the health of the mother, and

e. *Failure of contraceptive devices* – The anguish caused by an unwanted pregnancy resulting from a failure of any contraceptive device or method can be presumed to constitute a grave mental injury to the health of the mother. This condition is a unique feature of the Indian law and virtually allows abortion on request, in view of the difficulty of proving that a pregnancy was not caused by failure of contraception.

The written consent of the guardian is necessary before performing abortion in women under 18 years of age, and in lunatics even if they are older than 18 years.

2. *The person or persons who can perform abortion*

The Act provides safeguards to the mother by authorizing only a Registered Medical Practitioner having experience in gynaecology and obstetrics to perform abortion where the length of pregnancy does not exceed 12 weeks. However, where the pregnancy exceeds 12 weeks and is not more than 20 weeks, the opinion of two Registered Medical Practitioners is necessary to terminate the pregnancy.

3. *Where abortion can be done*

The Act stipulates that no termination of pregnancy shall be made at any place other than a hospital established or maintained by Government or a place approved for the purpose of this Act by Government.

Abortion services are provided in hospitals in strict confidence. The name of the abortion seeker is kept confidential, since abortion has been treated statutorily as a personal matter.

MTP RULES (1975)

Rules and Regulations framed initially were altered in October 1975 to eliminate time-consuming procedures involved in MTP and to make services more readily available. These changes have occurred in 3 administrative areas *(95, 96)*.

1. *Approval by Board*

Under the new rules, the Chief Medical Officer of the district is empowered to certify that a doctor has the necessary training in gynaecology and obstetrics to do abortions. The procedure of doctors applying to Certification Boards was removed.

2. *Qualification required to do abortion*

The new rules allow for registered medical practitioners to qualify through on the spot training :

> "If he has assisted a RMP in the performance of 25 cases of medical termination of pregnancy in an approved institution".

The doctor may also qualify to do MTPs under the new rules if he has one or more of the following qualifications which are similar to the old rules :

(a) 6 months housemanship in obstetrics and gynaecology.

(b) a postgraduate qualification in OBG.

(c) 3 years of practice in OBG for those doctors registered before the 1971 MTP Act was passed.

(d) 1 year of practice in OBG for those doctors registered on or after the date of commencement of the Act.

3. *The place where abortion is performed*

Under the new rules, non-governmental institutions may also take up abortions provided they obtain a licence from the Chief Medical Officer of the district, thus eliminating the requirement of private clinics obtaining a Board licence.

Impact of liberalization of abortion

Although abortion has been greatly liberalized, the annual number of legal abortions are about 6.1 per 1000 pregnancies, whereas the illegal abortions performed in the country are about 13.5 per 1000 pregnancies. In other words, illegal abortions are still rife although it is now more than 45 years since MTP Act was promulgated.

An amendment to the MTP Act in the year 2003 includes decentralization of power for approval of places as MTP centres, from state to district level with the aim of enlarging the network of safe MTP centres, and MTP service providers. The strategy at the community level is : (a) spread awareness regarding safe MTP in the community and the availability of services thereof ; (b) Enhance access to confidential counselling for safe MTP; train ANMs, AWWs, and link workers/ASHAs to provide such counselling; and (c) Promote post-abortion care through ANMs, AWWs, link workers/ASHAs while maintaining confidentiality. At the facility level the strategy is : (1) To provide manual Vaccum Aspiration facility at all CHCs and at least 50 per cent of PHCs that are being strengthened for 24 hour deliveries; (2) Provide comprehensive and high quality MTP services at all FRUs; and (3) Encourage private and NGO sectors to establish quality MTP services *(98)*.

According to the new Oct. 2022 ruling of Supreme Court, Rule 3B allows abortion between 20 and 24 weeks of pregnancy if there is a change in marital status during pregnancy including widowhood or divorce. The Supreme Court declared that rule 3B must also extend to unmarried women who experience a change in their relationship (even if not married) status, whether due to separation from, desertion by or death of their partners *(97)*.

Repeated abortion is not conducive to the health of the mother. It has to be ensured that abortion does not replace the traditional methods of birth control. The numerous abortion hazards which are inherent should serve as a warning that abortions under the best of circumstances can never be as safe as efficient contraception.

MISCELLANEOUS

1. Abstinence

The only method of birth control which is completely effective is complete sexual abstinence. It is sound in theory; in practice, an oversimplification. It amounts to repression of a natural force and is liable to manifest itself in other directions such as temperamental changes and even nervous breakdown. Therefore, it can hardly be considered as a method of contraception to be advocated to the masses.

2. Coitus interruptus

This is the oldest method of voluntary fertility control.

It involves no cost or appliances. It continues to be a widely practised method. The male withdraws before ejaculation, and thereby tries to prevent deposition of semen into the vagina. Some couples are able to practise this method successfully, while others find it difficult to manage. The chief drawback of this method is that the precoital secretion of the male may contain sperm, and even a drop of semen is sufficient to cause pregnancy. Further, the slightest mistake in timing the withdrawal may lead to the deposition of a certain amount of semen. Therefore, the failure rate with this method may be as high as 25 per cent.

Hitherto, the alleged side-effects (e.g., pelvic congestion, vaginismus, anxiety neurosis) were highly magnified. Today, expert opinion is changing in this respect. If the couple prefers it, there should be no objection to its use. It is better than using no family planning method at all. It is conceded that coitus interruptus along with abstinence and abortion played a major role in reducing birth rates in the developed world during the 18th and 19th centuries *(45)*.

3. Safe period (rhythm method)

This is also known as the *"calendar method"* first described by Ogino in 1930. The method is based on the fact that ovulation occurs from 12 to 16 days before the onset of menstruation (see Fig. 7). The days on which conception is likely to occur are calculated as follows :

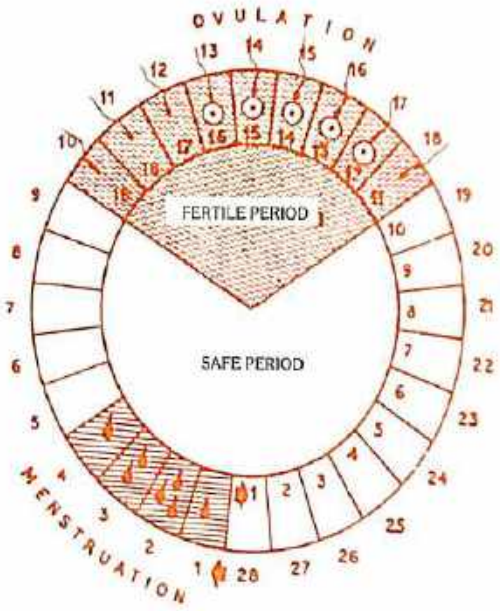

FIG. 7
Safe period in a 28-day cycle

The shortest cycle minus 18 days gives the first day of the fertile period. The longest cycle minus 10 days gives the last day of the fertile period. For example, if a woman's menstrual cycle varies from 26 to 31 days, the fertile period during which she should not have intercourse would be from the 8th day to the 21st day of the menstrual cycle, counting day one as the first day of the menstrual period. Fig. 7 shows the fertile period and the safe period in a 28-day cycle.

However, where such calculations are not possible, the couple can be advised to avoid intercourse from the 8th to the 22nd day of the menstrual cycle, counting from the first day of the menstrual period *(94)*.

The drawbacks of the calendar method are : (a) a woman's menstrual cycles are not always regular. If the cycles are irregular, it is difficult to predict the safe period (b) it is only possible for this method to be used by educated and responsible couples with a high degree of motivation and cooperation (c) compulsory abstinence of sexual intercourse for nearly one half of every month – what may be called "programmed sex" (d) this method is not applicable during the postnatal period, and (e) a high failure rate of 9 per 100 woman-years *(40)*. The failures are due to wrong calculations, inability to follow calculations, irregular use and "taking chances".

Two medical complications have been reported to result from the use of safe period; ectopic pregnancies and embryonic abnormalities. Ectopic pregnancies may follow conception late in the menstrual cycle and displacement of the ovum; embryonic abnormalities may result from conception involving either an over-aged sperm or over-aged ovum. If this is correct, the safe period may not be an absolutely safe period *(99)*.

4. Natural family planning methods

The term "natural family planning" is applied to three methods: (a) basal body temperature (BBT) method (b) cervical mucus method, and (c) symptothermic method. The principle is the same as in the calendar method, but here the woman employs self-recognition of certain physiological signs and symptoms associated with ovulation as an aid to ascertain when the fertile period begins. For avoiding pregnancy, couples abstain from sexual intercourse during the fertile phase of the menstrual cycle; they totally desist from using drugs and contraceptive devices. This is the essence of natural family planning.

(a) Basal body temperature method (BBT)

The BBT method depends upon the identification of a specific physiological event – the rise of BBT at the time of ovulation, as a result of an increase in the production of progesterone. The rise of temperature is very small, 0.3 to 0.5 degree C. When no ovulation occurs (e.g., as after menopause, during lactation) the body temperature does not rise. The temperature is measured preferably before getting out of bed in the morning. The BBT method is reliable if intercourse is restricted to the post-ovulatory infertile period, commencing 3 days after the ovulatory temperature rise and continuing up to the beginning of menstruation. The major drawback of this method is that abstinence is necessary for the entire pre-ovulatory period. Therefore, few couples now use the temperature method alone *(100)*.

(b) Cervical mucus method

This is also known as *"billings method"* or *"ovulation method"*. This method is based on the observation of changes in the characteristics of cervical mucus. At the time of ovulation, cervical mucus becomes watery clear resembling raw egg white, smooth, slippery and profuse. After ovulation, under the influence of progesterone, the mucus thickens and lessens in quantity. It is recommended that the woman uses a tissue paper to wipe the inside of vagina to assess the quantity and characteristics of mucus. To practice this method the woman should be able to distinguish between different types of mucus. This method requires a high degree of motivation than most other methods. The appeal and appropriateness of this method in developing countries such as India, especially among lay people, is dubious.

(c) Symptothermic method

This method combines the temperature, cervical mucus and calendar techniques for identifying the fertile period. If the woman cannot clearly interpret one sign, she can "double check" her interpretation with another. Therefore, this method is more effective than the "Billings method".

To sum up, natural family planning demands discipline and understanding of sexuality. It is not meant for everybody. The educational component is more important with this approach than with other methods. The opinion of the Advisory Group to WHO's Special Programme of Research in Human Reproduction is that the current natural family planning methods have very little application particularly in developing countries *(101)*.

5. Breast-feeding

Field and laboratory investigations have confirmed the traditional belief that lactation prolongs postpartum amenorrhoea and provides some degree of protection against pregnancy *(102)*. No more than 5–10 per cent of women conceive during lactational amenorrhoea, and even this risk exists only during the month preceding the resumption of menstruation *(103)*. However, once menstruation returns, continued lactation no longer offers any protection against pregnancy *(104)*. By and large, by 6 months after childbirth, about 20–50 per cent of women are menstruating and are in need of contraception *(105)*.

6. Birth control vaccine

Several immunological approaches for men and women are being investigated. The most advanced research involves immunization with a vaccine prepared from beta sub-unit of human chorionic gonadotropin (hCG), a hormone produced in early pregnancy. Immunization with hCG would block continuation of the pregnancy. Antibodies appeared in about 4–6 weeks and reached maximum after about 5 months and slowly declined reaching zero levels after a period ranging from 6–11 months. The immunity can be boosted by a second injection. Two types of pregnancy vaccines employing variants of the beta sub-unit of hCG are now about to go into clinical trial *(51)*. Research on birth control vaccines continues. The uncertainties are great *(85)*.

TERMINAL METHODS
(Sterilization)

Voluntary sterilization is a well-established contraceptive procedure for couples desiring no more children. Currently female sterilizations account for about 85 per cent and male sterilizations for 10–15 per cent of all sterilizations in India (106), in spite of the fact that male sterilization is simpler, safer and cheaper than female sterilization.

Sterilization offers many advantages over other contraceptive methods – it is a one-time method; it does not require sustained motivation of the user for its effectiveness; provides the most effective protection against pregnancy; the risk of complications is small if the procedure is performed according to accepted medical standards; and it is most cost-effective. It has been estimated that each procedure averts 1.5 to 2.5 births per woman *(107)*.

Guidelines for sterilization

Sterilization services are provided free of charge in Government institutions. Guidelines have been issued from time to time by the Government covering various aspects of sterilization. These are *(108, 109)*:

a. The age of the husband should not ordinarily be less than 25 years nor should it be over 50 years.
b. The age of the wife should not be less than 20 years or more than 45 years.
c. The motivated couple must have 2 living children at the time of operation.
d. If the couple has 3 or more living children, the lower limit of age of the husband or wife may be relaxed at the discretion of the operating surgeon, and
e. It is sufficient if the acceptor declares having obtained the consent of his/her spouse to undergo sterilization operation without outside pressure, inducement or coercion, and that he/she knows that for all practical purposes, the operation is irreversible, and also that the spouse has not been sterilized earlier.

Male sterilization *(110, 111)*

Male sterilization or vasectomy being a comparatively simple operation can be performed even in primary health centres by trained doctors under local anaesthesia. When carried out under strict aseptic technique, it should have no risk of mortality. In vasectomy, it is customary to remove a piece of vas at least 1 cm after clamping. The ends are ligated and then folded back on themselves and sutured into position, so that the cut ends face away from each other. This will reduce the risk of recanalization at a later date. It is important to stress that the acceptor is not immediately sterile after the operation, usually until approximately 30 ejaculations have taken place *(45)*. During this intermediate period, another method of contraception must be used. If properly performed, vasectomies are almost 100 per cent effective.

Following vasectomy, sperm production and hormone output are not affected. The sperm produced are destroyed intraluminally by phagocytosis. This is a normal process in the male genital tract, but the rate of destruction is greatly increased after vasectomy. Vasectomy is a simpler, faster and less expensive operation than tubectomy in terms of instruments, hospitalization and doctor's training. Cost-wise, the ratio is about 5 vasectomies to one tubal ligation.

COMPLICATIONS

The very few complications that may arise are :

(a) *Operative* : The early complications include pain, scrotal haematoma and local infection. Wound infection is reported to occur in about 3 per cent of patients. Good haemostasis and administration of antibiotics will reduce the risk of these complications.

(b) *Sperm granules* : Caused by accumulation of sperm, these are a common and troublesome local complication of vasectomy. They appear in 10–14 days after the operation. The most frequent symptoms are pain and swelling. Clinically the mass is hard and the average size approximately 7 mm. Sperm granules may provide a medium through which re-anastomosis of the severed vas can occur. The sperm granules eventually subside. It has been reported that using metal clips to close the vas may reduce or eliminate this problem.

(c) *Spontaneous recanalization* : Most epithelial tubes will recanalize after damage, and the vas is no exception. The incidence of recanalization is variously placed between 0 to 6 per cent. Its occurrence is serious. Therefore, the surgeon should explain the possibility of this complication to every acceptor prior to the operation, and have written consent acknowledging this fact. In a study, the wives of 6 out of 14,047 men who had vasectomies in the UK became pregnant between 16 months and 3 years later *(112)*. Therefore, the patient should be urged to report for a regular follow-up, may be up to 3 years.

(d) *Autoimmune response* : Vasectomy is said to cause an autoimmune response to sperm. Blocking of the vas causes reabsorption of spermatozoa and subsequent development of antibodies against sperm in the blood. Normally 2 per cent of fertile men have circulating antibodies against their own sperm. In men who have had vasectomies, the figure can be as high as 54 per cent. There is no reason to believe that such antibodies are harmful to physical health. It is likely that the circulating antibodies can cause a reduction in subsequent fertility despite successful reanastomosis of the vas *(44)*.

(e) *Psychological* : Some men may complain of diminution of sexual vigour, impotence, headache, fatigue, etc. Such adverse psychological effects are seen in men who have undergone vasectomy under emotional pressure. That is why it is important to explain to each acceptor the basis of the operation and give him sufficient time to make up his mind voluntarily and seriously to have the operation done.

Causes of failure *(111)*

The failure rate of vasectomy is generally low, 0.15 per 100 person–years. The most common cause of failure is due to the mistaken identification of the vas. That is, instead of the vas, some other structure in the spermatic cord such as thrombosed vein or thickened lymphatic has been taken. Histological confirmation has, therefore, been recommended on all vasectomy specimens by some authors in developed countries. In developing countries, histological confirmation is ruled out because of lack of facilities for such an examination. A simpler method has been recommended, that is, microscopic examination of a smear prepared by gentle squeezing of the vas on a glass slide and staining with Wright's stain. The vas can be identified by the presence of columnar epithelial cells that line the lumen of the vas. In some cases, failure may be due to spontaneous recanalisation of vas. Sometimes there may be more than one vas on one side. Pregnancy could also result from sexual intercourse before the disappearance of sperms from the reproductive tract.

Post-operative advice

To ensure normal healing of the wound and to ensure the success of the operation, the patient should be given the following advice :

1. The patient should be told that he is not sterile immediately after the operation; at least 30 ejaculations may be necessary before the seminal examination is negative *(45)*.
2. To use contraceptives until aspermia has been established.
3. To avoid taking bath for at least 24 hours after the operation.
4. To wear a T-bandage or scrotal support (langot) for 15 days : and to keep the site clean and dry.
5. To avoid cycling or lifting heavy weights for 15 days; there is, however, no need for complete bed rest.
6. To have the stitches removed on the 5th day after the operation.

No scalpel vasectomy

No scalpel vasectomy is a new technique that is safe, convenient and acceptable to males. This new method is now being canvassed for men as a special project, on a voluntary basis under the family welfare programme. Under the project, medical personnel all over the country are to be trained. Availability of this new technique at the peripheral level will increase the acceptance of male sterilization in the country. The project is being funded by the UNFPA *(98)*.

Female sterilization

Female sterilization can be done as an interval procedure, postpartum or at the time of abortion. Two procedures have become most common, namely laparoscopy and minilaparotomy.

(a) Laparoscopy

This is a technique of female sterilization through abdominal approach with a specialized instrument called "laparoscope". The abdomen is inflated with gas (carbon dioxide, nitrous oxide or air) and the instrument is introduced into the abdominal cavity to visualize the tubes. Once the tubes are accessible, the Falope rings (or clips) are applied to occlude the tubes. This operation should be undertaken only in those centres where specialist obstetrician–gynaecologists are available. The short operating time, shorter stay in hospital and a small scar are some of the attractive features of this operation.

Patient selection : Laparoscopy is not advisable for postpartum patients for 6 weeks following delivery; however, it can be done as a concurrent procedure to MTP. Haemoglobin per cent should not be less than 8. There should be no associated medical disorders such as heart disease, respiratory disease, diabetes and hypertension. It is recommended that the patient be kept in hospital for a minimum of 48 hours after the operation.

The cases are required to be followed-up by health workers (F) LHVs in their respective areas once between 7–10 days after the operation, and once again between 12 and 18 months after the operation.

Complications : Although complications are uncommon, when they do occur they may be of a serious nature requiring experienced surgical intervention. Puncture of large blood vessels and other potential complications have been reported as major hazards of laparoscopy.

(b) Minilap operation

Minilaparotomy is a modification of abdominal tubectomy. It is a much simpler procedure requiring a smaller abdominal incision of only 2.5 to 3 cm conducted under local anaesthesia. The minilap/Pomeroy technique is considered a revolutionary procedure for female sterilization. It is also found to be a suitable procedure at the primary health centre level and in mass campaigns. It has the advantage over other methods with regard to safety,

efficiency and ease in dealing with complications. Minilap operation is suitable for postpartum tubal sterilization.

Evaluation of contraceptive methods

Contraceptive efficacy is generally assessed by measuring the number of unplanned pregnancies that occur during a specified period of exposure and use of a contraceptive method. The two methods that have been used to measure contraceptive efficacy are the Pearl index and life-table analysis.

The **Pearl index** is defined as the number of "failures per 100 woman-years of exposure (HWY)." This rate is given by the formula :

$$\text{Failure rate per HWY} = \frac{\text{Total accidental pregnancies}}{\text{Total months of exposure}} \times 1200$$

In applying the above formula, the total accidental pregnancies shown in the numerator must include every known conception, whatever its outcome, whether this had terminated as live births, still-births or abortions or had not yet terminated. The factor 1200 is the number of months in 100 years. The total months of exposure in the denominator is obtained by deducting from the period under review of 10 months for a full-term pregnancy, and 4 months for an abortion *(99)*.

A failure rate of 10 per HWY would mean that in the lifetime of the average woman about one-fourth or 2.5 accidental pregnancies would result, since the average fertile period of a woman is about 25 years *(99)*.

In designing and interpreting a use–effectiveness trial, a minimum of 600 months of exposure is usually considered necessary before any firm conclusion can be reached *(99)*.

With most methods of contraception, failure rates decline with duration of use. The Pearl index is usually based on a specific exposure (usually one year) and, therefore, fails to accurately compare methods at various durations of exposure. This limitation is overcome by using the method of life-table analysis.

Life-table analysis : Life-table analysis calculates a failure rate for each month of use. A cumulative failure rate can then compare methods for any specific length of exposure. Women who leave a study for any reason other than unintended pregnancy are removed from the analysis, contributing their exposure until the time of the exit.

Element of success in family planning programme

The main strategy of family planning programme is to offer to client easy access to a wide range of affordable contraceptive method through multiple service delivery channels in a good quality, reliable fashion. The key points are as follows : (1) *Make services accessible* : Offering services through a variety of delivery points makes methods available to more potential users; (2) *Make services affordable* : Partnerships between public and private-sector services encourage clients to pay what they can, while public programmes serve the poor for free or for low fees; (3) *Offer client-centered care* : Planning and providing services with the clients in mind help to make sure their needs are met and their preferences are honoured; (4) *Rely on evidence-based technical guidance* : Up-to-date service delivery guidelines, tools, and job aids can help translate research findings into better practice; (5) *Communicate effectively* : Communication grounded in behaviour theory and sensitive to local norms motivates clients to seek services and helps them make good family planning choices; (6) *Assure contraceptive security* : A strong logistics system and a long-term plan for contraceptive security ensure that a variety of methods, and the supplies and equipment to provide them, are always available; (7) *Work for supportive policies* : Showing how family planning contributes to development goals makes the case for continued support for family planning programme; (8) *Coordinate* : When governments, donor agencies, and implementing partners work together, they streamline efforts and avoid duplication; (9) *Build a high-performing staff* : Programme can keep workers motivated and on the job by creating a good working environment, matching skills with tasks, and rewarding a job well done; (10) *Secure adequate budget, use it well* : Spending wisely, doing more with less, and finding ways to recover costs can help ensure financial sustainability; (11) *Base decisions on evidence* : Research, monitoring, and evaluation yield important information to guide decision-making, and they need not be expensive; (12) *Lead strongly, manage well* : Strong leadership helps programmes navigate change. Good management solves operational problems; and (13) *Integrate services appropriately* : Programmes can address a wider range of health needs by integrating services where appropriate and offering referrals where it is not.

Unmet need for family planning *(113)*

Many women who are sexually active would prefer to avoid becoming pregnant, but nevertheless are not using any method of contraception (including use by their partner). These women are considered to have an "unmet need" for family planning. The concept is usually applied to married women. However, it can apply to sexually active fecund women and perhaps to men, but its measurement has been limited to married women only. Unmet need can be a powerful concept for family planning. It poses a challenge to family planning programme – to reach and serve millions of women whose reproductive attitude resembles those of contraceptive user – but who are, for some reason or combination of reasons, not using contraceptives.

Among the most common reason for unmet need are inconvenient or unsatisfactory services, lack of information, fears about contraceptive side-effects and opposition from husband or relatives. Unmet need is defined on the basis of women's response to survey questions.

According to the National Family Health Survey-5, the unmet need for family planning is highest (28.0 per cent) among women between 15 to 24 years of age and is almost entirely for spacing the births rather than for limiting the births. The unmet need for contraception among women aged 30 years and above are mostly for limiting the births.

Unmet need for family planning is higher in rural areas than in urban areas. It also varies by women's education (within range of 11–17 per cent) and religion (hindu and christian women have a lower unmet need than muslim women). Table 23 shows some of the characteristics of unmet need for family planning in India *(20)*.

TABLE 23

Percentage of currently married women with unmet need for family planning in India by selected background characteristics (NFHS-5, 2019–2021)

Background characteristics	Unmet need for family planning		
	For spacing	For limiting	Total
1. Age			
15–19	15.6	2.2	17.8
20–24	12.4	4.9	17.3
25–29	6.2	7.0	13.2
30–34	2.5	6.6	9.1
35–39	0.9	5.5	6.3
40–44	0.3	4.7	5.0
45–49	0.2	3.3	3.4
2. Residence			
Urban	3.5	4.9	8.4
Rural	4.3	5.6	9.9
3. Schooling			
No schooling	2.0	5.3	7.3
<5 years complete	2.4	4.9	7.2
5–7 years complete	2.9	5.4	8.3
8–9 years complete	4.7	5.5	10.3
10–11 years complete	4.8	5.1	9.9
12 or more years complete	6.9	5.6	12.5
4. Religion			
Hindu	3.9	5.2	9.0
Muslim	5.0	6.8	11.8
Christian	5.5	4.8	10.4
Sikh	3.5	6.0	9.5
Buddhist/Neo-Buddhist	3.9	4.3	8.2
Jain	4.8	2.7	7.5
Other	4.5	6.1	10.7
5. Caste/tribe			
Scheduled caste	4.0	5.2	9.2
Scheduled tribe	4.5	4.7	9.2
Other backward class	4.2	5.4	9.6
Other	3.7	5.7	9.4
Don't know	5.0	6.9	12.0
6. Wealth index			
Lowest	4.5	6.9	11.4
Second	4.1	5.6	9.7
Middle	3.9	4.8	8.6
Fourth	4.0	5.0	9.0
Highest	3.7	4.8	8.6
Total	4.0	5.4	9.4

Source : *(20)*

"Demand satisfied" by modern contraceptives

'Demand satisfied' calculates the need satisfied by modern methods out of total demand in the community (includes the cohort using modern contraceptives and traditional methods, and having unmet need for contraception). India's 'demand satisfied' shows an increase from 72 per cent in NFHS-4 to 74.2 per cent in NFHS-5 and modern contraceptive usage. 12 states show 'demand satisfied' of more than 75 per cent.

The National Family Health Survey–5 results show that although current use of contraception has increased, and the extent of unmet need has declined in most of the states in India, there is a need for considerable improvement in the coverage and quality of family planning services, especially in the states of Uttar Pradesh, Bihar, Assam and Jharkhand etc.

Contraception and adolescence *(114)*

Adolescence is the period between puberty and the end of physiological maturation, which occurs between ages 15–19 years. Pregnancy in adolescence constitutes about 11 per cent of all pregnancies in most developing countries and in some developed countries such as the USA. For the year 2014, WHO puts the global adolescent birth rate at 49 per 1000 girls of that age, country rates range from one to 229 births per 1000 girls. This indicates a marked decrease since 1990 *(115)*. These are often "at risk" pregnancies. Many are undesired, and occur in unmarried adolescents who then resort to legal or illegal abortion, performed under unsatisfactory medical conditions. This has serious health and even life-threatening consequences for these young women – the ensuing mortality and morbidity (especially secondary sterility) are quite considerable.

Prevention of undesired pregnancies and of sexually transmitted diseases in young people through educational programmes dealing with responsible sexual behaviour is a major public health challenge. Adolescents are ambivalent about family planning : to request contraception is to "reveal" one's sexuality. For this reason, adolescent girls sometimes choose the risk of an undesired pregnancy and of an abortion.

BARRIER METHODS : Condoms make barrier method worthwhile, because they protect those adolescents, with occasional different sexual partners, against STD and AIDS. However, condoms must be properly used, and it depends on the man's behaviour. Young men seem to be increasingly aware of the importance of safeguarding their own health and that of their partners. Cervical caps and diaphragms, on the other hand, are inappropriate for adolescents since they require foreseeing of intercourse and complicated manipulations, to which young people are loath.

HORMONAL CONTRACEPTION : Hormonal methods are perfectly suitable for adolescents, who generally do not suffer from such problems as cardiovascular contraindications. In fact, these are probably the most adequate methods, since they are completely reversible, and in no way modify the future fertility of these young women. In developed countries, pills are usually preferred, but trimestrial or monthly injections are also appropriate. Implants, with their five year term, cover too long a period for certain adolescents.

IUD : IUD are theoretically contraindicated, because of the risk of pelvic infection and of secondary sterility. However, an adolescent is better protected by an IUD than by illegal repeated abortions. This method has the advantage of being discrete and avoiding demanding routines.

OTHER METHODS : Periodic abstinence is not easy when cycles are irregular and intercourse is unforeseen, and with new partners. In certain countries, however, they are practically the only method taught, for religious reasons, and poor protection is preferable to no protection at all. Similarly, withdrawal is not very suitable method, since young men are usually not very skillful.

Spermicides are not contraindicated, but have two disadvantages – they are costly, and are not effective against STD and AIDS.

A major chunk of the world population is under 25 years age group. An extremely large number of young people will, therefore, be entering their reproductive years at that time. The demographic future of the world will depend on them, on how well informed they are, and on their sense of responsibilities.

DELIVERY SYSTEM

Since family planning is essentially a component of the health care system, the primary responsibility for the delivery of services rests with the Government through its health care system at the Centre and in the States.

At the Centre

The Family Welfare Programme is a centrally sponsored scheme, and the states receive 100 per cent assistance from the central government. Since the entire cost is virtually borne by the central government, the central government controls the planning, and financial management of the programme (e.g., establishment of clinics, pattern of staffing, expenditure); training, research and evaluation, and most important, the formulation of an overall policy for the programme. The current policy is to promote family planning on the basis of voluntary and informed acceptance with full community participation. The emphasis is on a 2-child family. Recently there have been two major changes in the approach to delivery of family planning services : first, a greater emphasis on spacing methods, side by side with terminal methods, and secondly to take the services to every door-step and motivate families to adopt the small family norm.

The administrative apparatus consists of a separate Department of Family Welfare, which was created in 1966 in the Central Ministry of Health and Family Welfare. The Secretary to the Government of India in the Ministry of Health and Family Welfare is in over all charge of the Department of Family Welfare. He is assisted by a **Special Secretary** and Joint Secretaries. The special secretary supervises the programme implementation and coordinates the various activities. There is now an **Advisor** (Mass Media and Communication) – an officer of the rank of an Additional Secretary. The National Institute of Health and Family Welfare acts as an apex technical institute for promoting health and family welfare in the country through education, training services, research and evaluation. There is a Central Family Welfare Council consisting of all the State Health Ministers to review the implementation of the programme. A Population Advisory Council headed by the Union Health Minister, Members of Parliament, and persons from the fields related to population control was set up in 1982. This body acts like a "think tank" to analyze the implementation of the programme and advise the government suitably. A cabinet sub-committee headed by the Prime Minister has also been formed for periodic review of the progress of the family welfare programme. Family planning is no longer viewed as the sole responsibility of the Health Ministry, but will devolve on all ministries connected with human resources and development. This is an important breakthrough in current thinking.

At the state level

Under the Indian constitution, the state governments are responsible for the administration and implementation of the Family Welfare Programme. Since most of the crucial policy decisions are made by the central government, the pattern of organization and many features of the delivery system are fairly well-standardized in the States.

The organizational set-up at the State level consists of a State Family Welfare Bureau, which is part of the State Health and Family Welfare Directorate. At present, 25 State Family Welfare Bureaus are functioning in the country.

In 1979, the offices of the Family Welfare and National Malaria Eradication Programme were merged into one office and named as Regional Office for Health and Family Welfare. These regional offices have been set up to maintain liaison with state governments and give technical assistance to them in connection with the implementation of the Family Welfare Programme and other important health programmes. To co-ordinate the family welfare activities between the state governments and the central government, one Family Welfare Cell has been sanctioned for each State.

At the district level

At the district level, the set-up consists of a District Family Welfare Bureau consisting of 3 divisions – an administrative division headed by the District Family Welfare Officer; mass education and media division, in charge of District Mass Education and Media Officer, and an evaluation division, in charge of a Statistical Officer. These are supported by 1,083 Urban Family welfare centres and 871 Urban Health Posts. Presently there are 4 types of Urban Health Posts–type A for areas with population less than 5,000, type B for areas with population between 5,000–10,000, type C for population between 10,000–25,000, and type D for areas with population between 25,000–50,000. If the population is more than 50,000, then it is to be divided into sectors of 50,000 population and Health Posts provided. Type A, B and C Health Posts are attached to a hospital for providing referral and supervisory services. Type D Health Post is attached to a hospital for sterilization, MTP and referral *(115)*. Only type D health post have a post of medical officer.

The 10 city family welfare bureaus are entrusted with the responsibility of coordination, monitoring and supervision etc. of the family welfare services provided by various institutions in the city.

Presently there are three types of Urban Family Welfare Centres. Type I is for population between 10,000–25,000, type II is for population between 25,000–50,000, and type III is for above 50,000 population *(115)*. These are manned by 2 para-medical staff in type I and II centres and by 6 persons including medical officer in type III centres.

The Urban family welfare centres and health posts provide comprehensive integrated services of MCH and family planning. The staff pattern is different for different types of health posts and urban family welfare centres.

At the community health centre

Community health centre is established and maintained by the state governments. Presently it is manned by four medical specialists i.e. surgeon, physician, gynaecologist and paediatrician, supported by 21 paramedical and other staff. It has 30 in-door beds with one OT, X-ray, labour room and laboratory facilities and serves as a referral centre for four PHCs. According to Indian Public Health Standards, the community health centre is to be manned by 6 medical specialists including an anaesthetist and an eye surgeon supported by 24 paramedical and other staff with inclusion of two nurse midwives. It provides, apart from other emergency obstetric care, full range of family planning services including laproscopic services and safe abortion services. At present as of March 2021, 5,481 community health centres are functional in the country.

At the primary health centre

Since more than 65 per cent of India's population lives in the rural areas an adequate network of service centres has been extended to the rural areas. A Rural Family Welfare Centre with a medical officer and supporting staff forms an integral part of the primary health centre. A total of 5,435 Rural Family Welfare Centres were established in the country at all block level PHCs sanctioned upto 1.4.1980. Most of the states have integrated these centres into their primary health care system and after this date family planning services are being provided through integrated facilities at PHCs. As of March 2021, 25,140 primary health centres were functioning in the country. Each centre is supported by sub-centres. The total number of sub-centres functioning are 1,56,101.

When fully staffed (by 3 medical officers including one lady doctor and supporting personnel) the PHC is expected to provide fairly comprehensive "essential health care" including family planning care. The medical officers are usually trained to provide MTP and sterilization services. The programme of insertion of copper-T IUDs has been intensified. It is intended that laparoscopic services which have become very popular will be made more widely available at the PHC.

The sub-centres are to provide the main thrust of the programme. Each sub-centre is staffed by one male and one female health worker. They are responsible for providing rudimentary health and MCH care; family planning motivation, supplies and services in spacing methods.

Various studies conducted have highlighted that the existing infrastructure is not being optimally utilized because of its inadequacy to provide proper services. To improve matters **popular committees** have been set up at all levels by some states to involve people in the programme and in exercising vigilance over the work of various functionaries.

At the village level

Two schemes are being implemented at the village level to improve the outreach of services and increase local participation: **(a) The Village Health Guides** : An innovative approach has been the creation of a band of village Health Guides (mostly women), one for each village or a population of 1000. They are made responsible for spreading knowledge and information to the eligible couples and providing them with supplies of Nirodh and oral pills. About 3.23 lakh health guides are in position. **(b) Trained dais** : The national target is to provide one trained dai per 1000 population. They conduct safe deliveries in rural areas. They also act as family planning counsellors and motivators, supplementing the delivery system. **(c) ASHA** : 9.39 lakh ASHAs have been selected so far and have been provided with drug kits. At present the village health guides in some states only, trained dais and ASHAs are the lynchpins of the family planning delivery system in India.

Family planning has a significant role in mitigating the impact of high population growth by helping women achieve desired family size and avoid unintended and mistimed pregnancies. Past few years have seen a paradigm shift in family planning programme. Studies show that if the current unmet need for family planning could be fulfilled over the next 5 years, 35,000 maternal deaths and 1.2 million infant deaths can be averted. The focus of the programme is now towards meeting the unmet need of contraception and increasing the use of modern contraceptive use, thereby help in averting unintended and mistimed pregnancies, achieve desired family size, and promote the health of the mother and child.

Currently the family planning methods in India can be broadly classified in two categories – spacing methods and limiting permanent methods.

(A) *Spacing methods* : These are reversible methods which can be adopted and discontinued as per an individual's choice,

(a) Oral contraceptives pills (combined oral contraceptive pill (Mala N), Centchroman (Chhaya)

(b) Condoms

(c) Intrauterine contraceptive devices (IUCD 380A – effective for 10 years, IUCD 375 – effective for 5 years)

(d) Contraceptive injectable MPA (Antara programme)

(B) *Permanent method* : These methods are irreversible in nature

(a) Female sterilization

i. Minilap

ii. Laparoscopic

(b) Male sterilization

i. Conventional

ii. Non scalpel vasectomy (no incision no stitches)

(C) Emergency contraceptive pills

During the year 2023–24 the number of acceptors by different methods was as follows *(116)*:

Sterilization	....	30.6 lakh
Total IUCD	....	67.57 lakh
Post-partum IUCD	....	37.51 lakh
Injectable MPA	....	44.62 lakh
Centchroman	....	103.04 lakh
Post-abortion IUCD	....	96,475

Performance of social marketing programme in the sale of contraceptives was :

Condoms	....	459.51 million
Oral pills	....	159.19 million cycles
Saheli	....	77.52 lakh tablets

New initiatives *(117)*

1. *Home Delivery of Contraceptives (HDC)*

a. A new scheme has been launched to utilize the services of ASHA to deliver contraceptives at the doorstep of beneficiaries. The scheme was launched in 233 pilot districts of 17 States on 11th July 2013 and is now expanded to the entire country from 17th December 2012.

b. ASHA is charging a nominal amount from beneficiaries for her effort to deliver contraceptives at doorstep i.e. Rs. 1 for a pack of 3 condoms, Rs.1 for a cycle of OCPs and Rs. 2 for a pack of one tablet of ECP.

2. *Ensuring spacing at birth (ESB)*

a. Under a new scheme launched by the Government of India, services of ASHAs to be utilized for counselling newly married couples to ensure spacing of 2 years after marriage and couples with 1 child to have spacing of 3 years after the birth of 1st child. The scheme is operational in 18 States (EAG, North-Eastern and Gujarat and Haryana). ASHA would be paid following incentives under the scheme :
   - Rs. 500/- to ASHA for delaying first child birth by 2 years after marriage.
   - Rs. 500/- to ASHA for ensuring spacing of 3 years after the birth of 1st child.
   - Rs. 1000/- in case the couple opts for a permanent limiting method upto 2 children only.

b. Ministry of Health & Family Welfare has introduced short term IUCD (5 years effectively), Cu IUCD 375 under the National Family Planning programme. Training of State level trainers has already been completed and process is underway to train service providers upto the sub-centre level.

c. A new method of IUCD insertion (post-partum IUCD insertion) has been introduced by the Government.

d. Promoting Post-partum Family Planning services at district hospitals by providing for placement of dedicated Family Planning Counsellors and training of personnel.

3. *Pregnancy Testing Kits*

Nischay Home based pregnancy test kits (PTKs) was launched under NRHM in 2008 across the country. The PTKs are being made available at sub-centres and to the ASHAs to facilitate the early detection and decision making for the outcomes of pregnancy.

4. *Mission Parivar Vikas (MPV)*

A programme launched in 146 high total fertility rate districts to accelerate the use and awareness of family planning methods. States and districts fact sheet highlight the current indicators and trends in these districts and will act as baseline and roadmap for future work in these districts, A five pronged strategy has been developed under the mission parivar vikas, which comprise of *(9)*:

a. Delivering assured services;
b. Building additional capacity/human resources development for enhanced service delivery;
c. Ensuring commodity security;
d. Implementing new promotional schemes; and
e. Creating an enabling environment.

5. *New contraceptive launch (9)*

The new contraceptive injectable MPA under "Antara programme" and oral contraceptive pill centchroman "chhaya" have been added to the existing contraceptive basket of choice thus providing the users with new options.

The public sector provides a wide range of contraceptive services for limiting and spacing of births at various levels of health system as described in Table 24.

Government of India is promoting "Fixed Day Static Services" (FDS) approach in sterilization services within the

TABLE 24
Family planning services in public health sector

Family planning method	Service provider	Service location	Service strategy and promotional schemes
Spacing Methods			
IUCD 380 A/IUCD 375	Trained & certified ANMs, LHVs, SNs and Doctors	Sub-centre & higher levels	• On demand • Camp approach • Revised Compensation Scheme
Oral contraceptive pills (OCPs)	Trained ASHAs, ANMs, LHVs, SNs and Doctors	At door step (in pilot districts), Village level Sub-centre & higher levels	• On demand • Village Health Nutrition Days
Condoms	Trained ASHAs, ANMs, LHVs, SNs and Doctors	At door step (in pilot districts), Village level Sub-centre & higher levels	• On demand • Village Health Nutrition Days
Injectable contraceptive MPA	Trained doctors, SNs and ANMs	Medical colleges and district hospitals (in MPV districts at all levels upto sub-centres)	
Limiting Methods			
Minilap	Trained & certified MBBS Doctors & Specialist Doctors	PHC & higher levels	• Fixed Day Static Approach • Camp approach • Revised Compensation Scheme
Laparoscopic sterilization	Trained & certified Specialist Doctors (OBG & General Surgeons)	Usually CHC & higher levels	• National Family Planning Insurance Scheme
NSV (No Scalpel Vasectomy)	Trained & certified MBBS Doctors & Specialist Doctors	PHC & higher levels	
Emergency Contraception			
Emergency contraceptive pills (ECPs)	Trained ASHAs, ANMs, LHVs, SNs and Doctors	At door step (in pilot districts) Village level, Sub-centre & higher levels	• On demand • Village Health Nutrition Days

ANM : Auxiliary Nurse Midwife; LHV : Lady Health Visitor; SN : Staff Nurse; ASHA : Accredited Social Health Activist.
Source : *(9)*

public health system with the aim of increasing access to sterilization services. States are being provided technical and financial support for the development of human resources and upgradation of health facilities for the functioning of FDS. In the states with high unmet need for limiting methods, sterilization camps will continue till the time FDS is implemented effectively. The frequency of sterilization services at different health facilities at FDS is as follows *(98)* :

- District hospital – twice a week
- Sub-district hospital – weekly
- CHC/Block PHC – fortnightly
- 24x7 PHC/PHC – monthly

Community Needs Assessment Approach *(118)*

Till recently, the achievements of family welfare programme were assessed on the basis of the targets given from the centre for individual contraceptives. This led to a situation where the achievement of the contraceptive targets had become the ends by themselves. Over the years it became apparent that there were many drawbacks in the top down target approach in which types and quantity of contraceptive need to be canvassed was decided by the higher authorities. Firstly, the user preference was not reflected in the targets. If the contraceptive required in accordance with the user was not available, the targets were not likely to be achieved. There was no authentic system of feedback regarding which type of contraceptive was to be promoted in a particular area or among a particular age group. Secondly, the quality of the services became secondary. For example, if in an attempt to fulfil targets for the number of IUD insertions, the quality of care is compromised (especially while screening women for pre-existing reproductive tract infections and sexually transmitted diseases before IUD insertion) the acceptability of IUD programme would receive a serious setback and discontinuation rate will be high. Thirdly, people may be tempted to resort to false reporting to claim fulfilment of the target. In other words, contraceptive targets and cash incentives resulted in the inflation of performance statistics and deterioration in the quality of services.

Government of India deliberated objectively on the utility of retaining the practice of targets at national and state levels. In the year 1995–96, one district in each of 18 states (including a pilot project in Kerala and Tamil Nadu) were made target free. Later on the practice of fixing up of targets for individual contraceptive method was given up from April 1996. This does not mean a licence to do no work. The population goals remain the same as before. Health workers are expected to consult families and local community in the beginning of the year in order to assess their needs and preference and then work-out for themselves the programme and workload for the coming year. The requirement for each village needs to be worked out to arrive at the workload for the ANM, this becomes the target for the ANM for the year. The workload of different ANMs under one PHC when added up would determine the workload for the PHC. Similarly requirements at the district level would be worked out by adding up the requirements at all the PHCs.

Later on it was found that due to complex calculations required the health workers were unable to fix the performance norms for themselves. Therefore, it was decided to modify and rename the target free manual as *Community Needs Assessment Approach Manual.*

Involvement of private sector

The family planning programme, to be successful, will have to be extended beyond the government delivery system to include the private sector. Grants-in-aid are provided to voluntary organizations and industrial organizations for running family welfare centres and postpartum centres. The scheme for involvement of private medical practitioners in the family welfare programme has been extended to practitioners of integrated medicine. Government has also created nation-wide retail outlets for selling subsidized condoms.

Incentives

The use of incentives and disincentives to encourage couples to practise family planning has become a common strategy in many developing countries. Financial compensation of individuals undergoing sterilization was first introduced in 1966; over the years, it has been gradually increased. The acceptors now receive a one-time payment as shown in Table 25 *(9)*:

National Family Planning Indemnity Scheme (NFPIS)

With effect from, 01.04.2013, it has been decided that States/UTs would process and make payment of claims to accepters of sterilization in the event of death/failures/complications/indemnity cover to doctors/health facilities. The States/UTs would make suitable budget provisions for implementation of the scheme through their respective State/UT Programme Implementation Plans (PIPs) under the National Rural Health Mission (NRHM) and the scheme is renamed as "Family Planning Indemnity Scheme".

	Claims arising out of sterilization operation	Amount (Rs.)
A	Death at hospital/within seven days of discharge	2,00,000
B	Death following sterilization (8th-30th day from discharge)	50,000
C	Expense for treatment of medical complications	25,000
D	Failure of Sterilization	30,000
E	Doctors/facilities covered for litigations upto 4 cases per year including defence cost	2,00,000 (per case)

State government employees, who undergo sterilization after two or three children are eligible for a special increment (two increments after 2 children and one after 3 children). Central government employees get one increment after sterilization. It is under the scheme introduced in Dec. 1979 to promote small family norm, provided the employee is below 50 years of age and his spouse below 45 years. They get special leave (14 days for women and 7 days for men). No maternity leave is allowed after 3 children.

The State Governments have been requested to : issue Green Cards to individual acceptors of terminal methods after two children as a mark of recognition and for priority attention in schemes where preferential treatment was feasible. Cash awards have been instituted for the best performing states, the amount of which will be spent on promoting family welfare activities *(119)*.

TABLE 25

Compensation scheme in public facilities and private accredited facilities

Compensation scheme in public facilities

(Amount in Rs.)

States	Type of operation	Acceptor	ASHA/Health Worker	Others	Total
11 High focus states (Uttar Pradesh, Bihar, Madhya Pradesh, Rajasthan, Chhattisgarh, Jharkhand, Odisha, Uttarakhand, Assam, Haryana, Gujarat)	Vasectomy	2000	300	400	2700
	Tubectomy	1400	200	400	2000
	Post-partum sterilization	2200	300	500	3000
Mission Parivar Vikas Districts	Vasectomy	3000	400	600	4000
	Tubectomy	2000	300	500	2800
	Tubectomy (PPS)	3000	400	600	4000
	Vasectomy (COT)	3000	400	1600	5000
	Tubectomy (COT)	2000	300	2200	4500
Other High focus states (North-East States, J&K, Himachal Pradesh)	Vasectomy	1100	200	200	1500
	Tubectomy	600	150	250	1000
Non-high focus states	Vasectomy	1100	200	200	1500
	Tubectomy (BPL+SC/ST only)	600	150	250	1000
	Tubectomy (APL)	250	150	250	650

Compensation scheme in private accredited facilities

(Amount in Rs.)

States	Type of operation	Facility	Others/Acceptor	Total
11 High focus states (Uttar Pradesh, Bihar, Madhya Pradesh, Rajasthan, Chhattisgarh, Jharkhand, Odisha, Uttrakhand, Assam, Haryana, Gujarat)	Vasectomy (All)	2000	1000	3000
	Tubectomy (All)	2000	1000	3000
Mission Parivar Vikas Districts	Vasectomy (All)	2500	1000	3500
	Tubectomy (All)	2500	1000	3500
	Post Partum Sterilization (PPS)	3000	1000	4000
Other High focus states (North-East States, J&K, Himachal Pradesh)	Vasectomy (All)	1300	200	1500
	Tubectomy (All)	1350	150	1500
Non-high focus states	Vasectomy (All)	1300	200	1500
	Tubectomy (All)	1350	150	1500

Source: *(9)*

Family welfare linked health insurance scheme *(98)*

Government of India has introduced a family planning insurance scheme for acceptors of sterilization and indemnity cover for doctors performing sterilization procedures in both government and accredited private/ NGO/corporate health facilities. The insurance scheme will be operated by the ICICI.

Compensation in the event of death :

In the event of death following sterilization (inclusive of death during process of sterilization operation) in hospital or within 7 days from the date of discharge from the hospital, the compensation available as stated above.

All the doctors and health facilities rendering family planning services, conducting such operations shall stand indemnified against claims arising out of failure of sterilization, death or medical complications resulting therefrom up to a maximum amount of Rs 2 lacs per doctor/ health facility per case. The cover would also include the legal costs and actual modality of defending the prosecuted doctor/ health facility in court, which would be borne by the insurance company within certain limits *(120)*.

Postpartum Programme *(121)*

An All India Hospital Postpartum Programme (AIHPP) was introduced in 1969. It is a hospital-based, maternity centred approach to family planning. The primary objective of the postpartum programme is to improve the health of the mother and children through MCH and Family Welfare programme which includes antenatal, neonatal, and postnatal services; immunization services to children and mothers; and prophylaxis against anaemia and blindness. The programme is based on the following rationale :

a. That women who have recently delivered are of proven fertility, and are at risk to become pregnant again rapidly
b. At the time of delivery and during the lying-in period, they are generally more receptive to adopt one or the other family planning method.

The postpartum programme offers necessary facilities to such women. It has proved to be an efficient way of delivering family planning services. The programme now covers 550 medical institutions at national, state and district levels inclusive of 100 medical colleges and 2 post-graduate institutions. A scheme of PAP smear test facilities has been sanctioned for all medical colleges.

With a view to provide MCH and family welfare services in rural and semi-urban areas, as well as to improve the health of mothers and children, the postpartum programme has been extended to sub-divisional and sub-district hospitals. 1,012 such centres are functioning in the country *(122)*.

Population education

Population education has been defined as "an educational programme which provides for a study of the population situation in the community, nation and world with the purpose of developing in the students rational and responsible attitudes and behaviour towards that situation" *(121)*. The content of population education programme is influenced by the specific national situation as well as by political and educational goals *(123)*.

In the Indian context, the concept of population education is designed to bring home to the students, both at school and university level the consequences of uncontrolled population growth; the benefits of a small family norm; the economics, sociology and statistics of population growth, its distribution and its relation to the levels of living.

SOCIOLOGY OF FAMILY PLANNING

The institution of family is as old as man himself. It is the basic social cell. The need for its discipline has only recently dawned because of changing economic, social and cultural patterns in the world – and above all, because of concern of what might be called "quality of life" criteria. Sociologists and economists have shown that it will be difficult to raise the living standards of the people while population growth continues unchecked. The gains of the five year developmental plans are being absorbed by the rapidly growing population for basic consumption, e.g., food, shelter, clothing, education and medical care.

Attitude surveys have shown that awareness of family planning is very widespread and over 60 per cent people have attitudes favourable to restricting or spacing births *(29)*. People are generally in favour of family planning, and there is no organized opposition to it. In spite of this, the rate of contraceptive use by couples in the developing countries is very low. This is the crux of the family planning problem. Studies have shown that the population problem is complicated by deep-rooted religious and other beliefs, attitudes and practices favouring larger families (e.g., strong preference for male children). The common beliefs are – that children are the gift of God; the number of children is determined by God; children are a poor man's wealth; children are an asset to which parents can look forward in periods of dependency caused by old age or misfortune, etc. Most of these beliefs stem from ignorance and lack of communication.

The problem of family planning is, therefore, essentially the problem of social change. Contraceptive technology is no short cut to the problem. What is more important is to stimulate social changes affecting fertility such as raising the age of marriage, increasing the status of women, education and employment opportunities, old age security, compulsory education of children, accelerating economic changes designed to increase the per capita income, etc. It is now axiomatic that economic development is the best contraceptive. The experience of all countries which have had a successful population control show that the best motivation is economic, a desire to improve standard of living. The solution to the problem is one of mass education and communication, so that people may understand the benefits of a small family.

VOLUNTARY ORGANIZATIONS

Voluntary organizations have played a major role in population control programmes since the beginning. They are involved in every possible way so as to complement governmental efforts to promote Family Welfare Programme. Apart from educational and motivational efforts, their activities include running of Family Welfare Centres, post-partum centres, ANM training schools, population research centres and other innovative projects.

Some of the well-known voluntary agencies in India are the Family Planning Association of India, the Family Planning Foundation and the Population Council of India. Others include the Indian Red Cross, the Indian Medical Association, Rotary Clubs, Lions Clubs, Citizens Forum, Christian Missionaries and Private Hospitals.

At the international level, the International Planned Parenthood Federation is the world's largest private voluntary organization supporting family planning services in developing countries. It is an international federation of independent Family Planning Associations with headquarters in London. Others with long experience in this field include the United Nations Fund for Population Activities (UNFPA), the US Agency for International Development (USAID), the Population Council, Ford Foundation, the Pathfinder Fund and World Bank besides WHO and UNICEF. The international agencies are assisting in funding family planning research, services, training and information programmes designed to reduce the family size.

NATIONAL FAMILY WELFARE PROGRAMME

India launched a nation-wide family planning programme in 1952, making it the first country in the world to do so, though records show that birth control clinics have been functioning in the country since 1930. The early beginnings of the programme were modest with the establishment of a few clinics and distribution of educational material, training and research. During the Third Five Year Plan (1961–66), family planning was declared as "the very centre of planned development". The emphasis was shifted from the purely "clinic approach" to the more vigorous "extension education approach" for motivating the people for acceptance of the "small family norm". The introduction of the Lippes Loop in 1965 necessitated a major structural reorganization of the programme, leading to the creation of a separate Department of Family Planning in 1966 in the Ministry of Health. During the years 1966–1969, the programme took firmer roots. The family planning infrastructure (e.g., primary health centres, sub-centres, urban family planning centres, district and State bureaus) was strengthened. During the Fourth Five Year Plan (1969–74), the Government of India gave "top priority" to the programme. The Programme was made an integral part of MCH activities of PHCs and their sub-centres. In 1970, an All India Hospital Postpartum Programme and in 1972, the Medical Termination of Pregnancy (MTP) Act were introduced. During the Fifth Five Year Plan (1975–80) there have been major changes. In April 1976, the country framed its first "National Population Policy". The disastrous forcible sterilization campaign of 1976 led to the Congress defeat in the 1977 election. In June 1977, the new (Janata) Government that came into power formulated a new population policy, ruling out compulsion and coercion for all times to come. The Ministry of Family Planning was renamed "Family Welfare".

Although the performance of the programme was low during 1977–78, it was a good year in as much as the programme moved into new healthier directions. The 42nd Amendment of the Constitution has made "Population control and Family Planning" a concurrent subject, and this provision has been made effective from January 1977. The acceptance of the programme is now purely on voluntary basis. The launching of the Rural Health Scheme in 1977 and the involvement of the local people (e.g., Health Guides, trained Dais, Opinion leaders) in the family welfare programme at the grass-root level were aimed at accelerating the pace of progress of the programme. India was a signatory to the Alma Ata Declaration in 1978. The acceptance of the primary health care approach to the achievement of HFA/2000 AD led to the formulation of a National Health Policy in 1982. The National Health Policy was approved by the Parliament in 1983. It laid down the long-term demographic goal of NRR=1 by the year 2000 – which implies a 2–child family norm – through the attainment of a birth rate of 21 and a death rate of 9 per thousand population, and a couple protection rate of 60 per cent by the year 2000. The Sixth and Seventh Five Year Plans were accordingly set to achieve these goals. The National Health Policy also called for restructuring the health care delivery system to achieve HFA/2000 AD, and family planning has been accorded a central place in health development.

The Universal Immunization Programme aimed at reduction in mortality and morbidity among infants and younger children due to vaccine preventable diseases was started in the year 1985–86. The oral rehydration therapy was also started in view of the fact that diarrhoea was a leading cause of death among children. Various other programmes under MCH were also implemented during the Seventh Five Year Plan. The objective of all these programmes were convergent and aimed at improving the health of the mothers and young children, and to provide them facilities for prevention and treatment of major diseases. During 1992 these programmes were integrated under Child Survival and Safe Motherhood (CSSM) Programme.

The process of integration of related programmes initiated was taken a step further during 1994 when the International Conference on Population and Development in Cairo recommended implementation of Unified Reproductive and Child Health Programme (RCH). It is obviously sensible that integrated RCH programme would help in reducing cost of inputs to some extent because overlapping of expenditure would no longer be necessary and outcome will be better. Accordingly, during Ninth Five Year Plan the RCH Programme integrates all the related programmes of the Eighth Five Year Plan. The concept of RCH is to provide need based, client oriented, demand driven, high quality integrated services.

The Government of India evolved a more detailed and comprehensive National Population Policy 2000 (see page 568) to promote family welfare.

In the year 2005 Govt. of India launched National Rural Health Mission, initially for seven years (2005–2012) which was extended for 5 years up to 2017. Then came National Urban Health Plan and merging both these plans as National Health Mission. In the year 2013, RMNCH+A strategy was launched which was based on a continuum of care approach and defines integrated packages of services for different stages of life. In the year 2014, India Newborn Action Plan (INAP) came with the goal to attain single digit neonatal mortality rate by 2030 and single digit stillbirth rate by 2030. In the year 2017, National Health Policy was launched.

Table 26 shows the achievements of the Health and Family Welfare Programme.

TABLE 26

Achievements of Health & Family Welfare Programme

Parameter	2015	2017	2024
Crude Birth Rate (Per 1000 Population)	20.8	20.2	16.0
Crude Death Rate (Per 1000 Population)	6.5	6.3	7.0
Total Fertility Rate (Per women)	2.3	2.2	2.0
Maternal Mortality Ratio (Per 100,000 live births)	130 (2014–16)	122 (2015–17)	97 (2019–20)
Neo-natal Mortality Rate (Per 1000 live births)	25	23	21 (2021)
Under Five Mortality Rate (Per 1000 live births)	43	37	31 (2021)
Expectation of life at Birth	69.0 (2013–17)	73 Mid-year 2024	

Source : *(116)*

EVALUATION OF FAMILY PLANNING

Evaluation is defined as a "process of making judgements about selected objectives and events by comparing them with specified value standards for the purpose of deciding alternative course of action". The purpose of evaluation is to improve the design and delivery of family planning services.

Five types of evaluation have been defined by a WHO Expert Committee in 1975 *(32)* on evaluation of family planning in health services :

1. Evaluation of need

That is, health, demographic and socio-economic needs for family planning. For example, the current status of maternal mortality in a given area is an indicator of the need for family planning.

2. Evaluation of plans

That is, an assessment of the feasibility and adequacy of programme plans.

3. Evaluation of performance

(a) *Services* : Clinic services, mobile services, post-partum services, contraceptive distribution, follow up services, education and motivation activities;

(b) *Response* : Number of new acceptors, characteristics of acceptors;

(c) *Cost analysis; and*

(d) *Other activities* : Administration, manpower, data system, etc.

4. Evaluation of effects

Changes in knowledge, attitudes, motivation and behaviour.

5. Evaluation of impact

A WHO Study Group in 1976 (125) proposed the following indices for evaluating the impact : (a) Family size (number of living children (b) desired number of additional children (c) birth interval (d) age of the mother at birth of first child and last child (e) birth order, and (f) number of abortions. To this may be added, changes in birth rate and growth rate.

Evaluation is a technical activity that requires trained personnel, statistical facilities and adequate flow of data and information.

The Family Welfare Programme in India has come a long way and holds forth the promise that in the not very distant future it may be accepted as a way of life by most people. Although birth control continues to occupy the same important position in the programme as it used to be in the earlier days the programme now aims at achieving a higher end – and that is, to improve, in conjunction with other development programmes, the quality of life of the people (124).

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9 Preventive Medicine in Obstetrics, Paediatrics and Geriatrics

"The test of any civilization is the measure of consideration and care which it gives to its weaker members"

In any community, mothers and children constitute a priority group. In sheer numbers, they comprise approximately 71.14 per cent of the population of the developing countries. In India, women of the child-bearing age (15 to 44 years) constitute 52.4 per cent of total female population, and children under 15 years of age about 26.5 per cent of the total population. Together they constitute nearly 57.5 per cent of the total population. By virtue of their numbers, mothers and children are the major consumers of health services, of whatever form.

Mothers and children not only constitute a large group, but they are also a "vulnerable" or special-risk group. The risk is connected with child-bearing in the case of women; and growth, development and survival in the case of infants and children. Whereas 50 per cent of all deaths in the developed world are occurring among people over 70, the same proportion of deaths are occurring among children during the first five years of life in the developing world. Global observations show that in developed regions maternal mortality ratio averages at 12 per 100,000 live births; in developing regions the figure is 232 for the same number of live births *(1)*. From commonly accepted indices, it is evident that infant, child and maternal mortality rates are high in many developing countries. Further, much of the sickness and deaths among mothers and children is largely preventable. By improving the health of mothers and children, we contribute to the health of the general population. These considerations have led to the formulation of special health services for mothers and children all over the world.

The problems affecting the health of mother and child are multifactorial. Despite current efforts, the health of mother and child still constitutes one of the most serious health problems affecting the community, particularly in the developing countries. The present strategy is to provide mother and child health services as an integrated package of "essential health care", also known as **primary health care** which is based on the principles of equity, intersectoral coordination and community participation. The primary health care approach combines all elements in the local community necessary to make a positive impact on the health status of the population, including the health of mothers and children.

Mother and child – one unit

Mother and child must be considered as one unit. It is because: (1) during the antenatal period, the foetus is part of the mother. The period of development of foetus in mother is about 280 days. During this period, the foetus obtains all the building materials and oxygen from the mother's blood; (2) child health is closely related to maternal health. A healthy mother brings forth a healthy baby; there is less chance for a premature birth, stillbirth or abortion; (3) certain diseases and conditions of the mother during pregnancy (e.g., syphilis, german measles, drug intake) are likely to have their effects upon the foetus; (4) after birth, the child is dependant upon the mother. At least up to the age of 6 to 9 months, the child is completely dependant on the mother for feeding. The mental and social development of the child is also dependant upon the mother. If the mother dies, the child's growth and development are affected (maternal deprivation syndrome); (5) in the care cycle of women, there are few occasions when service to the child is not simultaneously called for. For instance, postpartum care is inseparable from neonatal care and family planning advice; and (6) the mother is also the first teacher of the child. It is for these reasons, the mother and child are treated as one unit.

Obstetrics, Paediatrics and Preventive and Social Medicine

In the past, maternal and child health services were rather fragmented, and provided piecemeal "personal health services" by different agencies, in different ways and in separate clinics. The current trend in many countries is to provide integrated MCH and family planning services as compact family welfare service. This implies a close relationship of maternity health to child health, of maternal and child health to the health of the family; and of family health to the general health of the community. In providing these services, specialists in obstetrics and child health (paediatrics) have joined hands, and are now looking beyond the four walls of hospitals into the community to meet the health needs of mothers and children aimed at positive health. In the process, they have linked themselves to preventive and social medicine, and as a result, terms such as "social obstetrics", "preventive paediatrics" and "social paediatrics" have come into vogue.

OBSTETRICS

Obstetrics is largely preventive medicine. The aim of obstetrics and preventive medicine is the same, viz. to ensure that throughout pregnancy and puerperium, the mother will have good health and that every pregnancy may culminate in a healthy mother and a healthy baby. The age-old concept that obstetrics is only antenatal, intranatal and postnatal care, and is thus concerned mainly with technical skills, is now considered as a very narrow concept, and is being replaced by the concept of **community obstetrics** which combines obstetrical concerns with concepts of primary health care.

SOCIAL OBSTETRICS

The concept of **social obstetrics** has gained currency in recent years. It may be defined as the study of the interplay of social and environmental factors and human reproduction going back to the preconceptional or even premarital period. The social and environmental factors which influence human reproduction are a legion, viz. age at marriage, child bearing, child spacing, family size fertility patterns, level of education, economic status, customs and beliefs, role of women in society, etc. A study of these factors is an important aspect of social obstetrics. The social obstetric problems in India, differ from the social obstetric problems in the developed countries, because of various differing social, economic, cultural and other factors. While accepting the influence of environmental and social factors on human reproduction, social obstetrics has yet another dimension, that is the influence of these factors on the organization, delivery and utilization of obstetric services by the community. In other words, social obstetrics is concerned with the delivery of comprehensive maternity and child health care services including family planning so that they can be brought within the reach of the total community *(2)*.

Preventive paediatrics

Paediatrics which is synonymous with child health is that branch of medical science that deals with the care of children from conception to adolescence, in health and disease. Paediatrics is one of the first clinical subjects to link itself to preventive medicine. Like obstetrics, paediatrics has a large component of preventive and social medicine. There is no other discipline so comprehensive as paediatrics that teaches the value of preventive medicine. Recent years have witnessed further specialization within the broad field of paediatrics viz. preventive paediatrics, social paediatrics, neonatology, perinatology, developmental paediatrics, paediatric surgery; paediatric neurology, and so on.

Preventive paediatrics comprises efforts to avert rather than cure disease and disabilities. It has been broadly divided into *antenatal paediatrics* and *postnatal paediatrics*. The aims of preventive paediatrics and preventive medicine are the same: prevention of disease and promotion of physical, mental and social well-being of children so that each child may achieve the genetic potential with which he/she is born. To achieve these aims, hospitals for children have adopted the strategy of "primary health care" to improve child health care through such activities as growth monitoring, oral rehydration, nutritional surveillance, promotion of breast-feeding, immunization, community feeding, regular health check-ups, etc. Primary health care with its potential for vastly increased coverage through an integrated system of service delivery is increasingly looked upon as the best solution to reach millions of children, especially those who are most in need of preventive and curative services.

Social paediatrics

The challenge of the time is to study child health in relation to community, to social values and to social policy. This has given rise to the concept of social paediatrics. Social paediatrics has been defined as "the application of the principles of social medicine to paediatrics to obtain a more complete understanding of the problems of children in order to prevent and treat disease and promote their adequate growth and development, through an organized health structure *(3)*". Social paediatrics, like social obstetrics, covers a wide responsibility. It is concerned not only with the social factors which influence child health but also with the influence of these factors on the organization, delivery and utilization of child health care services. In other words, social paediatrics is concerned with the delivery of comprehensive and continuous child health care services and to bring these services within the reach of the total community. Social paediatrics also covers the various social welfare measures – local, national and international – aimed to meet the total health needs of a child.

Preventive and social medicine, with its involvement in total community care, and expertise in epidemiology and in the methodology of collection and utilization of data relating to the community and the environment, makes an indispensable contribution to social obstetrics and social paediatrics in the :

1. collection and interpretation of community statistics, delineating groups "at risk" for special care;
2. correlation of vital statistics (e.g., maternal and infant morbidity and mortality rates, perinatal and child mortality rates) with social and biological characteristics such as birth weight, parity, age, stature, employment etc. in the elucidation of aetiological relationships;
3. study of cultural patterns, beliefs and practices relating to childbearing and childrearing, knowledge of which might be useful in promoting acceptance and utilization of obstetric and paediatric services by the community;
4. to determine priorities and contribute to the planning of MCH services and programmes; and
5. for evaluating whether MCH services and programmes are accomplishing their objectives in terms of their effectiveness and efficiency.

Hitherto, obstetrics, paediatrics and preventive and social medicine were operating in watertight compartments. The emergence of social paediatrics, social obstetrics and their association with preventive and social medicine are certainly new developments in contemporary medicine. In some Universities, a chair of social paediatrics has also been established. The increasing coming together of these disciplines augurs well for the provision of comprehensive mother and child health care and family planning services as a compact family welfare service.

Maternity cycle

The stages in maternity cycle are :

(i) Fertilization;
(ii) Antenatal or prenatal period;
(iii) Intranatal period;
(iv) Postnatal period; and
(v) Inter-conceptional period.

Fertilization takes place in the outer part of the fallopian tube. Segmentation of the fertilized ovum begins at once and proceeds at a rapid rate. The fertilized ovum reaches the uterus in 8 to 10 days. Cell division proceeds at a rapid rate. By a process of cell division and differentiation, all the organs and tissues of the body are formed. The periods of growth have been divided as follows :

1. Prenatal period :
   (a) Ovum – 0 to 14 days
   (b) Embryo – 14 days to 9 weeks
   (c) Foetus – 9th week to birth
2. Premature infant – from 28 to 37 weeks
3. Birth, full term – average 280 days.

MCH problems

MCH problems cover a broad spectrum. At one extreme, the most advanced countries are concerned with problems such as perinatal problems, congenital malformations, genetic and certain behavioural problems. At the other extreme, in developing countries, the primary concern is reduction of maternal and child mortality and morbidity, spacing of pregnancies, limitation of family size, prevention of communicable diseases, improvement of nutrition and promoting acceptance of health practices. Currently, the main health problems affecting the health of the mother and the child in India, as in other developing countries, revolve round the triad of *malnutrition, infection* and the consequences of *unregulated fertility (4)*. Associated with these problems is the scarcity of health and other social services in vast areas of the country together with poor socio-economic conditions.

1. MALNUTRITION

Malnutrition is like an iceberg; most people in the developing countries live under the burden of malnutrition. Pregnant women, nursing mothers and children are particularly vulnerable to the effects of malnutrition. The adverse effects of maternal malnutrition have been well documented–maternal depletion, low birth weight, anaemia, toxemias of pregnancy, postpartum haemorrhage, all leading to high mortality and morbidity. The effects of malnutrition are also frequently more serious during the formative years of life. Previously it was thought that malnutrition was largely concentrated in school age children, and in toddlers. Now it is realized that the *intrauterine period* of life is a very important period from the nutritional standpoint. Infants born with adequate birth weight have relatively low mortality even under poor environmental conditions. The next critical period of childhood is the *period of weaning*. Severe malnutrition coincides with the age at which babies are usually weaned. Susceptibility to infection and severity of illness are significantly less in well nourished, than in malnourished children. Nutrition protection and promotion is, therefore, an essential activity of MCH care.

Measures to improve the nutritional status of mothers and children may be broadly divided into *direct* and *indirect* nutrition interventions *(4)*. *Direct interventions* cover a wide range of activities, viz. supplementary feeding programmes, distribution of iron and folic acid tablets, fortification and enrichment of foods, nutrition education, etc. *Indirect nutrition* interventions have still wider ramifications because they are not specifically related to nutrition. These include measures such as control of communicable diseases through immunization, improvement of environmental sanitation, provision of clean drinking water, family planning, food hygiene, education and primary health care. Nutritional surveillance is becoming increasingly important for identifying subclinical malnutrition, as it tends to be overlooked in both the mother and the child. The primary health worker (community worker) can play a vital role in improving the nutritional status of mothers and children.

2. INFECTION

Maternal infections may cause a variety of adverse effects such as foetal growth retardation, low birth weight, embryopathy, abortion and puerperal sepsis. In industrial societies, the risk of the mother acquiring infections during pregnancy is relatively low, but in underdeveloped areas, the mother is exposed to significantly higher risks. Many women are infected with HIV, hepatitis B, cytomegalo viruses, herpes simplex virus or toxoplasma during pregnancy. Furthermore, about 2 to 10 per cent pregnant women suffer from asymptomatic bacteriuria.

As far as the baby is concerned, infection may begin with labour and delivery and increase as the child grows older. Children may be ill with debilitating diarrhoeal, respiratory and skin infections for as much as a *third of their first year of life*. In some regions, the situation is further aggravated by such chronic infections as malaria and tuberculosis. The occurrence of multiple and frequent infections may precipitate in the children a severe protein-energy malnutrition and anaemia. When the child becomes ill, traditions, beliefs and taboos enter into play; the indirect effect of infections may be more important than the direct one in traditional societies.

Prevention and treatment of infections in mother and children is a major and important part of normal MCH care activity. It is now widely recognized that children in developing areas need to be immunized against nine infections – tuberculosis, diphtheria, whooping cough, tetanus, hepatitis B, haemophilus influenza type B, Japanese encephalitis in endemic states, measles and polio. Many countries, including India, have adopted the WHO Expanded Programme on Immunization as part of everyday MCH care. Tetanus toxoid application during pregnancy has also been taken up. Education of mothers in medical measures such as oral rehydration in diarrhoea and febrile diseases. In addition, a good knowledge and practice of personal hygiene and appropriate sanitation measures, particularly in and around the home, are essential pre-requisites for the control of the most common infections and parasitic diseases.

3. UNCONTROLLED REPRODUCTION

The health hazards for the mother and the child resulting from unregulated fertility have been well recognized – increased prevalence of low birth weight babies, severe anaemia, abortion, antepartum haemorrhage and a high maternal and perinatal mortality, which have shown a sharp rise after the 4th pregnancy. Statistics have shown that in almost every country in the world, a high birth rate is associated with a high infant mortality rate and under-five death rate (Table 1).

TABLE 1

Selected rates by country for crude birth rates, infant mortality rates and under-five mortality rates (mid 2024)

Country	Crude birth rate per 1000 population (mid 2024)	IMR per 1000 live births (mid 2024)	Under-five mortality rate per 1000 live births (2022)
India	16	23	29
Pakistan	28	49	61
Bangladesh	20	23	29
Thailand	7	7	8
Sri Lanka	14	7	6
China	6	5	7
Switzerland	9	3.8	4
UK	10	3.7	4
USA	11	5.6	6
Singapore	7	2.2	2
Japan	6	1.8	2

Source : *(5, 6)*

Because family planning has a striking impact on the health of the mother and the child, a number of countries have integrated family planning in the MCH care activities. The introduction of new types of IUD; easier and safer techniques of pregnancy termination and female sterilization; oral pills and long-acting injectable medroxyprogesterone acetate (MPA) have contributed a good deal in the utilization of family planning services. In some countries, MCH programmes are extending their scope to include family-life education in schools. There is also an increasing acceptance of the role of traditional midwives and community health workers, with suitable training for the extension of family planning services to remote rural areas.

Maternal and child health

The term "maternal and child health" refers to the promotive, preventive, curative and rehabilitative health care for mothers and children. It includes the sub-areas of maternal health, child health, family planning, school health, handicapped children, adolescence, and health aspects of care of children in special settings such as day care *(4)*.

The specific objectives of MCH are (a) reduction of maternal, perinatal, infant and childhood mortality and morbidity; (b) promotion of reproductive health; and (c) promotion of the physical and psychological development of the child and adolescent within the family. The ultimate objective of MCH services is lifelong health *(4)*.

Pregnancy detection

The simple way to confirm pregnancy in the first trimester is to conduct a urine examination using a pregnancy test kit. The kit detects pregnancy on the basis of presence of human chorionic gonadotrophin hormone in the urine. The test is performed soon after a missed period and is simple to perform. The pregnancy test should be offered to any women who is in reproductive age group and comes with a history of amenorrhoea or symptoms of pregnancy. The Government of India has made "Nischay" pregnancy test kit available across the country. Other test kits are also available in the market. The kit is provided to ASHA or other link workers and the women should be advised appropriately on the result of the test *(7)*.

ANTENATAL CARE

Antenatal care (ANC) can be defined as the care provided by skilled health-care professionals to pregnant women and pregnant adolescent girls in order to ensure the best health conditions for both mother and baby during pregnancy. The components of ANC include: risk identification; prevention and management of pregnancy-related or concurrent diseases; health education and health promotion *(8)*. ANC reduces maternal and perinatal morbidity and mortality both directly, through detections, and indirectly, through the identification of women and girls at increased risk of developing complications during labour and delivery, thus ensuring referral to an appropriate level of care *(8)*.

Ideally this care should begin soon after conception and continue throughout pregnancy. In some countries, notification of pregnancy is required to bring the mother in the prevention care cycle as early as possible.

Objectives

The objectives of antenatal care are :

(1) To promote, protect and maintain the health of the mother during pregnancy;
(2) To detect "high-risk" cases and give them special attention;
(3) To foresee complications and prevent them;
(4) To remove anxiety and dread associated with delivery;
(5) To reduce maternal and infant mortality and morbidity;
(6) To teach the mother elements of child care, nutrition, personal hygiene, and environmental sanitation;
(7) To sensitize the mother to the need for family planning, including advice to cases seeking medical termination of pregnancy; and
(8) To attend to the under-fives accompanying the mother.

The above objectives are achieved by the following programme of health care services :

(1) Antenatal visits

Ideally the mother should attend the antenatal clinic once a month during the first 7 months; twice a month, during the next month; and thereafter, once a week, if everything is normal. A high proportion of mothers in India are from lower socio-economic group, and many of them are working women. Attendance at the antenatal clinic may mean loss of daily wages. Consequently, it is difficult for them to attend the antenatal clinic so often. In these cases, a minimum of 4 visits covering the entire period of pregnancy should be the target, as shown below :

The suggested schedule is as follows *(7)* :

1st visit – within 12 weeks, preferably as soon as the pregnancy is suspected, for registration of pregnancy and first antenatal check-up.
2nd visit – between 14 and 26 weeks.
3rd visit – between 28 and 34 weeks.
4th visit – between 36 weeks and term.

It is advisable for the woman to visit medical officer at the PHC for an antenatal check-up during the period of 28–34 weeks (3rd visit). Besides this, she may be advised to avail investigation facilities at the nearest PHC/CHC/FRU.

Registration of pregnancy within 12 weeks is the primary responsibility of the ANM. Opportunities such as Village Health Nutrition Day should be availed to ensure early registration of pregnancy and antenatal check-up.

Early pregnancy detection is important for the following reasons *(7)* :

1. It facilitates proper planning and allows for adequate care to be provided during pregnancy for both the mother and the foetus.
2. Record the date of last menstrual period and calculate the expected date of delivery.
3. The health status of the mother can be assessed and any medical illness that she might be suffering from can be detected. Also to obtain and record the baseline information on blood pressure, weight, haemoglobin etc.
4. It helps in timely detection of complications at an early stage and helps to manage them appropriately by referral as and where required.
5. It also helps to confirm if the pregnancy is wanted and if not, then refer the women at the earliest to a 24 hours PHC or FRU that provides safe abortion services. The health personnel should be alert to the possibility of sex selective abortion as such abortions are illegal.

6. Early detection of pregnancy and provision of care from the initial stage facilitates a good interpersonal relationship between the care giver and the pregnant woman.

Estimation of number of pregnancies in a specified area and pregnancy tracking (7)

To ensure complete registration, it is essential that the ANM should know the estimated number of pregnancies to be registered annually in her area. Calculating the expected number of annual pregnancies in the area will help her judge how good her pregnancy registration is. In case the number of pregnancies registered is less than that of the estimated pregnancies, she needs to track down the pregnancies she has missed, with the help of ASHAs and AWWs. Estimating the number of pregnancies will also help her judge whether she has an adequate stock of the supplies required to provide routine ANC (such as TT injections, IFA tablets and ANC record forms) and tackle any complications that arise during this period.

The number of expected pregnancies per year :

The ANM must know the population size and birth rate of the area under her jurisdiction. The expected number of live births may be calculated as shown below :

$$\text{Expected no. of live births (Y)/year} = \frac{\text{Birth rate (per 1000 population)} \times \text{population of the area}}{1000}$$

As some pregnancies may not result in a live birth (i.e. abortions and stillbirths may occur), the expected number of live births would be an under-estimation of the total number of pregnancies. Hence, a correction factor of 10% is required, i.e. add 10% to the figure obtained above.

So, the total number of expected pregnancies

$$(Z) = Y + 10\% \text{ of } Y$$

As a thumb rule, in any given month, approximately half the number of pregnancies estimated above should be in records.

Example of estimation of the number of pregnancies annually

Birth rate	= 25/1000 population
Population under the sub-centre	= 5000
Therefore, expected number of live births	= (25×5000)/1000
	= 125 births
Correction factor (pregnancy wastage)	= 10% of 125
	= say 13
Therefore, total no. of expected pregnancies in a year	= 125 + 13 = 138

In any month, the ANM should have about 69 pregnancies registered with her.

If the number of women registered is less than expected, the ANM should approach community leaders and key people to ensure that the pregnant women are registered and come for ANC. ASHA and link worker should visit every house in the area and ensure that all pregnant women are registered. Some women may be receiving ANC from the private sector. Ensure that their names together with the names of the facilities where they are registered are mentioned in the antenatal register.

The ANM must keep track of all pregnant women in her area. In case a registered women does not turn-up for her ANC check-up, ANM must follow her and counsel her for the regular ANC check-up. An antenatal check-up after a missed appointment should include all the components of the missed visit(s) as well as those that correspond to the present visit. For example, the woman should be given her TT injection and supply of IFA tablets, her weight and blood pressure should be checked besides being screened for complications.

A policy decision has been taken for a name-based tracking system whereby pregnant women and children can be tracked for their ANCs and immunization along with a feedback system for the ANM, ASHA etc. This has been done to ensure that all pregnant women receive their ANCs and PNCs, and children receive full immunization. This will also help in tracking and ensuring ANC/PNC for missed/left out cases.

PREVENTIVE SERVICES FOR MOTHERS (ANTENATAL CHECK-UP)

The first visit, irrespective of when it occurs, should include the following components :

I. History-taking

During the first visit, a detailed history of the woman needs to be taken to : (1) Confirm the pregnancy (first visit only); (2) Identify whether there were complications during any previous pregnancy/confinement that may have a bearing on the present one; (3) Identify any current medical/surgical or obstetric condition(s) that may complicate the present pregnancy; (4) Record the date of 1st day of last menstrual period and calculate the expected date of delivery by adding 9 months and 7 days to the 1st day of last menstrual period; (5) Record symptoms indicating complications, e.g. fever, persisting vomiting, abnormal vaginal discharge or bleeding, palpitation, easy fatigability, breathlessness at rest or on mild exertion, generalized swelling in the body, severe headache and blurring of vision, burning in passing urine, decreased or absent foetal movements etc; (6) History of any current systemic illness, e.g., hypertension, diabetes, heart disease, tuberculosis, renal disease, epilepsy, asthma, jaundice, malaria, reproductive tract infection, STD, HIV/AIDS etc. Record family history of hypertension, diabetes, tuberculosis, and thalassaemia. Family history of twins or congenital malformation; and (7) History of drug allergies and habit forming drugs.

II. Physical examination

1. *Pallor* : Presence of pallor indicates anaemia. The woman should be examined for pallor at each visit. Examine woman's conjunctiva, nails, tongue, oral mucosa and palms. Pallor should be co-related with haemoglobin estimation.
2. *Pulse* : The normal pulse rate is 60 to 90 beats per minute. If the pulse rate is persistently low or high, with or without other symptoms, the woman needs medical attention.
3. *Respiratory rate* : It is important to check the respiratory rate, especially if the woman complaints of breathlessness. Normal respiratory rate is 18–20 breaths per minute.
4. *Oedema* : Oedema (swelling), which appears in the evening and disappears in the morning after a full night's sleep, could be a normal manifestation of pregnancy. Any oedema of the face, hands, abdominal wall and vulva is abnormal. Oedema can be suspected if a woman

complains of abnormal tightening of any rings on her fingers. She must be referred immediately for further investigations. If there is oedema in association with high blood pressure, heart disease, anaemia or proteinuria, the woman should be referred to the medical officer.

5. *Blood pressure* : Measure the woman's blood pressure at every visit. This is important to rule out hypertensive disorders of pregnancy. Hypertension is diagnosed when two consecutive readings taken four hours or more apart show the systolic blood pressure to be 140 mmHg or more and/or the diastolic blood pressure to be 90 mmHg or more. High blood pressure during pregnancy may signify Pregnancy-Induced Hypertension (PIH) and/or chronic hypertension. If the woman has high blood pressure, check her urine for the presence of albumin. The presence of albumin (+2) together with high blood pressure is sufficient to categorize her as having pre-eclampsia. Refer her to the MO immediately. If the diastolic blood pressure of the woman is above 110 mmHg, it is a danger sign that points towards imminent eclampsia. The urine albumin should be estimated at the earliest. If it is strongly positive, the woman should be referred to the FRU IMMEDIATELY. If the woman has high blood pressure but no urine albumin, she should be referred to the MO at 24×7 PHC. A woman with PIH, pre-eclampsia or imminent eclampsia requires hospitalization and supervised treatment at a 24-hour PHC/FRU.

6. *Weight* : A pregnant woman's weight should be taken at each visit. The weight taken during the first visit/ registration should be treated as the baseline weight. Normally, a woman should gain 10–12 kg during her pregnancy. Ideally after the first trimester, a pregnant woman gains around 2 kg every month. If the diet is not adequate, i.e. if the woman is taking less than the required amount of calories, she might gain only 5–6 kg during her pregnancy. An inadequate dietary intake can be suspected if the woman gains less than 2 kg per month. She needs to be put on food supplementation. The help of the AWW should be taken in this matter, especially for those categories of women who need it the most. Low weight gain usually leads to Intrauterine Growth Retardation and results in the birth of a baby with a low birth weight. Excessive weight gain (more than 3 kg in a month) should raise suspicion of pre-eclampsia, twins (multiple pregnancy) or diabetes. Take the woman's blood pressure and test her urine for proteinuria and sugar. If the blood pressure is high and the urine is positive for protein or sugar, refer her to medical officer.

7. *Breast examination* : Observe the size and shape of the nipples for the presence of inverted or flat nipples.

III. Abdominal examination

Examine the abdomen to monitor the progress of the pregnancy and foetal growth. The abdominal examination includes the following :

1. *Measurement of fundal height* : Enlargement of the uterus and the height of the uterine fundus is as shown in Fig. 1.
   a. 12 weeks – Uterine fundus just palpable per abdomen.
   b. 20 weeks – Fundus flat at the lower border of umbelicus.
   c. 36 weeks – Fundus felt at the level of xiphisternum.

   The duration of pregnancy should always be expressed in terms of completed weeks. In the first half of pregnancy the size of the uterus is of the greatest value in confirming the calculated duration of pregnancy.
2. *Foetal heart sounds* : The foetal heart sounds can be heard after 6th month. The rate varies between 120 to 140 per minute. They are usually best heard in the midline; after the 28th week, their location may change because of the position and lie of the foetus.
3. *Foetal movements* : Foetal movements can be felt by the examiner after 18–22nd week by gently palpating the abdomen.
4. *Foetal parts* : These can be felt about the 22nd week. After the 28th week, it is possible to distinguish the head, back and limbs.
5. *Multiple pregnancy* : This must be suspected if the uterus is larger than the estimated gestational age or palpation of multiple foetal parts.
6. *Foetal lie and presentation* : Relevant only after 32 weeks of pregnancy.
7. Inspection of abdominal scar or any other relevant abdominal findings.

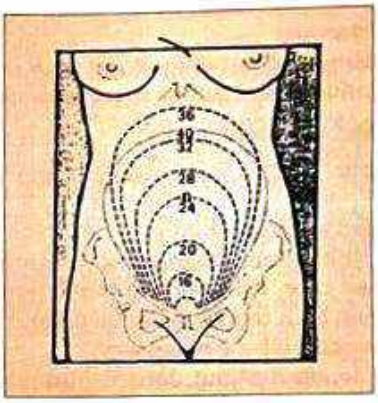


FIG. 1

Uterine fundal height at various stages of pregnancy (numbers indicate weeks of pregnancy)

IV. Assessment of gestational age *(9)*

Measurement of gestational age has changed over the time. As the dominant effect of gestational age on survival and long-term impairment has become apparent over the last 30 years, perinatal epidemiology has shifted from measuring birth weight alone to focusing on gestational age. The most accurate "gold standard" for assessment is routine early ultrasound assessment together with foetal measurements ideally in the first trimester. Gestational age assessment based on the date of last menstrual period (LMP) was previously the most widespread method used and remains the only available method in many settings. Many countries now use "best obstetric estimate", combining ultrasound and LMP as an approach to estimate gestational age. It can have a large impact on the number of preterm births reported.

Any method using ultrasound requires skilled technicians, equipment and for maximum accuracy, first trimester antenatal clinic attendance. These are not common in low-income settings, where majority of preterm births occur. Alternative approaches to LMP in these settings include fundal height, clinical assessment of the newborn after birth or birth weight as a surrogate.

V. Laboratory investigations

The following laboratory investigations are carried out at the facilities indicated below :

a. At the sub-centre :
   - Pregnancy detection test.
   - Haemoglobin examination.
   - Urine test for presence of albumin and sugar.
   - Rapid malaria test.

b. At the PHC/CHC/FRU :
   - Blood group, including Rh factor.
   - VDRL/RPR.
   - HIV testing.
   - Rapid malaria test (if unavailable at SC).
   - Blood sugar testing.
   - HBsAg for hepatitis B infection.

Essential components of every antenatal check-up :

1. Take the patient's history.
2. Conduct a physical examination–measure the weight, blood pressure and respiratory rate and check for pallor and oedema.
3. Conduct abdominal palpation for foetal growth, foetal lie and auscultation of foetal heart sound according to the stage of pregnancy.
4. Carry out laboratory investigations, such as haemoglobin estimation and urine tests for sugar and proteins.

Interventions and counselling

1. Iron and folic acid supplementation and medication as needed.
2. Immunization against tetanus.
3. Group or individual instruction on nutrition, family planning, self care, delivery and parenthood.
4. Home visiting by a female health worker/trained dai.
5. Referral services, where necessary.
6. Inform the woman about Janani Suraksha Yojana and other incentives offered by the government.

RISK APPROACH (10)

The central purpose of antenatal care is to identify "high risk" cases (as early as possible) from a large group of antenatal mothers and arrange for them skilled care, while continuing to provide appropriate care for all mothers. These cases comprise the following :

1. Elderly primi (30 years and over).
2. Short statured primi (140 cm and below).
3. Malpresentations, viz breech, transverse lie, etc.
4. Antepartum haemorrhage, threatened abortion.
5. Pre-eclampsia and eclampsia.
6. Anaemia.
7. Twins, hydramnios.
8. Previous still-birth, intrauterine death, manual removal of placenta.
9. Elderly grandmultiparas.
10. Prolonged pregnancy (14 days–after expected date of delivery).
11. History of previous caesarean or instrumental delivery.
12. Pregnancy associated with general diseases, viz. cardiovascular disease, kidney disease, diabetes, tuberculosis, liver disease, malaria, convulsions, asthma, HIV, RTI, STI, etc.
13. Treatment for infertility.
14. Three or more spontaneous consecutive abortions.

The "risk approach" is a managerial tool for improved MCH care. Its purpose is to provide better services for all, but with special attention to those who need them most. Inherent in this approach is maximum utilization of all resources, including some human resources that are not conventionally involved in such care – traditional birth attendants, community health workers, women's groups, for example. The risk strategy is expected to have far-reaching effects on the whole organization of MCH/FP services and lead to improvements in both the coverage and quality of health care, at all levels, particularly at primary health care level.

MAINTENANCE OF RECORDS

A Mother and Child Protection Card should be duly completed for every woman registered. It contains a registration number, identifying data, previous health history and main health events etc. The case record should be handed over to the woman. She should be instructed to bring the record with her during all subsequent check-ups/visits and also to carry it along with her at time of delivery. This card has been developed jointly by the Ministry of Health and Family Welfare (MOHFW) and Ministry of Women and Child Development (MOWCD) to ensure uniformity in record keeping. This will also help the service provider to know the details of previous ANCs/PNCs both for routine and emergency care. The information contained in the card should also be recorded in the antenatal register as per the Health Management Information System (HMIS) format.

HOME VISITS

Home visiting is the backbone of all MCH services. Even if the expectant mother is attending the antenatal clinic regularly, it is suggested that she must be paid at least one home visit by the Health Worker Female or Public Health Nurse. More visits are required if the delivery is planned at home. The mother is generally relaxed at home. The home visit will win her confidence. The home visit will provide an opportunity to observe the environmental and social conditions at home and also an opportunity to give prenatal advice.

(2) Prenatal advice

A major component of antenatal care is antenatal or prenatal advice. The mother is more receptive to advice concerning herself and her baby at this time than at other times. The "talking points" should cover not only the specific problems of pregnancy and child-birth but overflow into family and child health care.

(i) *DIET* : Reproduction costs energy. A pregnancy in total duration consumes about 60,000 kcal, over and above normal metabolic requirements. Lactation demands about 550 kcal a day. Further, child survival is correlated with birth weight. And birth weight is correlated to the weight gain of the mother during pregnancy. On an average, a normal healthy woman gains about 9–11 kg of weight during pregnancy. Several studies have indicated that weight gain of poor Indian women averaged 6.5 kg during pregnancy *(11)*. Thus pregnancy imposes the need for considerable extra calorie and nutrient requirements. If maternal stores of iron are poor (as may happen after repeated pregnancies) and if enough iron is not available to the mother during pregnancy, it is possible that foetus may lay down insufficient iron stores. Such a baby may show a normal haemoglobin at birth, but will lack the stores of iron necessary for rapid growth and increase in blood volume and muscle mass in the first year of life. Stresses in the form of malaria and other childhood infections will make the

deficiency more acute, and many infants become severely anaemic during early months of life. A balanced and adequate diet is therefore, of utmost importance during pregnancy and lactation to meet the increased needs of the mother, and to prevent "nutritional stress".

(ii) *PERSONAL HYGIENE* : Of equal importance is advice regarding personal hygiene. (a) *Personal cleanliness* : The need to bathe every day and to wear clean clothes should be explained. The hair should also be kept clean and tidy. (b) *Rest and sleep* : 8 hours sleep, and at least 2 hours rest after mid-day meals should be advised. (c) *Bowels*: Constipation should be avoided by regular intake of green leafy vegetables, fruits and extra fluids. Purgatives like castor oil should be avoided to relieve constipation. (d) *Exercise*: Light household work is advised, but manual physical labour during late pregnancy may adversely affect the foetus. (e) *Smoking*: Smoking should be cut down to a minimum. Expectant mothers who smoke heavily produce babies much smaller than the average – it is because nicotine has a vasoconstrictor influence in the uterus and induces a degree of placental insufficiency. The adverse effects of smoking range from low birth-weight to an increased risk of perinatal death of the infant *(12)*. Women who smoke during pregnancy give birth to babies which on an average weigh 170g less at term than the babies of non-smokers. The perinatal mortality amongst babies whose mothers smoked during pregnancy is between 10–40 per cent higher than in non-smokers. (f) *Alcohol* : Evidence is mounting that alcohol can cause a range of fertility problems in women. Moderate to heavy drinkers who became pregnant have greater risk of pregnancy loss *(13)*, and if they do not abort, their children may have various physical and mental problems *(14)*. Heavy drinking has been associated with a fetal syndrome (FAS) which includes intrauterine growth retardation and developmental delay. More recently, it has been shown that the consumption of even moderate amount of alcohol during pregnancy is associated with an increased risk of spontaneous abortion *(15)*. (g) *Dental care*: Advice should also be given about oral hygiene. (h) *Sexual intercourse*: This should be restricted especially during the last trimester.

(iii) *DRUGS* : The use of drugs that are not absolutely essential should be discouraged. Certain drugs taken by the mother during pregnancy may affect the foetus adversely and cause foetal malformations. The classical example is thalidomide, a hypnotic drug, which caused deformed hands and feet of the babies born. The drug proved most serious when taken between 4 to 8 weeks of pregnancy. Other examples are LSD which is known to cause chromosomal damage, streptomycin which may cause 8th nerve damage and deafness in the foetus, iodide-containing preparations which may cause congenital goitre in the foetus *(16)*. Corticosteroids may impair foetal growth, sex hormones may produce virilism, tetracyclines may affect the growth of bones and enamel formation of teeth. Anaesthetic agents including pethidine administered during labour can have depressant effect on the baby and delay the onset of effective respiration. Later still in the puerperium, if the mother is breast-feeding, there are certain drugs which are excreted in breast milk. A great deal of caution is required in the drug-intake by pregnant women *(17)*.

(iv) *RADIATION* : Exposure to radiation is a positive danger to the developing foetus. The most common source of radiation is abdominal X-ray during pregnancy. Case cohort studies have shown that mortality rates from leukaemia and other neoplasms were significantly greater among children exposed to intrauterine X-ray. This is in addition to congenital malformations such as microcephaly. The X-ray examination in pregnancy should be carried out only for definite indications, X-ray dosage kept to minimum. Furthermore, in all women of child-bearing age among whom there is a possibility of pregnancy, elective X-ray should be avoided in the two weeks preceeding the menstrual period.

(v) *WARNING SIGNS* : The mother should be given clear-cut instructions that she should report immediately in case of the following warning signals : (a) swelling of the feet (b) fits (c) headache (d) blurring of the vision (e) bleeding or discharge per vagina, and (f) any other unusual symptoms.

(vi) *CHILD CARE* : The art of child care has to be learnt. Special classes are held for mothers attending antenatal clinics. Mother-craft education consists of nutrition education, advice on hygiene and childrearing, cooking demonstrations, family planning education, family budgeting, etc.

(3) Specific health protection

(i) *ANAEMIA* : According to NFHS IV, about 50 per cent of pregnant women in India are anaemic. The major aetiological factors being iron and folic acid deficiencies. It is well known that anaemia per se is associated with high incidence of premature births, postpartum haemorrhage, puerperal sepsis and thromboembolic phenomena in the mother. The Government of India has initiated a programme in which 100 mg of elemental iron and 500 mcg of folic acid are being distributed daily for 100 days to pregnant women through antenatal clinics, primary health centres and their subcentres.

(ii) *OTHER NUTRITIONAL DEFICIENCIES* : The mother should be protected against other nutritional deficiencies that may occur, particularly protein, vitamin and mineral especially vit A and iodine deficiency. In some MCH Centres fresh milk is supplied free of cost to all expectant mothers; where this is not possible, skimmed milk should be given. Capsules of vitamin A and D are also supplied free of cost.

(iii) *ASYMPTOMATIC BACTERIURIA (ASB)*: Urinary tract infection during pregnancy are associated with risks to both mother and foetus. It includes pyelonephritis preterm birth, low birth weight and increased perinatal mortality. Because of physiological changes during pregnancy, the pregnant woman is more prone to urinary tract infection. Midstream urine culture is the recommended method for diagnosis of ASB. If culture facility is not available on-site, midstream urine gram-staining is recommended for the diagnosis *(8)*. The patient should be appropriately treated for ASB.

(iv) *GESTATIONAL DIABETES*: Hyperglycaemia first detected at any time during pregnancy should be classified as either gestational diabetes mellitus or diabetes mellitus in pregnancy according to WHO criteria. Gestational diabetes is high blood sugar that develops during pregnancy and usually disappears after giving birth. It can occur at any stage of pregnancy but is more common in the second half. Having gestational diabetes also means that the woman is at increased risk of developing type 2 diabetes in the future. At the first antenatal visit, family history of diabetes should be recorded to determine if the woman is more at risk of gestational diabetes *(8)*. The general symptoms are excessive thirst and hunger, frequent urination, drowsiness or fatigue, dry itchy skin, blurring of vision, slow healing of wounds. The second pregnancy may be associated with type 2 diabetes. Hyperglycaemia during pregnancy can harm mother and the foetus, increasing risk of high blood pressure, preeclampsia, miscarriage or stillbirth, birth defects and big

baby (birth weight more than 4.5 kg).

(v) *TOXEMIAS OF PREGNANCY* : The presence of albumine in urine and an increase in blood pressure indicates toxemias of pregnancy. Their early detection and management are indicated. Efficient antenatal care minimizes the risk of toxemias of pregnancy.

(vi) *TETANUS* : If the mother was not immunized earlier, 2 doses of adsorbed tetanus toxoid should be given – the first dose at 16–20 weeks and the second dose at 20–24 weeks of pregnancy. The minimum interval between the 2 doses should be one month. No pregnant woman should be denied even one dose of tetanus toxoid, if she is seen late in pregnancy. For a woman who has been immunized earlier, one booster dose will be sufficient. When such a booster has been given, it will provide necessary cover for subsequent pregnancies, during the next 5 years. It is advised not to inject tetanus toxoid at every successive pregnancy because of the risk of hyperimmunization and side-effects.

(vii) *SYPHILIS* : Syphilis is an important preventable cause of pregnancy wastage in some countries. Pregnancies in women with primary and secondary syphilis often end in spontaneous abortion, stillbirth, perinatal death, or the birth of a child with congenital syphilis. Syphilitic infection in the pregnant woman is transmissible to the foetus. Neurological damage with mental retardation is one of the most serious consequences of congenital syphilis. When the mother is suffering from syphilis, infection of the foetus does not occur before the 4th month of pregnancy; it is most likely to occur after the 6th month by which time the Langhan's cell layer has completely atrophied *(18)*. Infection of the foetus is most likely to occur when the mother is suffering from primary or secondary stages of syphilis than late syphilis.

It is routine procedure in antenatal clinics to test blood for syphilis at the first visit. Since the mother can subsequently get infected with syphilis, the ideal procedure would be to test blood for syphilis both early and late in pregnancy. Congenital syphilis is easily preventable. Ten daily injections of procaine penicillin (600,000 units) are almost always adequate *(18)*.

(viii) *GERMAN MEASLES* : Maternal viraemia associated with the rubella infection during pregnancy may result in infection of placenta and foetus. Only a limited number of foetal cells become infected. The growth rate of infected cell is reduced, resulting in fewer number of cells in affected organ at birth. The infection may lead to deranged and hypoplastic organ development, resulting in structural anomalies in the newborn. The timing of infection determines the extent of teratogenic effect. In general, the earlier in pregnancy infection occurs, the greater the damage to the foetus. Infection during first trimester of pregnancy results in abnormalities in infant in about 85 per cent of cases, but detectable defects are found in about 16 per cent of infants who acquired infection during second trimester. Birth defects are uncommon if maternal infection occurs after 20 weeks of gestation *(19)*.

Ideally we should prevent infection during pregnancy by preventing and controlling the disease in the general population. Currently this is being attempted by vaccination of all school-aged children with rubella vaccine, and including the rubella vaccine in the routine immunization schedule. Supplementing the community control of infection is the vaccination of all women of childbearing age who are sero-negative. Before vaccinating, it is advisable that pregnancy be ruled out and effective contraception be maintained for 8 weeks after vaccination because of the possible risk to the foetus from the virus.

(ix) *Rh STATUS* : The foetal red cells may enter the maternal circulation in a number of different circumstances, during labour, caesarean section, therapeutic abortion, external cephalic version, and apparently spontaneously in the late pregnancy. The intrusion of these cells, if the mother is Rh-negative and the child is Rh-positive, provokes an immune response in her so that she forms antibodies to Rh which can cross the placenta and produce foetal haemolysis. The same response may be produced to a greater degree by a transfusion of Rh-positive blood. In a pregnant woman, isoimmunization mainly occurs during labour, so that the first child although Rh-positive, is unaffected except where the mother has been already sensitized. In the second or subsequent pregnancies, if the child is Rh-positive, the mother will react to the smallest intrusion of foetal cells by producing antibodies to destroy foetal blood cells causing haemolytic disease in the foetus. Clinically haemolytic disease takes the form of *hydrops foetalis, icterus gravis neonatorum* (of which kernicterus is often a sequel) and congenital haemolytic anaemia.

It is a routine procedure in antenatal clinics to test blood for Rhesus type in early pregnancy. If the woman is Rh-negative and the husband is Rh-positive, she is kept under surveillance for determination of Rh-antibody levels during antenatal care. The blood should be further examined at 28 weeks and 34–36 weeks of gestation for antibodies. Rh anti-D immunoglobulin should be given at 28 weeks of gestation so that sensitization during the first pregnancy can be prevented. If the baby is Rh-positive, the Rh anti D immunoglobulin is given again within 72 hours of delivery. It should also be given after abortion. Post maturity should be avoided. Whenever there is evidence of haemolytic process in foetus-in-utero, the mother should be shifted to an equipped centre specialized to deal with Rh problems. The incidence of haemolytic disease due to Rh factor in India is estimated to be approximately one for every 400 to 500 live births.

(x) *HIV INFECTION* : HIV may pass from an infected mother to her foetus, through the placenta or to her infant during delivery or by breast-feeding. About one-third of the children of HIV–positive mothers get infected through this route. The risk of transmission is higher if the mother is newly infected or if she has already developed AIDS. Voluntary prenatal testing for HIV infection should be done as early in pregnancy as possible for pregnant women who are at great risk (if they or their partner has a number of sexual partners; has a sexually transmitted disease; uses illicit injectable drugs etc.). Universal confidential voluntary screening of pregnant women in high-prevalence areas may allow infected women to choose therapeutic abortion, make an informed decision on breast-feeding, or receive appropriate care. Screening should not be used as a substitute for primary prevention through community-wide education on safe sexual practice, making condoms readily available and preventing parenteral transmission *(20)*.

(xi) *HEPATITIS B INFECTION* : Spread of infection from HBV carrier mothers to their babies appears to be a factor for the high prevalence of HBV infection in some regions. The mechanism of perinatal infection is uncertain. Most infections appear to occur at birth. Transmission of the virus to the baby after delivery is likely if both surface antigen and e antigen are positive. Vertical transmission can be blocked by immediate post-delivery administration of B immunoglobulin and hepatitis B vaccine. Please refer to page 258 for details.

(xii) *PRENATAL GENETIC SCREENING* : Prenatal genetic screening includes screening for chromosomal abnormalities associated with serious birth defects, screening for direct evidence of congenital structural anomalies, and screening for haemoglobinopathies and other inherited conditions detectable by biochemical assay. Universal genetic screening is generally not recommended. Screening for chromosomal abnormalities and for direct evidence of structural anomalies is performed in pregnancy in order to make the option of therapeutic abortion available when severe defects are detected. Typical examples are screening for trisomy 21 (Down's syndrome) and severe neural tube defects. Women aged 35 years and above, and those who already have an afflicted child are at higher risk.

(4) Mental preparation

Antenatal care does not mean only palpation, blood and urine examination and pelvic measurements. These are no doubt important aspects of antenatal care. Mental preparation is as important as physical or material preparation. Sufficient time and opportunity must be given to the expectant mothers to have a free and frank talk on all aspects of pregnancy and delivery. This will go a long way in removing her fears about confinement. The "mothercraft" classes at the MCH Centres help a great deal in achieving this objective.

(5) Family planning

Family planning is related to every phase of the maternity cycle. The mother is psychologically more receptive to advice on family planning than at other times. Educational and motivational efforts must be initiated during the antenatal period. If the mother has had 2 or more children, she should be motivated for puerperal sterilization. In this connection, the All India Postpartum Programme services are available to all expectant mothers in India.

(6) Paediatric component

It is suggested that a paediatrician should be in attendance at all antenatal clinics to pay attention to the under-fives accompanying the mothers.

INTRANATAL CARE

Childbirth is a normal physiological process, but complications may arise. Septicaemia may result from unskilled and septic manipulations, and *tetanus neonatorum* from the use of unsterilized instruments. The need for effective intranatal care is therefore indispensable, even if the delivery is going to be a normal one. The emphasis is on the cleanliness. It entails – clean hands and fingernails, a clean surface for delivery, clean cord care i.e., clean blade for cutting the cord and clean tie for the cord, no application on cord stump, and keeping birth canal clean by avoiding harmful practices. Hospitals and health centres should be equipped for delivery with midwifery kits, a regular supply of sterile gloves and drapes, towels, cleaning materials, soap and antiseptic solution, as well as equipment for sterilizing instruments and supplies. There are delivery kits available with the items needed for basic hygiene for delivery at home, where a midwife with a midwifery kit is not likely to be present. The aims of good intranatal care are :

(i) thorough asepsis;
(ii) delivery with minimum injury to the infant and mother;
(iii) readiness to deal with complications such as prolonged labour, antepartum haemorrhage, convulsions, malpresentations, prolapse of the cord, etc.; and
(iv) Care of the baby at delivery – resuscitation, care of the cord, care of the eyes, etc.

Domiciliary care

Mothers with normal obstetric history may be advised to have their confinement in their own homes, provided the home conditions are satisfactory. In such cases, the delivery may be conducted by the Health Worker Female or trained dai. This is known as "domiciliary midwifery service."

The advantages of the domiciliary midwifery service are : (1) the mother delivers in the familiar surroundings of her home and this may tend to remove the fear associated with delivery in a hospital; (2) the chances for cross infection are generally fewer at home than in the nursery/hospital; and (3) the mother is able to keep an eye upon her children and domestic affairs; this may tend to ease her mental tension.

Domiciliary midwifery is also not without disadvantages : (1) the mother may have less medical and nursing supervision than in the hospital; (2) the mother may have less rest; (3) she may resume her domestic duties too soon; and (4) her diet may be neglected. Strictly speaking, many homes in India are unsuitable for even a normal delivery. The argument that childbirth is a natural event and should take place at home does not guarantee that everything will be normal.

Since 72.2 per cent of India's population live in rural areas, most deliveries will have to take place in the home with the aid of Female Health Workers or trained dais. Domiciliary out–reach is a major component of intranatal health care : The Female Health Worker, who is a pivot of domiciliary care, should be adequately trained to recognize the 'danger signals' during labour and seek immediate help in transferring the mother to the nearest Primary Health Centre or Hospital. The danger signals are :

(1) sluggish pains or no pains after rupture of membranes;
(2) good pains for an hour after rupture of membranes, but no progress;
(3) prolapse of the cord or hand;
(4) meconium-stained liquor or a slow irregular or excessively fast foetal heart;
(5) excessive 'show' or bleeding during labour;
(6) collapse during labour;
(7) a placenta not separated within half an hour after delivery;
(8) post-partum haemorrhage or collapse; and
(9) a temperature of 38 deg C or over during labour. There should be a close liaison between domiciliary and institutional delivery services.

Institutional care

About one per cent of deliveries tend to be abnormal, and four per cent "difficult", requiring the services of a doctor. Institutional care is recommended for all 'high-risk" cases, and where home conditions are unsuitable.

The mother is allowed to rest in bed on the first day after delivery. From the next day, she is allowed to be up and about. The current practice is to discharge the woman after 48 hours lying-in period after a normal delivery.

Rooming-in

Keeping the baby's crib by the side of the mother's bed is called "rooming-in". This arrangement gives an opportunity

for the mother to know her baby. Mothers interested in breast feeding usually find there is a better chance for success with rooming-in. Rooming-in also allays the fear in the mother's mind that the baby is not misplaced in the central nursery. It also builds up her self-confidence.

POSTNATAL CARE

Care of the mother (and the newborn) after delivery is known as postnatal or postpartal care. Broadly this care falls into two areas: care of the mother which is primarily the responsibility of the obstetrician; and care of the newborn, which is the combined responsibility of the obstetrician and paediatrician. This combined area of responsibility is also known as perinatology.

Care of the mother

The objectives of postpartal care are :

(1) To prevent complications of the postpartal period;
(2) To provide care for the rapid restoration of the mother to optimum health;
(3) To check adequacy of breast-feeding;
(4) To provide family planning services; and
(5) To provide basic health education to mother/family.

Complications of the postpartal period

Certain complications may arise during the postpartal period which should be recognized early and dealt with promptly. These are (1) *Puerperal sepsis* : This is infection of the genital tract within 3 weeks after delivery. This is accompanied by rise in temperature and pulse rate, foul-smelling lochia, pain and tenderness in lower abdomen, etc. Puerperal sepsis can be prevented by attention to asepsis, before and after delivery. This is particularly important in domiciliary midwifery service. (2) *Thrombophlebitis* : This is an infection of the veins of the legs, frequently associated with varicose veins. The leg may become tender, pale and swollen. (3) *Secondary haemorrhage* : Bleeding from vagina anytime from 6 hours after delivery to the end of the puerperium (6 weeks) is called secondary haemorrhage, and may be due to retained placenta or membranes. (4) *Others* : Urinary tract infection and mastitis, etc. It is extremely important to look for these complications in the postpartal period and prevent or treat them promptly.

Restoration of mother to optimum health

The second objective of postpartal care is to provide care whereby, the woman can recuperate physically and emotionally from her experience of delivery. The broad areas of this care fall into three divisions :

PHYSICAL

(1) *Postnatal examinations* : Soon after delivery, the health check-ups must be frequent, i.e., twice a day during the first 3 days, and subsequently once a day till the umbilical cord drops off. At each of these examinations, the FHW checks temperature, pulse and respiration, examines the breasts, checks progress of normal involution of uterus, examines lochia for any abnormality, checks urine and bowels and advises on perineal toilet including care of the stitches, if any. The immediate postnatal complications, viz. puerperal sepsis, thrombophlebitis, secondary haemorrhage should be kept in mind. At the end of 6 weeks, an examination is necessary to check-up involution of uterus which should be complete by then. Further visits should be done once a month during the first 6 months, and thereafter once in 2 or 3 months till the end of one year. In rural areas only limited postnatal care is possible. Efforts should be made by the FHWs to give at least 3 to 6 postnatal visits. The common conditions found on examination during the late postnatal period are subinvolution of uterus, retroverted uterus, prolapse of uterus and cervicitis. Postnatal examination offers an opportunity to detect and correct these defects.

(2) *Anaemia* : Routine haemoglobin examination should be done during postnatal visits, and when anaemia is discovered, it should be treated. In some cases, it may be necessary to continue treatment for a year or more.

(3) *Nutrition* : Though a malnourished mother is able to secrete as much breast milk as a well nourished one, she does it at the cost of her own health. The nutritional needs of the mother must be adequately met. Often the family budget is limited; the mother should be shown the means how she can eat better with less money.

(4) *Postnatal exercises* : Postnatal exercises are necessary to bring the stretched abdominal and pelvic muscles back to normal as quickly as possible. Gradual resumption of normal house-hold duties may be enough to restore one's figure.

PSYCHOLOGICAL : The next big area of postnatal care involves a consideration of the psychological factors peculiar to the recently delivered woman. One of the psychological problems is fear which is generally borne of ignorance. Other problems are timidity and insecurity regarding the baby. If a woman is to endure cheerfully the emotional stresses of childbirth, she requires the support and companionship of her husband. Fear and insecurity may be eliminated by proper prenatal instruction. The postpartum psychosis is perhaps precipitated by birth; and it is rather uncommon.

SOCIAL : It has been said that the most important thing a woman can do is to have a baby. This is only part of the truth. The really important thing is to nurture and raise the child in a wholesome family atmosphere. She, with her husband, must develop her own methods.

Breast-feeding

Postnatal care offers an excellent opportunity to find out how the mother is getting along with her baby, particularly with regard to feeding. For many children, breast milk provides the main source of nourishment in the first year of life. In some societies, lactation continues to make an important contribution to the child's nutrition for 18 months or longer. In the world's more affluent societies, breast-feeding appears to have become a lost art and the feeding bottle has usurped the breast. When the standard of environmental sanitation is poor and education low, the content of the feeding bottle is likely to be as nutritionally poor as it is bacteriologically dangerous. It is therefore very important to advise the mothers to avoid the feeding bottle.

A great asset in India is that an average Indian mother, although poor in nutritional status, has a remarkable ability to breast-feed her infant for prolonged periods, sometimes extending to nearly 2 years and beyond. Longitudinal and cross-sectional studies indicate that poor Indian women secrete as much as 400 to 600 ml of milk per day during the first year (Table 2). No other food is required to be given until 6 months after birth. At the age of 6 months, breast milk should be supplemented by additional foods rich in protein and other nutrients (e.g., animal milk, soft-cooked mashed vegetables, etc.). These are called supplementary foods which should be introduced very gradually in small amounts.

TABLE 2

Output of breast milk at different stages of lactation

Months of lactation	Number examined	Per day mean–output of breast milk (ml)
0–2	20	530
3–4	18	640
5–6	14	730
7–8	14	660
9–10	17	600
11–12	30	525
13–15	11	515
16–18	29	440
19–24	14	400
25–36	12	425
37–38	4	345

Family planning

It has already been stressed that family planning is related to every phase of maternity cycle. Every attempt should be made to motivate mothers when they attend postnatal clinics or during postnatal contacts to adopt a suitable method for spacing the next birth or for limiting the family size as the case may be. Postpartum sterilization is generally recommended on the 2nd day after delivery. Although lactation confers some protection against conception, it cannot be depended upon; contraceptives have to be supplied immediately postpartum. To ask the mother to come at the time of her first menstruation may be too late. A contraceptive must therefore be used, that will not affect lactation in the early postpartum period. In this connection, IUD and conventional (non–hormonal) contraceptives are the choices during the first 6 months following delivery. In general, combined or sequential oral "pills" should be avoided in a lactating mother as they do suppress lactation. Fortunately, evidence is accumulating that progestogens alone have little or no effect on lactation. The injection of medroxy-progesterone acetate (MPA) after delivery has been found to be successful in ensuring spacing of pregnancy without suppressing lactation; however, because of its side-effects (e.g., irregular uterine bleeding, prolonged infertility) some countries have limited its use to multiparae at ages 35 and over, or who have already completed their families. MPA is not recommended for general use.

Basic health education

Health education during the postnatal period should cover the following broad areas : (a) hygiene – personal and environmental; (b) feeding for mother and infant; (c) pregnancy spacing; (d) importance of health check-up; and (e) birth registration.

CARE OF CHILDREN

This section focuses on children in the age group 0–14 years. This is the most important age group in all societies, not because they constitute about 40 per cent of the total population, but because there is a renewed awareness that the determinants of chronic disease in later life and health behaviour are laid down at this stage *(21)*. Family influences and education are of the highest importance, and these experiences ultimately influence patterns of their future life-styles, occupational skills, and even political attitudes and leadership. The childhood period is also a vital period because of the so called socialization process, that is, transmission of attitudes, customs and behaviour. In addition, of course, they are vulnerable to disease, death and disability owing to their age, sex, place of living, socio-economic class and a host of other variables. Certain specific biological and psychological needs must be met to ensure the survival and healthy development of the child and future adult.

It is customary to divide the childhood into the following age-periods :

1. Infancy (upto 1 year of age) :
   a. Neonatal period (first 28 days of life).
   b. Post neonatal period (28th day to 1 year).
2. Pre-school age (1–4 years).
3. School age (5–14 years).

Antenatal paediatrics

Fifty years ago, the main purpose of antenatal care was the prevention of maternal mortality. With the fall in the maternal mortality to about 0.2 per 1000 live births, attention has shifted to the child – first to decrease perinatal mortality, secondly to prevent perinatal morbidity; and more recently to the "foetus at risk". This has given rise to the concept of antenatal paediatrics. Recent technical developments such as amniocentesis, ultrasonography, fetoscopy and chorion biopsy have contributed significantly to the diagnosis of congenital abnormalities and inborn errors of metabolism *(22, 23)*. This knowledge has led to the recognition that causation and possible prevention may lie in intra-uterine life. The emphasis has greatly changed in the care of the child with the prevention of disorders (e.g., low birth weight, foetal disorders and neonatal asphyxia) assuming greater importance.

Antenatal care should, appropriately, begin even before the mother conceives and enters the maternity cycle; this care comprising such measures as genetic counselling for prospective parents; limitation and proper spacing of births with intervals of 2–3 years; delaying a young woman's first pregnancy until she is physically and socially mature enough to cope with it; ensuring adequate maternal nutrition; protection of the unborn against intrauterine infections and other adverse influences. In a developing country such as India, all this may not be possible, but certainly some elements, such as improvement of maternal nutrition, family planning and counselling could go a long way in ensuring maternal and foetal health.

INFANCY

Infants (0–1 year) constitute about 2.92 per cent of the total population in India. Of the 136 million children born each year in the world, 90 per cent are in the third world. Although the chances of survival of these newborns has improved by 50 per cent in the last 20 years, the first few hours, days and months of their lives are still an obstacle race. From the time of birth, 20–30 per cent of babies are under-weight. That makes them vulnerable to infection and disease. About 40 per cent of total infant mortality occurs in the first month of life. Then comes the weaning period, when one out of four surviving children receives neither the quality nor the quantity of food needed to replace the substances provided by mother's milk. The result is that more and more children in developing countries reach adulthood with their health already largely impaired. An infant mortality rate of

58 per thousand, as compared to 5 per thousand in the developed countries, places India in the unenviable position of being among the less developed in the world. Many low-cost measures are available for saving life of millions of children, like immunization, breast feeding, birth spacing, growth monitoring, improved weaning, oral rehydration. Attention is focused on these elements of child health care in developing countries.

NEONATAL CARE

A flow chart of the optimum care of the newborn is as shown in Fig. 2. This aspect of family health services has been termed neonatology. This branch of medicine is, perhaps, more than any other, dependant on teamwork in which disciplines of obstetrics and gynaecology, paediatrics, preventive and social medicine, community health services and nursing have an important part to play, if any impact is to be made on the vast problems of perinatal and neonatal mortality and morbidity. The paediatrician has a key role as a coordinator and guide for the whole team.

Early neonatal care

The first week of life is the most crucial period in the life of an infant. In India, 61.3 per cent of all infant deaths occur within the first month of life. Of these, more than half may die during the first week of birth. This is because the new born has to adapt itself rapidly and successfully to an alien external environment. The risk of death is the greatest during the first 24–48 hours after birth. The problem is more acute in rural areas where expert obstetric care is scarce, and the home environmental conditions in which the baby is born, are usually unsatisfactory.

The objective of early neonatal care is to assist the newborn in the process of adoption to an alien environment, which involves :

(i) establishment and maintenance of cardio–respiratory functions;
(ii) maintenance of body temperature;
(iii) avoidance of infection;
(iv) establishment of satisfactory feeding regimen; and
(v) early detection and treatment of congenital and acquired disorders, especially infections.

Congenital infections caused by toxoplasmosis, rubella, human (alpha) herpes-virus 1 or 2, human (beta) herpes virus, and syphilis (TORCHES synonyms) is associated with high mortality rate in the neonates *(24)*.

Immediate care

1. CLEARING THE AIRWAY

Establishment and maintenance of cardio-respiratory functions (e.g., breathing) is the most important thing the moment the baby is born, and everything else is secondary. To help establish breathing, the airways should be cleared of mucus and other secretions. Positioning the baby with his head low may help in the drainage of secretions. This process can be assisted by gentle suction to remove mucus and amniotic fluid. Resuscitation becomes necessary if natural breathing fails to establish within a minute, as in the case of babies who have already been subject to hypoxia during labour. In these cases, resuscitation may require more active measures such as suction, application of oxygen mask, intubation and assisted respiration. All labour wards should be equipped with resuscitation equipment including oxygen. If the heart has stopped beating for 5 minutes, the baby is probably dead.

2. APGAR SCORE

The Apgar score is taken at 1 minute and again at 5 minutes after birth. Today it is considered as negligence to omit Apgar scoring of a newborn infant, especially low birth weight babies *(25)*. It requires immediate and careful observation of the heart rate, respiration, muscle tone, reflex response and colour of the infant. Each sign is given a score of 0, 1 or 2 (Table 3). It provides an immediate estimate of the physical condition of the baby. A perfect score should be 9 or 10; 0–3 indicates that the baby is severely depressed and 4–6 moderately depressed. A score below 5 needs prompt action. Infants with low Apgar scores at 5 minutes of age are subject to a high-risk of complications and death during the neonatal period *(25)*.

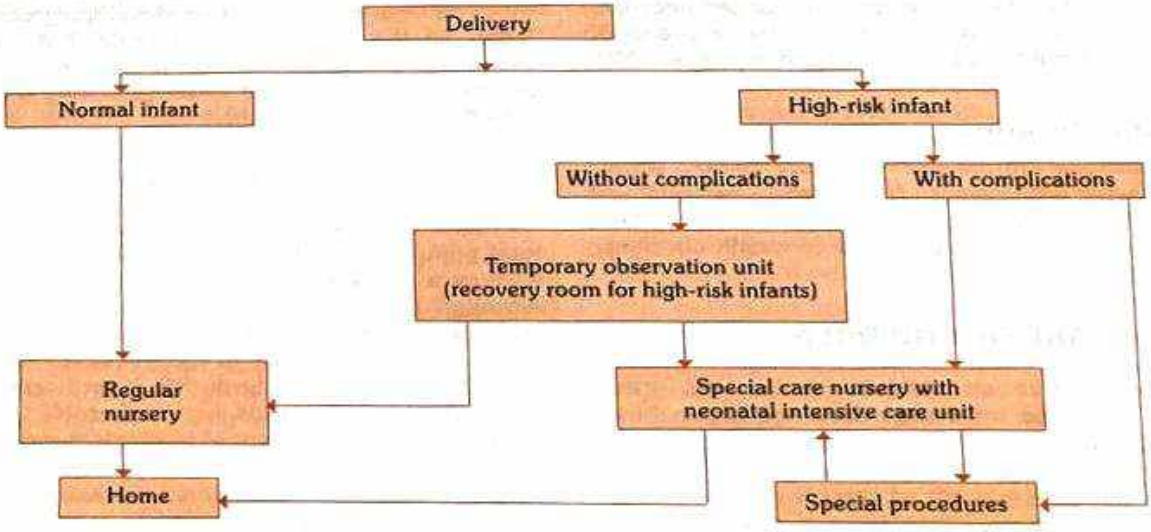


FIG. 2
Flow chart of optimum newborn care

TABLE 3
Apgar score

Sign	Score		
	0	1	2
Heart rate	Absent	Slow (below 100)	Over 100
Respiratory effort	Absent	Slow Irregular	Good crying
Muscle tone	Flaccid	Some flexion of extremities	Active movements
Reflex response	No response	Grimace	Cry
Colour	Blue, pale	Body pink Extremities blue	Completely pink
Total score = 10	Severe depression 0–3	Mild depression 4–6	No depression 7–10

3. CARE OF THE CORD

In the case of the normal infant, the umbilical cord should be cut and tied when it has stopped pulsating. The advantage is that the baby derives about 10 ml of extra blood, if the cord is cut after pulsation ceases. This is particularly important in India, where anaemia is frequent. Care must be taken to prevent tetanus of the newborn by using properly sterilized instruments and cord ties. It is essential to apply an antiseptic preparation on the cord stump and the skin around the base. The cord should be kept as dry as possible. It dries and shrivels up and separates by aseptic necrosis in 5–8 days.

4. CARE OF THE EYES

Before the eyes are open, the lid margins of the newborn should be cleaned with sterile wet swabs, one for each eye from inner to outer side. Instil a drop of freshly prepared silver nitrate solution (1 per cent) to prevent gonococcal conjunctivitis, alternatively, a single application of tetracycline 1 per cent ointment can be given. Any discharge from the eye of an infant is pathological and calls for immediate treatment.

Ophthalmia Neonatorum : A variety of organisms are implicated – *N. gonorrhoea*, *C. trachomatis* (commonest), staphylococcus, streptococcus, Candida spp, etc. The most serious cause of conjunctivitis of the newborn is infection with *N. gonococcus* as it can rapidly cause blindness. *C. trachomatis* is also an important cause of neonatal conjunctivitis. Since gonococcal ophthalmia neonatorum has become much less frequent than conjunctivitis due to other acquired organisms, application of topical neomycin might be more useful *(26)*.

As a preventive measure, specific maternal genital tract infection should be treated effectively prior to, or during pregnancy, and specific care should be taken while conducting face or breech delivery.

5. CARE OF THE SKIN

A newborn baby is wet from amniotic fluid and can easily become cold. Drying the baby with clean cloth to remove vernix, meconium and blood clots is done by the nursing staff. The baby is then wrapped in dry, clean cloth from head to foot to prevent heat loss. First bath is given after temperature stabilization, preferably after a week.

6. MAINTENANCE OF BODY TEMPERATURE

The normal body temperature of a newborn is between 36.5 to 37.5°C. A newborn baby is projected out of warm womb of the mother into an environment which may be 10 to 20°C cooler especially in winter months in India.

A newborn has little thermal control and can lose body heat quickly. Immediately after birth; most of the heat loss occurs through evaporation of the amniotic fluid from the body of the wet child. As much as 75 per cent of the heat loss can occur from the head. It is important that immediately after birth the child is quickly dried with a clean cloth and wrapped in warm cloth and given to the mother for skin-to-skin contact and breast-feeding. Practices such as separating the baby from the mother for the first 12–24 hours of life are harmful. Pre-term and low birth weight babies lose heat more easily through their thin skin as they have less sub-cutaneous fat for insulation. Putting the newborn on a cold surface such as metallic tray, rubber sheeting or weighing scale should be avoided, and the child should be kept away from cold walls, open windows and from draught *(27)*.

7. BREAST-FEEDING

Breast-feeding should be initiated within an hour of birth instead of waiting several hours as is often customary. Although there is little milk at that time, it helps to establish feeding and a close mother–child relationship, known as "bonding".

The first milk which is called "colostrum" is the most suitable food for the baby during this early period because it contains a high concentration of protein and other nutrient the body needs; it is also rich in anti-infective factors which protect the baby against respiratory infections and diarrhoeal diseases. Supplementary feeds are not necessary. The regular milk comes on the third to sixth day after birth. The baby should be allowed to breast-feed whenever it wants. Feeding the baby on demand helps the baby to gain weight. It is very important to advise mother to avoid feeding bottles.

Neonatal examinations

a. FIRST EXAMINATION

The first examination is made soon after birth, and preferably in the delivery room. This examination is (a) to ascertain that the baby has not suffered injuries during the birth process; (b) to detect malformations especially those requiring urgent treatment; and (c) to assess maturity.

The following abnormalities found on examination should be immediately attended to : (a) cyanosis of the lips and skin; (b) any difficulty in breathing; (c) imperforated anus; (d) persistent vomiting; (e) signs of cerebral irritation such as twitchings, convulsions, neck rigidity, bulging of anterior fontanel, and (g) temperature instability.

b. SECOND EXAMINATION

The second examination should be made preferably by a paediatrician within 24 hours after birth. This examination should form the first stage of a continual process of health care surveillance. It is a detailed systematic examination from head to foot, conducted in good light. The following protocol will be found useful for such an examination *(28)*.

1. Body size:
   Body weight; crown–heel length; head and thoracic perimeters.
2. Body temperature.

3. Skin :

   Observe for cyanosis of lips and skin; jaundice; pallor; generalized erythema; vesicular and bullous lesions.

4. Cardio-respiratory activities :

   Cardiac murmurs; absence of femoral pulse; central cyanosis, a respiratory rate of over 60 per minute; thoracic cage retraction on inspiration.

5. Neuro-behavioural activity :

   (i) Posture : neck retraction; frog-like posture; hyper-extension of all limbs; hyperflexion of all limbs; asymmetrical posture (ii) Muscle tone : tendon reflexes; cry; movements.

6. Head and face :

   Hydrocephalus; large fontanelles; prominent scalp vein (i) Eyes : cataract; coloboma; conjunctivitis (ii) Ears : dysmorphism; accessary auricles; pre-auricular pits (iii) Mouth and lips : Hare lip; cleft palate.

7. Abdomen :

   Signs of distension; abnormal masses; imperforate anus.

8. Limbs and joints :

   Deformities of joints; congenital dislocation of the hips; extra digits.

9. Spine :

   Neural tube defects

10. External genitalia :

    Male : Hypospadius; undescended testis; hydrocele;

    Female : fused labia; enlarged clitoris.

The infected newborn *(27)*

Neonatal infection is particularly frequent in Africa. It is the main cause of neonatal mortality in many developing countries. Contributing factors are related to the environment (traditional practices, poor hygiene), the course of pregnancy (premature rupture of membranes) and constitutional fragility (prematurity, small-for-date, dysmaturity). Transplacental contamination is one of the important cause of infection in new-borns. Early detection of newborns at risk of transplacental infection is important, so that close monitoring and preventive action may be implemented.

NEONATAL TETANUS : It can be prevented by vaccination of pregnant women and sero-vaccination of newborns in case of at-risk delivery. These measures have proved effective in those countries where they are systematically applied.

CONGENITAL SYPHILIS : The frequency of congenital syphilis is on rise in some large African cities. Diagnosis is essentially based on the evidence of syphilis in the mother, since clinical signs of congenital syphilis often do not occur at once. In case of doubt and if there is risk of inadequate subsequent medical surveillance of the baby, treatment with 2.4 to 4.8 million I.U. of Benzathine Penicillin may be recommended.

NEWBORN WITH A HBV-POSITIVE MOTHER : Chronic carriers of hepatitis virus are extremely frequent in some countries. Babies may be infected at birth when the mother is a carrier of this virus. The risk of transmission is somewhere around 20 per cent when the mother has the HBs antigen only, and around 90 per cent when she also has the HBe antigen. Transmission occurs through the blood and the genital secretions and therefore affects the newborn during the immediate perinatal period and throughout infancy. It is not a contraindication of breast-feeding.

If the newborn is infected, there is a risk that he/she will become a chronic carrier, and tend to develop active chronic hepatitis, cirrhosis or primary cancer of liver during adulthood. 50 per cent of severe cases of infantile hepatitis before age one year are the outcome of untreated perinatal transmission.

It is possible to prevent perinatal transmission by seroprophylaxis combined with vaccination – an intra-muscular injection of 0.5 ml of hepatitis B immunoglobulin along with hepatitis B vaccine within 24 hours of birth. The vaccine must be repeated at 6, 10 and 14 weeks of age.

This prophylaxis has proved effective. The real problem is to detect mothers who are chronic carriers of the HBs antigen, and the high cost of prevention.

NEWBORN WITH A HIV-POSITIVE MOTHER : The rapidity of the propagation of HIV infection is a source of great concern. About 30 per cent babies born to HIV-positive mothers get infected. Transmission of infection mostly occurs at the end of the pregnancy, and it is not influenced by the type of delivery. The virus has been isolated in breast-milk. Although there is probably a risk of transmission of infection through breast-milk, prohibiting breast-feeding is debatable, as it is so essential for the survival of newborn in developing countries. The risk of transmission depends on the severity of the mother's case. It is higher from mothers with AIDS, but may also occur from seropositive cases. The infection can be prevented by giving ART. Please refer to page 410 for details. The question of whether to perform BCG vaccination arises – it is contraindicated in infected children, and therefore, should not be performed in the offspring of HIV positive mothers until it is determined whether the baby is infected or not. This is only feasible at the end of several months when the maternal antibodies are completely eliminated *(27)*.

MEASURING THE BABY

Measurements of birth-weight, length (height) and head circumference are the simplest and one of the reliable means by which the health and maturity of a baby is evaluated.

1. Birth-weight

The birth-weight should be taken preferably within the first hour of life, before significant post-natal weight loss has occurred *(29)*. The naked baby should be placed on a clean towel on the scale pan. In home delivery, weight is taken by placing the baby in a sling bag using a salter weighing scale. The child is weighed to the nearest 100 g according to the standard method for weight measurement.

The average birth-weight of infants is lower in many developing countries than it is in developed countries. There are reasons to believe that this difference is not of genetic origin but is due largely to maternal malnutrition.

2. Length (height)

This need not be taken immediately if the baby's condition gives rise to any anxiety, but should be recorded

within the first 3 days. Length can be taken most accurately with a measuring board (infantometer) with a fixed head piece on which the infant lies supine with its legs fully extended and the feet flexed at right angles to the lower legs. Two people are needed to hold the baby correctly. The sliding board is moved firmly against the feet before the reading is taken. Length is taken to the nearest 0.1 cm.

3. Head circumference

This measurement may change slightly during the first 3 days owing to moulding during labour. It is taken with a tape measure at the maximum circumference of the head in the occipito-frontal diameter.

The purpose of taking these measurements are :

(i) to assess the baby's size against known standards for the population;

(ii) to compare the size with estimated period of gestation; and

(iii) to provide a baseline against which subsequent progress can be measured.

Anthropometric measurements may be classified as *(30)* :

(a)	Weight	:	kg
(b)	Length	:	total height, sitting height, heel knee-length
(c)	Perimeters	:	head, chest, abdomen, arm, calf
(d)	Diameters	:	biacromial, bicristal, biepicondylar, bistyloid, bicondylar
(e)	Skinfold thickness	:	triceps, biceps, superiliac subscapular.

NEONATAL SCREENING

The object of screening newborns is primarily to detect infants with treatable genetic, developmental and other abnormalities, and secondarily, to provide their parents with genetic counselling. The Apgar score and routine clinical examinations are simple screening tests which should be carried out on all newborn infants. 10 to 15 ml of cord blood should be collected at birth and saved in the refrigerator for 7 days for typing, coombs' testing and other tests if needed. Recent years have witnessed development of numerous tests for screening congenital metabolic disorders, inherited haemoglobinopathies and red blood cell disorders. Since these diseases are rare, general screening of the population for them is neither justified nor technically possible. However, only a few tests qualify for a screening programme. The most common disorders which are screened are discussed below.

(a) *Phenylketonuria (PKU)* : PKU is a rare (incidence 1 in 10,000–20,000 births) disorder of amino acid metabolism. This is an autosomal recessive trait in babies who are homozygous with a deficiency in the enzyme phenylalanine hydrozylase (PAH) which normally converts phenylalanine to tyrosin. The deficiency results in raised serum phenylalanine concentrations causing mental retardation and tendency to seizures if the child does not receive low phenylalanine diet. Mass screening of blood phenylalanine in neonates is performed in many countries by the Guthrie test. It is possible to test for all three types of metabolic error, namely PKU, galactosaemia and maple syrup urine disease by taking blood from the 6–10 days old baby by heel prick and collecting 3 or 4 separate drops of it on thick absorbent filter paper. The treatment of PKU consists of a diet free of phenylalanine. Careful dietary management in affected children results in normal physical and mental development. (b) *Neonatal hypothyroidism* : This is the most common disorder that is screened. Congenital hypothyroidism leads to serious sequelae, including severe mental retardation, which can be prevented if medical treatment is given within the first 1–2 months of life. The test involves measuring the radioimmunoassays of the thyroid hormone T4 or the thyroid-stimulating hormone (TSH). By examining the cord blood of newborns, potential victims of IDD could be identified and proper prevention can be taken at such an early stage of life. (c) *Coombs' test* : This is done routinely on infants of all Rh-negative mothers. (d) *Sickle cell or other haemoglobinopathies* : Agar-gel electrophoresis is done on infants whose mothers have sickle cell or other haemoglobinopathies, e.g., thalassaemia, G6PD. (e) *Congenital dislocation of hip* : The test consists of manipulating the hip of the child from the adducted to abducted position while the thigh is flexed. A positive or abnormal result is indicated by a click or snap being produced during the test. The test is carried out on all babies at 6–14 days after birth, and at monthly intervals until the child is 4 months old. Diagnosis within a week or two of birth means that treatment can be completed before the infant could normally have reached the stage of standing. Failure to diagnose the condition will expose the child to a whole series of difficult operations in later life *(20)*.

The requirements for effective screening for inborn errors are discussed in detail in chapter 4.

Identification of "at-risk" infants

The number of infants (and children 1–5 years of age) in a community, or attending a child health clinic, may be so large that it may not be possible to give sufficient time and attention to all of them. It is therefore necessary to identify particularly those "at-risk" and give them special intensive care, because it is these "at-risk" babies that contribute so largely to perinatal, neonatal and infant mortality. The basic criteria for identifying these babies include :

1. birth weight less than 2.5 kg;
2. twins;
3. birth order 5 and more;
4. artificial feeding;
5. weight below 70 per cent of the expected weight (i.e., II and III degrees of malnutrition);
6. failure to gain weight during three successive months;
7. children with PEM, diarrhoea; and
8. working mother/one parent.

Late neonatal care

The remaining three weeks of the neonatal period carry the common and serious hazards of infection and failure of satisfactory nutrition. Diarrhoea and pneumonia take a heavy toll of life in infants exposed to an unsatisfactory environment. The case fatality rate of what would normally be trivial episodes can increase dramatically when elementary care is not given.

TABLE 4

Types of preterm birth, risk factors involved and preventive strategies

Type	Risk factors	Examples	Prevention strategies
Spontaneous preterm birth	Age at pregnancy and pregnancy spacing	Adolescent pregnancy, advanced maternal age, short inter-pregnancy interval	Preconception care, including access to family planning from adolescence, after birth and throughout reproductive years
	Multiple pregnancies	Increased rates of twin and higher-order pregnancies with assisted reproduction	Introduce and monitor policies for best practice in assisted reproduction
	Infection	Urinary tract infections, asymptomatic bacteriuria, malaria, HIV, syphilis, chorioamnionitis, bacterial vaginosis	Sexual health programmes aimed at prevention and treatment of infections prior to and during pregnancy Intermittent preventive treatment of malaria (context specific), antenatal screening for lower genital tract infections and asymptomatic bacteriuria
	Underlying chronic medical conditions	Diabetes, hypertension, anaemia, asthma, thyroid disease, HIV	Maximize preconception control for pre-existing conditions, as well as screening and prompt management during pregnancy
	Nutritional	Undernutrition, micronutrient deficiencies	Assess and treat low nutritional status prior to conception and in early pregnancy Consider supplementation (e.g. iron folate and zinc supplementation) for pregnant women without systemic illness
	Lifestyle and workrelated	Smoking, excess alcohol consumption, recreational drug use, excess physical work and activity	Adopt laws and rights-based approaches to protect pregnant women, and ensure maternity leave Behavioural and community public health interventions targeting pregnant women and women of reproductive age, e.g. pharmacological interventions for smoking cessation
	Environmental	Exposure to indoor and ambient air pollution, heat stress	Public health measures, antenatal counselling, avoidance of air pollution and excessive heat where possible
Spontaneous preterm birth	Maternal psychological health	Depression, violence against women	Antenatal screening where capacity to provide a supportive response is available
	Genetic and other	Genetic risk (e.g. family history), cervical incompetence, intrauterine growth restriction, congenital abnormality	Individual-specific interventions, e.g. cervical cerclage for women with singleton pregnancy and high risk of preterm birth
Provider-initiated preterm birth	Induction or caesarean birth for maternal indication	Common indications include : pre-eclampsia/eclampsia, placental abnormalities (e.g. placenta accrete) and preexisting maternal conditions	Not applicable
	Induction or caesarean birth for fetal indication	Common indications include severe fetal growth restriction	Not applicable
	Induction or caesarean birth without medical indication	Non-medically indicated, due to physician or patient preferences or incentives	Programmes and policies to reduce the practice of non-medically initiated preterm birth Midwifery-led continuity models of care have proved effective

Source : *(31)*

SMALL–FOR–DATE (SFD) BABIES :

Also known as small for gestational age babies. These may be born at term or preterm. They weigh less than the 10th percentile for the gestational age. These babies are clearly the result of retarded intrauterine foetal growth.

Computation : The percentage of LBW babies is computed as :

$$\frac{\text{Live-born babies with birth weight less than 2.5 Kg}}{\text{Total number of live births}} \times 100$$

The factors associated with intrauterine growth retardation are multiple and interrelated to mother, the placenta or to the foetus. The maternal factors include malnutrition, severe anaemia, heavy physical work during pregnancy, hypertension, malaria, toxaemia, smoking, low economic status, short maternal stature, very young age, high parity and close birth spacing, low education status etc. *(32)*. The placental causes include placental insufficiency and placental abnormalities. The foetal causes include foetal abnormalities, intrauterine infections, chromosomal abnormality and multiple gestation.

SFD babies have a high risk of dying not only during the neonatal period but during their infancy, thus significantly raising the rate of infant and perinatal mortality and contribute greatly to immediate and long term health problems. Most of them become victims of protein-energy malnutrition and infections.

In the developing countries, adverse prenatal and post-natal development of the child is associated with 3 interrelated conditions : malnutrition, infection and unregulated fertility which are often due to poor socio-economic and environmental conditions.

IMPORTANCE

LBW is one of the most serious challenges in maternal and child health in both developed and developing countries. Its public health significance may be ascribed to numerous factors – its high incidence; its association with mental retardation and a high risk of perinatal and infant mortality and morbidity (half of all perinatal and one-third of all infant deaths are due to LBW); human wastage and suffering; the very high cost of special care and intensive care units and its association with socio-economic underdevelopment *(33)*.

LBW is the single most important factor determining the survival chances of the child. Many of them die during their first year. The infant mortality rate is about 20 times greater for all LBW babies than for other babies. The lower the birth weight, the lower is the survival chance. Many of them become victims of protein–energy malnutrition and infection. LBW is thus an important guide to the level of care needed by individual babies. LBW also reflects inadequate nutrition and ill-health of the mother. There is a strong and significant positive correlation between maternal nutritional status and the length of pregnancy and birth weight. A high percentage of LBW therefore points to deficient health status of pregnant women, inadequate prenatal care and the need for improved care of the newborn.

As premature babies are born before their bodies and organ systems have completely matured, they may need help breathing, eating, fighting infection and staying warm. Very premature babies who are born before 28 weeks, are especially vulnerable. Many of their organs may not be ready for life outside the mother's uterus and may be too immature to function well.

Some of the problems premature babies may experience include *(34)* :

- Temperature instability – inability to stay warm due to low body fat
- Respiratory problems;
  - hyaline membrane disease/respiratory distress syndrome – a condition in which the airsacs cannot stay open due to lack of surfactant in the lung
  - chronic lung disease/bronchopulmonary dysplasia-long-term respiratory problems caused by injury to the lung tissue
  - air leaking out of the normal lung spaces into other tissues
  - incomplete lung development
  - apnea (stopping breathing) – occurs in about half of babies born at or before 30 weeks
- Cardiovascular
  - patent ductus arteriosus (PDA) – a heart condition that causes blood to divert away from the lungs
  - too low or too high blood pressure
  - low heart rate – often occurs with apnea
- Blood and metabolic;
  - anaemia – may require blood transfusion
  - jaundice – due to immaturity of liver and gastrointestinal function
  - too low or too high levels of minerals and other substances in the blood such as calcium and glucose (sugar)
- Gastrointestinal;
  - difficulty feeding – many are unable to coordinate suck and swallow before 35 weeks gestation
  - poor digestion
  - necrotizing enterocolitis (NEC) – a serious disease of the intestine common in premature babies
- Neurologic;
  - intraventricular haemorrhage – bleeding in the brain
  - periventricular leukomalacia – softening of tissues of the brain around the ventricles (the spaces in the brain containing cerebrospinal fluid).
  - poor muscle tone
  - seizures – may be due to bleeding in the brain
  - retinopathy of prematurity – abnormal growth of the blood vessels in a baby's eye
- Infections – premature infants are more susceptible to infection and may require antibiotics

PREVENTION

Experts opine that the rates of LBW babies could be reduced to not more than 10 per cent in all parts of the world *(35)*. It is clear from the multiplicity of causes that there is no universal solution. Interventions have to be cause–specific. Main attention has been given in recent years to ways and means of preventing LBW through good prenatal care and intervention programmes, rather than "treatment" of LBW babies born later.

DIRECT INTERVENTION MEASURES

The incidence of LBW can be reduced if pregnant women "at risk" are identified and steps are taken to reduce the risk. For this approach the women need to be identified early in pregnancy. To achieve this goal, the mothers health card – which is simple and can be used by primary health care worker – has been found very useful. The risk factors are : mother's malnutrition, heavy work load, diseases and infections and high blood pressure. Added to malnutrition, too many and too frequent pregnancies contribute to the continued depletion of her body. Both malnutrition and morbidity due to infections during pregnancy are amenable to correction or can be prevented. Some of the direct interventions are as follows :

(i) *Increasing food intake* : Studies have shown that even a relatively small dietary improvement in the malnourished pregnant mother, even during the last trimester, can result in a significant improvement in the birth weight of an infant. In Southern India, treatment of anaemic mothers led to an increase in birth weight of offspring. Direct intervention covers a wide range of activities, viz. supplementary feeding, distribution of iron and folic acid tablets, fortification and enrichment of foods, etc.; (ii) *Controlling infections* : Many maternal infections go unrecognized. They should be diagnosed and treated (e.g., malaria, urinary tract infection, infections due to cytomegalovirus, toxoplasmosis, rubella and syphilitic infection) or otherwise prevented. These infections can affect foetal growth in several ways; and (iii) *Early detection and treatment of medical disorders* : These include hypertension, toxemias, and diabetes.

INDIRECT INTERVENTION

Family planning, avoidance of excessive smoking, improved sanitation measures, and measures aimed at improving the health and nutrition of young girls, each have a role to play. These measures can be expected to be more effective and to have lasting effects only if, at the same time there are improvements in the socio-economic and environmental conditions and in the distribution of health and social services especially in the under-served areas. Government support could be provided through such measures as maternity leave with full wages and child benefits.

Fig. 3 summarizes the integrated services delivery package for maternal and newborn care.

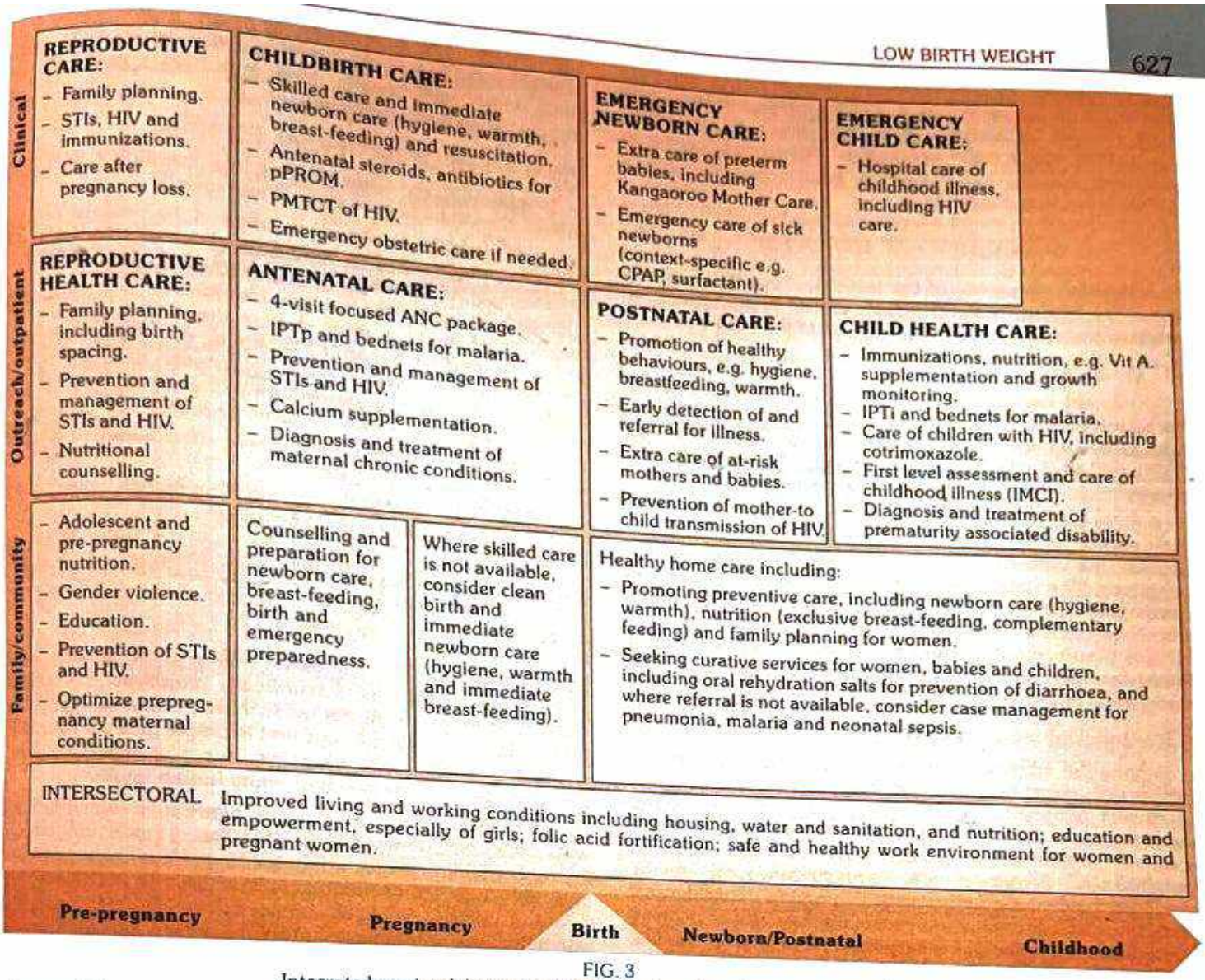


FIG. 3
Integrated service delivery packages for maternal, newborn and child health

Source : *(31)*

TREATMENT

From the point of view of treatment, LBW babies can be divided in to 2 groups : (a) those under 2 kg and (b) those between 2–2.5 kg. The first group requires first class modern neonatal care (which is hardly available globally) in an intensive care unit until the weight reaches that of the second group. The second group may need an intensive care unit for a day or two.

KANGAROO MOTHER CARE

Kangaroo mother care for low birth-weight babies was introduced in Colombia in 1979 by Drs. Hector Martinez and Edzar Rey as a response to, inter alia, high infection and mortality rates due to overcrowding in hospitals. It has since been adopted across the developing world and has become essential element in the continuum of neonatal care. The four components of kangaroo mother care are all essential for ensuring the best care option, especially for low birth-weight babies. They include skin-to-skin positioning of a baby on the mother's chest; adequate nutrition through breast-feeding; ambulatory care as a result of earlier discharge from hospital; and support for the mother and her family in caring for the baby *(36)*.

The intensive care comprises of: (a) *Incubatory* care: that is, adjustment of temperature, humidity and oxygen supply. There is increasing evidence that low levels of oxygen in a baby's blood stream (hypoxia) can produce cerebral palsy. Therefore, continuous monitoring of the level of oxygen in baby's blood stream is now carried out in the best incubatory care units. If the oxygen is excessive, it may lead to retrolental fibroplasia. (b) *Feeding* : Breast-feeding is rarely possible – the baby cannot suck. However, breast milk should be used if available. Feeding is often by nasal catheter; and (c) *Prevention of infection* : Infection presents the greatest hazard. Death may occur within a few hours following respiratory infection. Prevention of infection is therefore, one of the most important functions of an intensive care unit.

The leading causes of death in low birth weight babies are :

a. atelectasis;
b. malformation;
c. pulmonary haemorrhage;
d. intracranial bleeding, secondary to anoxia or birth trauma; and
e. pneumonia and other infections.

Facility based newborn care services like newborn care

corner, newborn stablization unit and special newborn care unit have improved the management of low birth weight babies. Some of these units are linked to obstetric units capable of monitoring the foetus. The development of perinatal intensive care units has been associated with a decline in neonatal mortality.

FEEDING OF INFANTS

A detailed discussion of the feeding of infants is outside the scope of this book. However, a brief mention may be made of some of the important aspects of the problem.

(1) Breast-feeding

Under any circumstances, breast milk is the ideal food for the infant. No other food is required by the baby until 6 months after birth. Under normal conditions, Indian mothers secrete 450 to 600 ml of milk daily with 1.1 gm protein per 100 ml. The energy value of human milk is 70 kcals per 100 ml.

A child who is breast-fed has greater chances of survival than a child artificially fed. Prolonged breast feeding does protect the infant from early malnutrition and some infections. The data suggests that infant mortality rates in developing countries are 5–10 times higher among children who have not been breast-fed or who have been breast-fed for less than 6 months. Despite the marked advantages of breast-feeding, its popularity has declined significantly in many parts of the world.

Advantages of breast-feeding

Among the advantages of breast milk are the following : (1) it is safe, clean, hygienic, cheap and available to the infant at correct temperature; (2) it fully meets the nutritional requirements of the infant in the first few months of life; (3) it contains antimicrobial factors such as macrophages, lymphocytes, secretory IgA, anti-streptococcal factor, lysozyme and lactoferrin which provide considerable protection not only against diarrhoeal diseases and necrotizing enterocolitis, but also against respiratory infections in the first months of life; (4) it is easily digested and utilized by both the normal and premature babies; (5) it promotes "bonding" between the mother and infant; (6) sucking is good for the baby – it helps in the development of jaws and teeth; (7) it protects babies from the tendency to obesity; (8) it prevents malnutrition and reduces infant mortality; (9) it provides several biochemical advantages such as prevention of neonatal hypocalcaemia and hypomagnesemia *(37)*; (10) it helps parents to space their children by prolonging the period of infertility; and (11) special fatty acids in breast milk lead to increased intelligence quotients and better visual acuity. A breast-fed baby is likely to have an IQ of around 8 points higher than a non-breast fed baby *(38)*.

Early initiation of breast-feeding lowers the mother's risk of postpartum haemorrhage and anaemia, boosts mother's immune system, delays next pregnancy and reduces the insulin of diabetic mothers. It protects mothers from ovarion and breast cancers and osteoporosis *(38)*.

It is neither necessary nor desirable to train a baby to "feed by the clock". It should be explained to the mother, however, that intervals between feeds are necessary for herself and for the baby, though they may vary between 1 to 4 hours, according to the baby's needs, size, strength of sucking and the mother's milk supply.

(2) Artificial feeding

The main indications for artificial feeding are failure of breast milk, prolonged illness or death of the mother. It is crucial for the baby to be fed "breast-milk substitutes" – e.g., dried whole milk powder, fresh milk from a cow or other animal, or commercial formulae.

PRINCIPLES OF ARTIFICIAL FEEDING

In planning an artificial feed, the nutritional needs of infants should be kept in view. These include :

1. Infants require an average of 100 kcal of energy per kg of body weight per day, i.e., about 150 ml of milk per kg of body weight each day;
2. The estimated protein requirement is about 2 g/kg of body weight during the first 6 months; it declines to about 1.5 g/kg by the end of one year. This works out to 13–14 g protein daily during the first year of life. In terms of calories, 8 to 10 per cent of calories are given as protein;
3. The carbohydrate requirement is about 10 g/kg of body weight daily;
4. After 4 months of age, undiluted boiled and cooled milk should be given;
5. Infants need feeding at frequent intervals about 6–8 times a day; older babies 5 times a day; and
6. During illness (e.g., fevers) the calorie need is increased, and it should be met.

(a) *DRIED MILK :* The safest milk is undoubtedly dried whole milk, which is scientifically prepared for infant feeding. It is free from bacteria; there is little danger from flies; it does not become sour and is simple to reconstitute. It is usually fortified with vitamins. But it is expensive and, therefore, beyond the reach of many Indian families.

(b) *COW'S MILK :* A cheaper alternative which is well within the reach of many Indian families is cow's milk, which in fact is widely used for infant feeding. Most health workers give very conflicting advice on the use of cow's milk for infant feeding. A small minority of over-enthusiastic paediatricians recommend undiluted cow's milk right from the birth, forgetting the fact that human milk is made for the human baby and cow's milk for the calf. Both cannot be equated. Most authorities in India and abroad including the World Health Organization have persistently recommended dilution of cow's milk during the first 2 months in order to reduce the solute load on neonatal kidneys. The Government of India in the Ministry of Health and Family Welfare in the "Manual for Health Worker (Female) Vol. I (1978) have also recommended dilution of cow's milk during the first two months. A suggested schedule for infant feeding with cow's milk is given in Table 5.

TABLE 5

Quantities per feeding – assuming five feedings per day

	Infant's weight (kg)			
	3	4	5	6
Cow's milk (ml)	70	100	150	180
Water (ml)	20	20	0	0
Sugar (g)	5	10	10	10
kcal	64	103	135	153
Protein (g)	2.1	3.0	4.5	5.4
– Place milk, water, and sugar in pan				
– bring to boil, then cool				
– pour into feeding utensil				

Source : *(39)*

Artificial feeding is a hazardous procedure in poor homes because of the dangers of contamination and over-dilution of the feed.

The composition of cow's milk and human milk is given in Table 6.

Table 6 shows that cow's milk and human milk are dissimilar in many respects. The differences may be seen as great as the difference between "brain" and "brawn". (a) *PROTEIN* : One of the striking difference is the low protein content of human milk; this is about 3 times less than in cow's milk and lower than in most mammals. The proteins in human breast milk and in cow's milk are completely different. Human milk contains more cystine, essential for the prematures, and less methionine than cow's milk. It is rich in taurine, indispensable for infants, but which they, unlike adults, are unable to synthesize. Breast milk is almost completely digested and utilized for growth, whereas much of cow's milk protein is excreted by the infant undigested producing whitish curdy stool. Breast milk contains other proteins whose functions are not nutritive, but anti-infective, e.g., IgG, lysozyme, living cells, etc. Human milk is virtually a "living" fluid. (b) *FATS* : Mother's milk is especially rich in fats, which represents between 35–50 per cent of total energy value. There are two main ways in which the fats of human milk differ from those of other milks – first, levels of essential polyunsaturated fatty acids, especially linoleic acid and alpha–linolenic acid are higher in human milk than in cow's milk; secondly, the fats of human milk are easier for the baby to digest and absorb than are those of cow's milk. With cow's milk, unabsorbed fatty acids tend to bind with calcium and prevent it from being absorbed. Although there is less calcium in human milk than in cow's milk, it is much better absorbed. (c) *CARBOHYDRATES* : Human milk contains more lactose than most other milks. It may be specially useful for the growing brain. In the intestine, lactose helps the "right" kind of bacteria (i.e., *Lactobacillus bifidus*) to grow. Lactobacillus and lactose help to keep the intestinal contents acidic, which inhibits the growth of harmful bacteria. Lactose plays an important role in maintaining low electrolyte concentration. (d) *VITAMINS AND MINERALS* : If the mother takes adequate amount of vitamins, there is no reason why the child should have a vitamin supplement. The earlier teaching that human milk was deficient in vitamin D is no longer accepted. Vitamin D is present in human milk in water–soluble form. Human milk contains more vitamin A and vitamin C than cow's milk. Another factor which was supposed to be deficient in human milk was iron, but again recent work has shown that iron contained in human milk has a high level of bio-availability, thanks to complex phenomena (the action of lactoferrin, acidity of the digestive track, presence of appropriate proportions of zinc and copper). The coefficient of uptake of the iron in breast milk may be as high as 70 per cent, whereas it is only 30 per cent for cow's milk and infant formulas *(40)*, and no iron supplement is necessary for the baby reared on human milk. Human milk is richer in copper, selenium and cobalt than cow's milk. It contains less sodium than cow's milk and does not put any unnecessary strain on the infant's kidneys. The calcium/phosphorus ratio is high, so that the uptake of calcium is better than cow's milk. The high phosphorus content of cow's milk causes this mineral to be assimilated to the detriment of calcium. It has the added disadvantage of combining with certain fatty acids to form non-soluble calcium soaps.

TABLE 6

Comparison between breast milk during the 1st month of lactation and unprocessed cow milk

Constituent	Breast milk grammes per litre	Cow milk grammes per litre
PROTEINS :	11	33
– Casein	4	28
– Soluble proteins	7	5
Lactalbumin	3.5	1.5 to 1.8
Beta-lactaglobulin	0	3.7
Lactotransferrin	1 to 2	0.2 to 0.5
Immunoglobulin	1 to 2	0.5
Lysozyme	0.5	Traces
NON-PROTEIN NITROGENOUS SUBSTANCES :	0.32	0.32
LIPIDS :	35	35
– Linoleic acid	3.5	1
CARBOHYDRATES :	70	50
– Lactose	62	50
– Nitrogenous oligosaccharides	8	0
MINERALS :	2	8
– Ca (Calcium)	0.33	1
– P (Phosphorus)	0.15	1
– Fe (Iron)	0.4 to 1.5 mg	0.3 to 0.5 mg
VITAMINS :		
– C	60 mg	20 mg
– D	50 IU	25 IU
ENERGY :	640–720 kcal 2670–3000 kJ	650 kcal 2717 kJ

Source : *(40)*

WEANING : Weaning is not sudden withdrawal of child from the breast. It is a gradual process starting around the age of 6 months, because the mother's milk alone is not sufficient to sustain growth beyond 6 months. It should be supplemented by suitable foods rich in protein and other nutrients. These are called "supplementary foods". These are usually cow's milk, fruit juice, soft cooked rice, suji, dhal and vegetables. The weaning period is the most crucial period in child development, for during the weaning process children are particularly exposed to the deleterious synergistic interaction of malnutrition and infection. Weaning, if not done properly, is often followed by diarrhoea and months of growth failure leading to kwashiorkor, marasmus and immunodeficiency marked by recurrent and persistent infections which may be fatal. A knowledge of weaning foods and practices is an important aspect of preventive and social paediatrics. At the age of one year, the child should receive solid foods consisting of cereals, pulses, vegetables and fruits. There is now enough evidence to show that children can be properly weaned by local foods of a kind usually consumed by the older children and adults in their families. Efforts should therefore be made to design and promote the use of adequate home-made weaning foods.

Baby friendly hospitals initiatives (2018)

Since 1993 WHO's efforts to improve infant and young child nutrition have focused on promoting breast feeding. It has been calculated that breast feeding could prevent deaths of at least one million children a year. A "baby-friendly

hospital initiative" (BFHI), created and promoted by WHO and UNICEF, has proved highly successful in encouraging proper infant feeding practices, starting at birth *(41)*. BFHI is supported by the major professional medical and nursing bodies in India. The implementation guidelines have been revised recently in the year 2018. The ten steps summarize a package of policies and procedures that facilities providing maternity and newborn services should implement to support breastfeeding. The steps are : (1a) Comply fully with the international code of marketing of breast-milk substitutes and relevant World Health Assembly resolutions; (1b) Have a written infant feeding policy that is routinely communicated to staff and parents; (1c) Establish ongoing monitoring and data-management system; (2) Ensure that staff have sufficient knowledge, competence and skills to support breastfeeding; (3) Discuss the importance and management of breastfeeding with pregnant women and their families; (4) Facilitate immediate and uninterrupted skin to skin contact and support mothers to initiate breastfeeding as soon as possible after birth; (5) Support mothers to initiate and maintain breastfeeding and manage common difficulties; (6) Do not provide breastfed newborns any food or fluids other than breast milk, unless medically indicated; (7) Enable mothers and their infants to remain together and to practice rooming-in 24 hours a day; (8) Support mothers to recognize and respond to their infant's cues for feeding; (9) Counsell mothers on the use and risk of feeding bottles, teats and pacifiers; and (10) Coordinate discharge so that parents and their infants have timely access to ongoing support and care *(42)*. The "Baby friendly" hospitals in India are also expected to adopt and practice guidelines on other interventions critical for child survival including antenatal care, clean delivery practices, essential newborn care, immunization and ORT *(43)*.

National guidelines on infant and young child feeding

In view of the vulnerability of young infant to the risk of breast-milk substiutes, the Government of India enacted the Infant Milk Substitutes, Feeding Bottles and Infant Food (Regulation of Production, Supply and Distribution) Act 1992. It came into force on 1st Aug. 1993. It prohibits the promotion of infant food, infant milk substitutes and feeding bottles as Government of India is committed to promote breast-feeding.

The new norms of infant and young child feeding i.e., exclusive breast-feeding for the first 6 months (replacing the 4–6 months age range of earlier guidelines), introduction of complementary foods at 6 months while continuing breast-feeding upto the age of 2 years or beyond; replaces the previous policy. The infant milk substitutes, feeding bottles and infant foods (Regulation of Production, Supply and Distribution) Amendment Act 2003, was passed and came into action since 1st January 2004 *(38)*. Goals set to be achieved by the year 2007 were :

1. Intensify nutrition and health education to improve infant and child feeding and caring practices so as to (a) bring down the prevalence of under-weight children under three years from the current level of 47 per cent to 40 per cent; (b) reduce prevalence of severe undernutrition in children in the 0–6 years age group by 50 per cent;
2. Enhance early institution of breast feeding (colostrum feeding) from the current level of 15.8 per cent to 50 per cent;
3. Enhance the exclusive breast-feeding rate for the first six months from the current rate of 55.2 per cent (for 0–3 months) to 80 per cent; and
4. Enhance the complementary feeding rate at six months from the current level of 33.5 per cent to 75 per cent.

GROWTH AND DEVELOPMENT

1. Definition

A phenomenon peculiar to the paediatric age group is growth and development. The term growth refers to increase in the physical size of the body, and development to increase in skills and functions. Growth and development are considered together because the child grows and develops as a whole. Growth and development include not only physical aspect, but also intellectual, emotional and social aspects. Normal growth and development take place only if there is optimal nutrition, if there is freedom from recurrent episodes of infections, and if there is freedom from adverse genetic and environmental influences. MCH care is concerned with the process of growth and development, which is the foundation of human life. It is the nature of this process of physical and psychological growth and development of the child which is crucial for health or ill-health, for life or death.

Determinants of growth and development

It is beyond the scope of this book to delve into the subject of growth and development which indeed is a vast one, except to make a passing reference to some of the more important factors influencing it. Briefly these are : (1) *GENETIC INHERITANCE* : Genetic factors influence growth and development, especially height and weight, mental and social development and personality. (2) *NUTRITION* : Nutrition influences growth and development before as well as after birth. In fact, retardation of growth rate is an indication of malnutrition. When the diet is improved the child begins to grow in height and weight. (3) *AGE* : Growth rate is maximum during foetal life, during the first year of life and then again at puberty. At other periods, growth is slower. (4) *SEX* : At about the age of 10 to 11 years, female children show a sudden increase in height and weight. This growth spurt corresponds to puberty. In male children, the growth spurt occurs a little later, i.e., between 12 and 13 years. (5) *PHYSICAL SURROUNDINGS* : Sunshine, good housing, lighting and ventilation have their effects on growth and development (6) *PSYCHOLOGICAL FACTORS*: Love, tender care and proper child-parent relationship do affect the social, emotional and intellectual development of children. (7) *INFECTIONS AND PARASITOSIS* : Certain infections of the mother during pregnancy (e.g., rubella, syphilis) affect the intrauterine growth of the foetus. Infections after birth (e.g., diarrhoea, measles) slow down growth and development, especially in the malnourished child. The intestinal parasites (e.g., roundworms) by consuming considerable quantities of nutrients hamper growth and development. (8) *ECONOMIC FACTORS* : The standard of living of the family is an important factor. Children from well-to-do families have better height and weight. The economic factor is connected with the nutrition and living of

the people. (9) *OTHER FACTORS*: These comprise the birth order of the child, birth spacing, birth weight in single and multiple pregnancies, education of the parents, etc. In short, a normal childhood implies proper physical, mental and emotional development, and is a prerequisite for a full adult life. The study of normal development and its determinants is the basis for paediatric education.

The process of growth from birth to age 20 may be represented diagrammatically in 3 curves (Fig. 4) which shows the level accomplished (as a percentage of development between birth and maturity). These curves are so drawn that height at age 20 corresponds to 100 on the vertical scale. It will be seen from Fig. 4 that the growth of the brain is spectacular during the pre-school age.

2. Normal growth

CONCEPT OF NORMALITY

When speaking of human growth and development, mention must be made of the difficulty of defining normality. A normal child may be defined as one whose characteristics fall within the range of measurements accepted as normal for the majority of children in the same (or reference) age group. Conventionally, these limits – the limits of normal variation – are assumed to include two standard deviations above and below the mean (i.e., between the 3rd and the 97th centiles). This presupposes the availability of accurate measurement techniques of growth, and a satisfactory set of reference values or standards for comparison.

As far as physical development is concerned, we have measurement techniques. For example, we measure growth in terms of kilograms and centimetres. But very great difficulties are encountered in connection with psychomotor, emotional and social development; most measurement techniques are based on observations such as "milestones of development."

Methods of assessment *(44, 45)*

In children, the parameters of growth generally used are : weight, height (or length in infants), and head and chest circumferences. These characteristics are measured and compared with the reference standards. Three methods are generally used for making comparisons : (i) The first method is based on mean (or median) values. The median, rather than mean is used where possible because of the skewed distribution of most anthropometric measurements. A variation of 2 standard deviations from either side of the mean (or median) is considered as within normal limits; (ii) The second method is by means of percentile or (centiles). Percentiles are easier to understand than standard deviations. Percentiles refer to the percentage of individuals falling below a particular level. By definition 3 per cent of children are below the 3rd percentile, and a further 3 per cent are above the 97th percentile. The remaining 94 per cent of individuals who fall between these two lines (i.e. between 3rd and 97th percentiles) should therefore be regarded as being within the range of "normal." However, the 6 per cent of the children outside this range may not necessarily be "abnormal", particularly if their growth is parallel with their centile lines. A measurement outside 3 standard deviation (above 99th and below 1st centile) is more likely to indicate a significant degree of abnormality; and (iii) Thirdly, it is also possible to assess the growth of a child by such indices as weight for length, and weight for height. These are age-independent indices.

The assessment of growth may be longitudinal or cross-sectional. Longitudinal assessment of growth entails measuring the same child at regular intervals. This provides valuable data about a child's progress. Cross-sectional studies are also essential to compare a child's growth with that of his peers. Cross-sectional comparisons involve large number of children of the same age. These children are measured and the range of their measurements (e.g., weight, height) is plotted, usually on percentile charts.

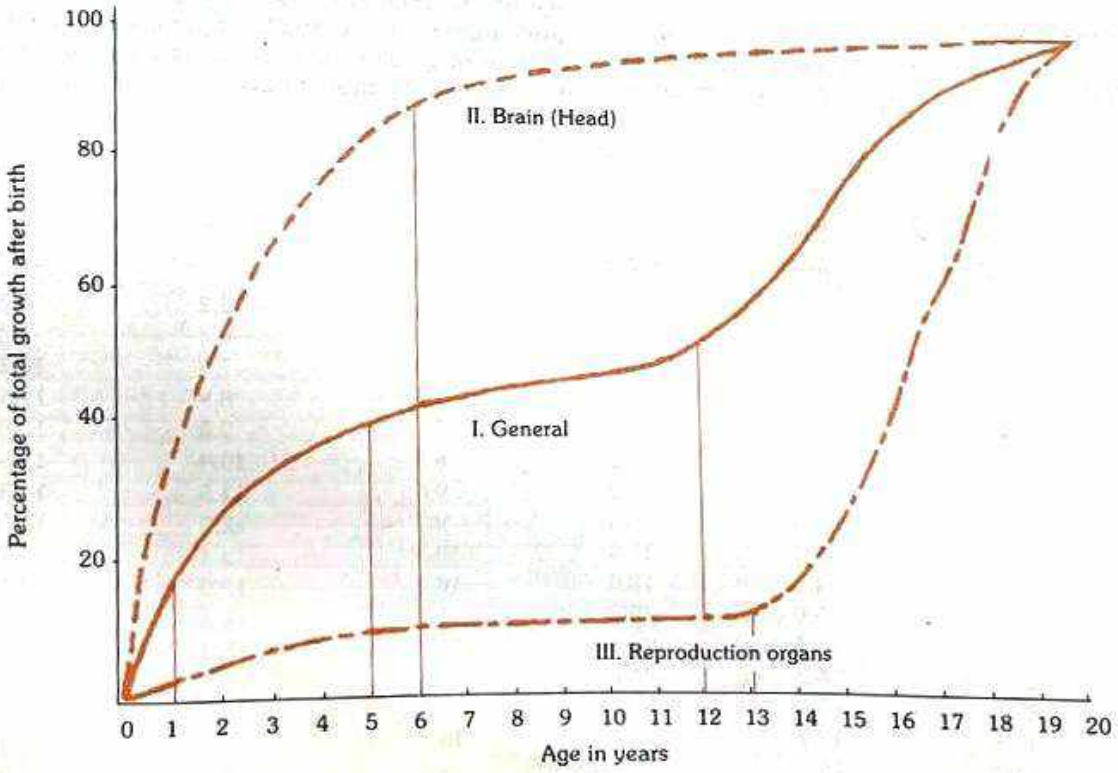


FIG. 4
Growth after birth

Reference values

For national and international comparisons and for monitoring, reference or "standard" values of growth are essential. The well known reference standards are : *(i) Harvard (or Boston) standards (46)* : These are based on observations made on children in Boston from 1930 to 1956. They have been carefully compiled longitudinally on a large series of children, mostly from North European origin. They became widely used throughout the world; *(ii) WHO reference values (47, 48)* : The Harvard values were replaced by WHO reference values for weight and height. These values were based on extensive cross-sectional data assembled by the United States National Centre for Health Statistics (NCHS) which were considered the best available for international use. The WHO reference values are used for children upto 5 years of age since the influence of ethnic or genetic factors on young children at this age period is considered insignificant, given the similar socio-economic environment; and *(iii) Indian standards (49)* : The Indian Council of Medical Research (ICMR) undertook a nationwide cross-sectional study during the year 1956 and 1965 to establish the much needed reference standards of growth and development of Indian children, for the country as a whole, as well as for each of the states in the country. As the Indian data are based on measurements of children belonging to the lower socio-economic groups which form the majority of Indian communities, the values cannot be considered as representing standard values *(50)*.

The use of local standards of reference is not recommended unless these are based on well-nourished and healthy samples of local population. Further, local standards do not permit international comparisons *(51)*. It was the opinion of WHO that countries or regions might eventually develop their own reference standards; in the interim, the WHO reference value should provide an effective substitute *(47)*.

Reference versus standard values

A distinction must be made between reference values and standard values. If the values are derived from a population racially different from the population under study, such values should be considered as reference values only and not as standard values *(52)*. That is, reference values cannot be used as standard values applicable to a population racially different. For example, it would be absurd to apply the Harvard standards of growth to Pigmies and Eskimos who are racially different *(51)*.

Surveillance of growth and development

Surveillance of growth and development is a specific function of the mother and child health services. It is an important component of the routine anticipatory care of children. The main purpose of growth surveillance is to identify those children who are not growing normally. Surveillance also reflects the effectiveness of other components of child care such as nutrition, sanitation and control of infection. Surveillance of growth and development covers the following aspects :

PHYSICAL GROWTH

1. Weight-for-age

Measurement of weight and rate of gain in weight are the best single parameters for assessing physical growth. A single weight record only indicates the child's size at the moment; it does not give any information about whether a child's weight is increasing, stationary or declining. This is because, normal variation in weight at a given age is wide. What is important is careful repeated measurement at intervals, ideally monthly, from birth to 1 year, every two months during the second year and every 3 months thereafter upto 5 years of age, since this age group is at greatest risk from growth faltering. By comparing the measurements with reference standards of weight of children of the same age (Table 7), the trend of growth becomes obvious. This is best done on growth chart. Serial weighing is also useful to interpret the progress of growth when the age of the child is not known. Thus, without the aid of a growth chart, it is virtually impossible to detect changes in the rate of growth, such as sudden loss of weight or halt in gain. Each baby should have its own growth chart.

TABLE 7

2006 – WHO standards of weight for age of boys and girls upto the age of 5 years (kg)

Age (months)	Boys			Girls		
	– 2SD	Median	+ 2SD	–2SD	Median	+2SD
0	2.5	3.3	4.4	2.4	3.2	4.2
4	5.6	7.0	8.7	5.0	6.4	8.2
8	6.9	8.6	10.7	6.3	7.9	10.2
12	7.7	9.6	12.0	7.0	8.9	11.5
16	8.4	10.5	13.1	7.7	9.8	12.6
20	9.1	11.3	14.2	8.2	10.4	13.5
24	9.7	12.2	15.3	9.0	11.5	14.8
28	10.2	12.9	16.3	9.7	12.3	16.0
32	10.8	13.7	17.4	10.3	13.1	17.1
36	11.3	14.3	18.3	10.8	13.9	18.1
40	11.8	15.0	19.3	11.3	14.6	19.2
44	12.2	15.7	20.2	11.8	15.3	20.4
48	12.7	16.3	21.2	12.3	16.1	21.5
52	13.2	17.0	22.2	12.8	16.8	22.6
56	13.6	17.7	23.2	13.3	17.5	23.8
60	14.1	18.3	24.2	13.7	18.2	24.9

Source : *(53)*

A baby should gain at least 500 gram wt. per month in the first three months of life. That is the minimum. The children who gain less weight are malnourished. It is usual for babies to gain about 1 kg a month, especially in the first 3 months. Healthy babies, on an average double their birth weight by 5 months, and treble it by the end of first year and quadruple by the age of two. During the first year, weight increases by about 7 kg. After that the increase in weight is not so fast – only about 2.5 kg during the second year and from then until puberty by about 2 kg per year. The weight and height gain patterns in India are as shown in Table 8.

TABLE 8

Average weight and height increase during the first 5 years

Age	Increments
	Weight increments per week
0 – 3 months	200 g
4 – 6 months	150 g
7 – 9 months	100 g
10 – 12 months	50 – 75 g
	Weight increments per year
1 – 2 years	2.5 kg
3 – 5 years	2.0 kg
	Length increments per year
1st year	25 cm
2nd year	12 cm
3rd year	9 cm
4th year	7 cm
5th year	6 cm

Source : *(52)*

In different parts of India, the average birth weight is between 2.7 and 2.9 kg *(54)*. The Indian infant manages to grow well upto the age of 3–4 months, even at the expense of its malnourished mother. Thereafter, the growth falters due to lack of supplementary feeding *(55)*. However, Indian children from well-to-do families display growth patterns as good as their counterparts in the Western world *(49)*.

Weight-for-age is often used to classify malnutrition and determine its prevalence. Jelliffe suggested that 80 per cent of the median weight-for-age of the reference be the cut-off point below which children could be considered malnourished.

2. Height (length)-for-age

Height should be taken in a standing position without foot wear. If the height machine is not available, the measuring scale fixed to the wall can be employed. This arrangement is suitable for children 2 years and above. The measuring scale should be capable of measuring to an accuracy of 0.1 cm *(48)*. A very great effort should be made to measure children accurately. Errors in the measurement of a young child may lead to significant errors in the classification of the nutritional status. The WHO standards (2006) for height-for-age are as shown in Table 9.

The length of a baby at birth is about 50 cm. It increases by about 25 cm during first year, and by another 12 cm during the second year. During growth spurt, boys add something like 20 cm in their height, and girls gain about 16 cm. The spurt is followed by a rapid slowing of growth. Indian girls reach 98 per cent of their final height on an average by the age of 16.5 years, and boys reach the same stage by the age of 17.75 years. With the exception of a few ethnic groups, there is evidence showing that all children have a similar growth potential.

Height is a stable measurement of growth as opposed to body weight. Whereas weight reflects only the present health status of the child, height indicates the events in the past also. The use of growth (height) centile chart is particularly valuable in studying the trend of height curve.

TABLE 9

2006 – WHO standards for length/height-for-age of boys and girls upto the age of 5 years (cm)

Age (months)	Boys			Girls		
	– 2SD	Median	+ 2SD	–2SD	Median	+2SD
0	46.1	49.9	53.7	45.4	49.1	52.9
4	59.7	63.9	68.0	57.8	62.1	66.4
8	66.2	70.6	75.0	64.0	68.7	73.5
12	71.0	75.7	80.5	68.9	74.0	79.2
16	75.0	80.2	85.4	73.0	78.6	84.2
20	77.7	83.2	88.8	76.7	82.7	88.7
24	81.7	87.8	93.9	80.0	86.4	92.9
28	83.8	90.4	97.0	82.2	89.1	96.0
32	86.4	93.4	100.4	84.9	92.2	99.4
36	88.7	96.1	103.5	87.4	95.1	102.7
40	90.9	98.6	106.4	89.8	97.7	105.7
44	93.0	101.0	109.1	92.0	100.3	108.6
48	94.9	103.3	111.7	94.1	102.7	111.3
52	96.9	105.6	114.2	96.1	105.0	114.0
56	98.8	107.8	116.7	98.1	107.3	116.5
60	100.7	110.0	119.2	99.9	109.4	118.9

Source : *(53)*

Low height for age : This is also known as nutritional stunting or dwarfing. It reflects past or chronic malnutrition. The cut-off point commonly taken for the diagnosis of stunting is 90 per cent of the United States NCHS height-for-age values *(56)*. Waterlow recorded the use of 2SD below the median reference as the cut-off point.

3. Weight-for-height

Height and weight are interrelated. Weight in relation to height is now considered more important than weight alone. It helps to determine whether a child is within range of "normal" weight for his height. For example, a child on the 75th centile of both his height and weight is neither overweight nor under–weight, but a child on the 75th centile of his weight chart and the 25th centile of his height chart is clearly overweight.

Low weight for height : This is also known as nutritional wasting or emaciation (acute malnutrition). It is associated with an increased risk of mortality and morbidity *(56)*. A child who is less than 70 per cent of the expected weight-for-height is classed as severely wasted.

The WHO has compiled reference value for children giving weight according to height. For details see reference 53.

Weight records

Weight records are generally kept by all infant clinics; the aim is the prevention of underfeeding, and in the developing world, the weight chart is an important tool in the prevention of malnutrition.

4. Head and chest circumference

At birth the head circumference is about 34 cm. It is about 2 cm more than the chest circumference. By 6 to 9 months, the two measurements become equal, after which the chest circumference overtakes the head circumference. In severely malnourished children, this overtaking may be delayed by 3 to 4 years due to poor development of the thoracic cage. In a ICMR study *(49)*, the crossing over of chest and head circumference did not take place until the age of two years and six months. This has been attributed to growth retardation in poor Indian children.

Besides increase in height and weight, the term "growth" also includes various physiological events which occur at predictable periods such as, dentition, ossification of bones and secondary sexual characteristics.

BEHAVIOURAL DEVELOPMENT

A closely related development is behavioural development. It is assessed in four fields :

1. Motor development;
2. Personal-social development;
3. Adaptive development; and
4. Language development.

The developmental landmarks or milestones of development provide an estimate of the time when the child can be expected to attain certain skills or points in development. Since the milestones are averages, each child is bound to differ from the other. For instance, some children sit up and speak earlier than others. Table 10 shows some of the normal developmental milestones and ages at which these are reached in the Indian context. When a child takes longer time to cross these milestones, the possibility of his being mentally handicapped should not be overlooked.

The behavioural development of the child is a complex affair. The work of ethnologists and sociologists show how quickly the child's behaviour conform to the models adult society offers them. For proper behaviour development, the child must be assured emotional and moral stability, that is, a home where he will find bonds of affection, regular discipline and parents who accept him and provide him with models of balanced conduct. Many children will not find themselves in ideal conditions. They consequently have trouble with behaviour, speech, sleep and appetite and these problems will have to be anticipated, diagnosed and treated.

THE GROWTH CHART

The growth or "road-to-health" chart (first designed by David Morley and later modified by WHO) is a visible

TABLE 10

Milestones of development

The 'milestones' given here are approximations and to assess any individual child, all types of growth development and behaviour must be taken into account.

Age	Motor development	Language development	Adaptive development	Socio-personal development
6-8 weeks	–	–	–	Looks at mother and smiles
3 months	Holds head erect	–	–	–
4-5 months	–	listening	begins to reach out for objects	recognizes mother
6-8 months	sits without support	experimenting with noises	transfers objects hand to hand	enjoys hide and seek
9-10 months	crawling	increasing range of sounds	releases objects	suspicious of strangers
10-11 months	stands with support	first words		
12-14 months	walks wide base		builds	
18-21 months	walks narrow base beginning to run	joining words	beginning to explore	
24 months	runs	short sentences		dry by day

display of the child's physical growth and development. It is designed primarily for the longitudinal follow-up (growth monitoring) of a child, so that changes over time can be interpreted.

It is important to note that in the weight-for-age chart, the height of the child is not taken into consideration. This is because weight is the most sensitive measure of growth, and any deviation from "normal" can be detected easily by comparison with **reference curves**. A child can lose weight, but not height. In short, the growth chart offers a simple and inexpensive way of monitoring weight gain, and in fact child health over time.

1. WHO child growth standards, 2006 (53)

In 1993 the WHO undertook a comprehensive review of the uses and interpretation of anthropometric references. The review concluded that the NCHS growth references, which had been recommended for international use since the late 1970s, did not adequately represent early childhood growth and that new growth curves were necessary. A Multicentre Growth Referenece Study (MGRS) was undertaken between 1997 and 2003 in Brazil, Ghana, India, Norway, Oman and USA and primary growth data and related information were gathered from 9,440 healthy breast-fed infants and young children (0 to 60 months boys and girls) from widely diverse ethnic background and cultural settings. In addition their mothers followed health practices such as breast feeding their children, and not smoking during and after pregnancy.

The new standards were generated for boys and girls aged 0–60 months – percentile and Z-score curves for length/height-for-age, weight-for-age, weight-for-length, weight-for-height and BMI-for-age. The last standard is an addition of the set of indicators previously available as part of the NCHS/WHO reference.

As expected, there are notable differences with the NCHO/WHO reference that vary by age, sex, anthropometric measure and specific percentile or Z-score curve. Differences are particularly important in infancy. Stunting will be greater throughout childhood when assessed using the new WHO standards compared to the NCHS/WHO reference. The growth pattern of breast-fed infant will result in a substantial increase in rates of underweight during the first half of infancy and a decrease thereafter. For wasting, the main difference is during infancy when wasting rate will be substantially higher using the new WHO standards. With respect to overweight, use of the new standards will result in a greater prevalence that will vary by age, sex and nutritional status of the index population.

The new WHO standards depict normal early childhood growth under optimal environmental conditions and can be used to assess children everywhere, regardless of ethnicity, socio-economic status and type of feeding.

Fig. 5 and 6 show the comparison of WHO with NCHS weight-for-age reference curve from birth to 5 years of age for boys and girls respectively (53).

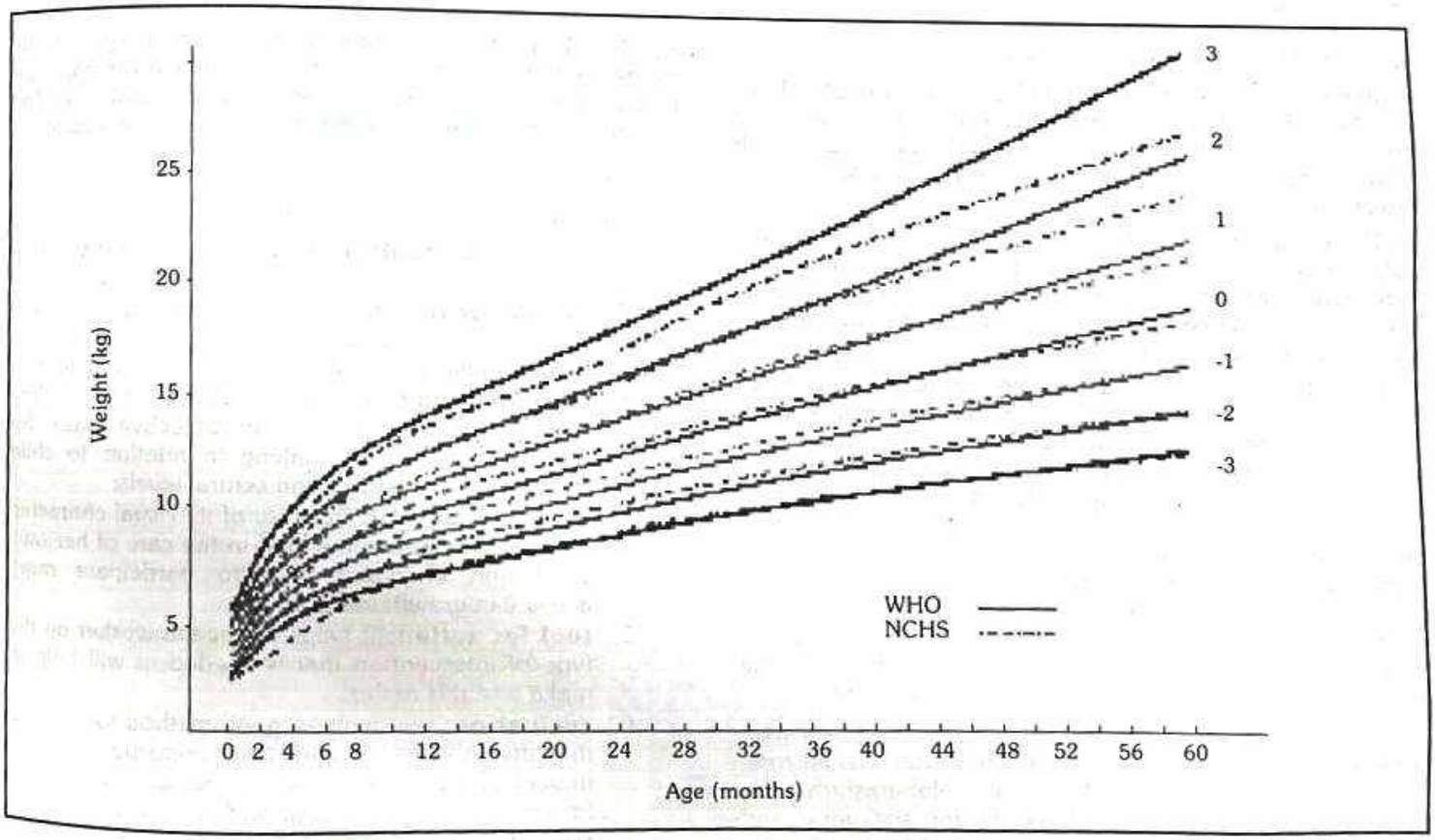


FIG. 5

Comparison of WHO with NCHS weight-for-age Z-scores for boys

Source : (53)

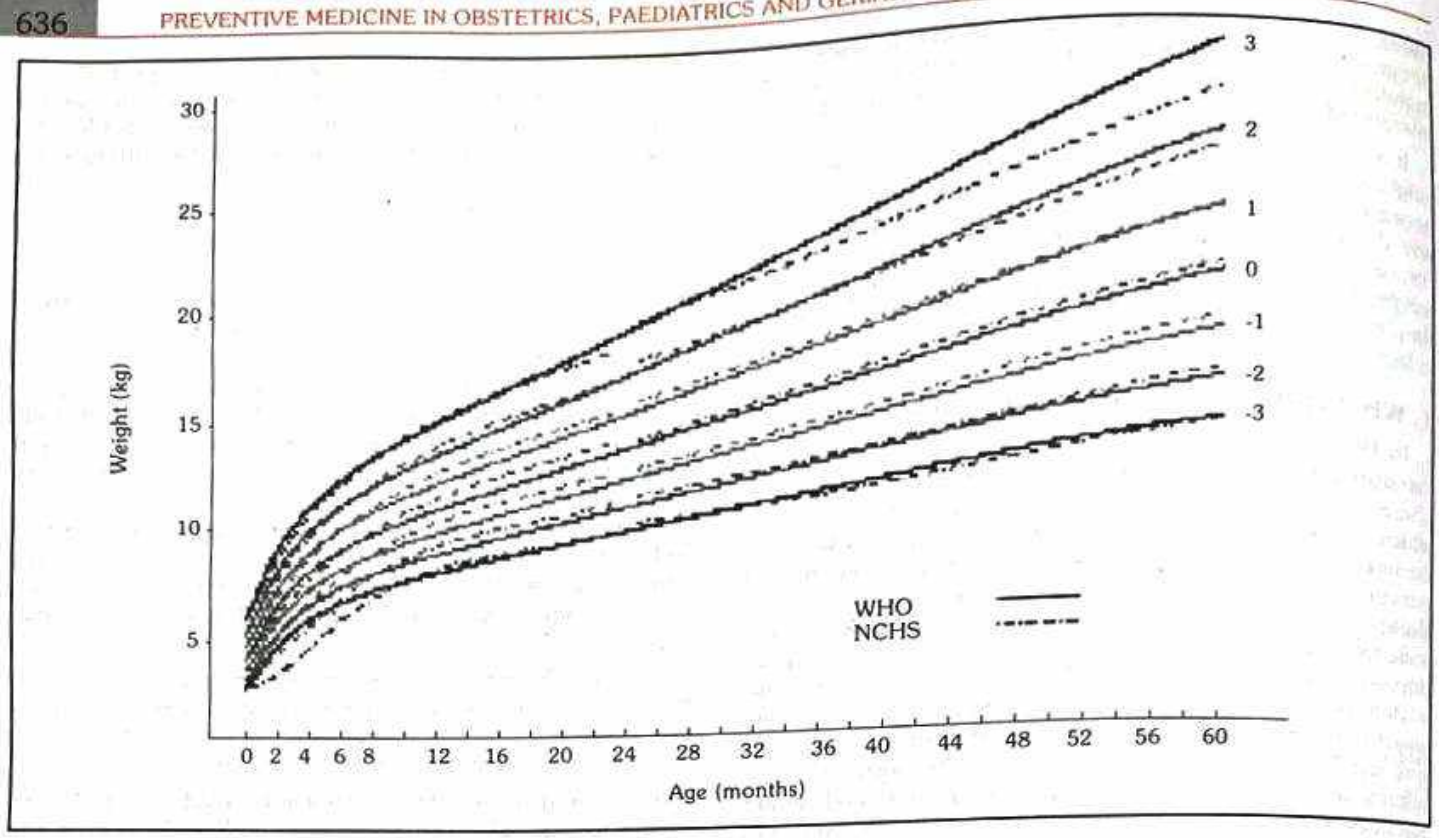


FIG. 6
Comparison of WHO with NCHS weight-for-age Z-scores for girls

Source : *(53)*

2. Growth chart used in India

India has adopted the new WHO Child Growth Standards (2006) in February 2009, for monitoring the young child growth and development within the National Rural Health Mission and the ICDS. The same standards will be used for research too in future.

These standards are available for both boys and girls below 5 years of age. With these new standards the child care workers will know when the nutrition and care needs of the child is being compromised and it will enable them to take timely corrective action at different levels.

A joint "Mother and Child Protection Card" has been developed, as shown in Fig. 7 and 8, which provides space for recording the family identification and registration, birth record, pregnancy record, institutional identification, care during pregnancy, preparation for delivery, registration under Janani Suraksha Yojana, details about immunization procedures, breast-feeding and introduction of supplementary food, milestones of the baby, birth spacing and reasons for special care. The chart is easily understood by the health workers and the mother, with a visual record of the health and nutritional status of the child. It is kept by the mother and brought to the health centre at each visit.

The growth chart shows normal zone of weight for age, undernutrition (below –2SD) and severely underweight zone (below –3SD). In some states like Maharashtra, the growth chart contains normal weight for age zone and undernutrition zone of grade one, second, third and fourth. It is the direction of growth that is more important than the position of dots on the line. The importance of the direction of growth is illustrated at the left hand, upper corner of the chart. Flattening or falling of the child's weight curve signals growth failure, which is the earliest sign of the protein-energy malnutrition and may precede clinical signs by weeks and months. Such a child needs special care. The objective in child care is to keep the child in normal zone.

Uses of growth chart

A growth chart has many potential uses :

1. for **growth monitoring** which is of great value in child health care;
2. **diagnostic tool:** for identifying "high-risk" children. For example, malnutrition can be detected long before signs and symptoms of it become apparent;
3. **planning and policy making:** by grading malnutrition, it provides an objective basis for planning and policy making in relation to child health care at the local and central levels;
4. **educational tool:** because of its visual character, the mother can be educated in the care of her own child and encourage her to participate more actively in growth monitoring;
5. **tool for action:** it helps the health worker on the type of intervention that is needed; it will help to make referrals easier;
6. **evaluation:** it provides a good method to evaluate the effectiveness of corrective measures and the impact of a programme or of special interventions for improving child growth and development; and
7. **tool for teaching:** it can also be used for teaching, for example, the importance of adequate feeding; the deleterious effects of diarrhoea.

The growth chart has been described as a passport to child health care *(57)*. It has won international recognition

and is now a standard method of monitoring children's health and nutritional status.

Alternative methods of growth monitoring

Growth charting is only one method of growth monitoring. There are other indicators such as height-for-age, weight-for-height, and arm circumference. The last two are independent of age and are particularly useful when age is not known.

CARE OF THE PRE-SCHOOL CHILD

Children between 1–4 years of age are generally called pre-school age children or toddlers. In the history of health services of many developing countries, their social and health needs were realized rather late. Today, more than ever before, the pre-school age child has become a focus for organized medical–social welfare activities, and their death rate is considered a significant indicator of the social situation in a country.

The pre-school age is distinguished by the following characteristics :

1. Large numbers

Pre-school age children (1–4 years) represent about 9.7 per cent of the general population in India. A large majority of these children live in rural and tribal areas and in urban slums. By virtue of their numbers, they are entitled to a large share of health and social services. Further, children are the human resources of the future. Their development is in the interest of the total national development; therefore, they need special attention. Unfortunately, pre-school age children are comparatively less attended to.

2. Mortality

The pre-school age (1–4 years) mortality in India is 2.3 per cent of all deaths. This high mortality which is largely due to infection and malnutrition is characteristic of this age group in underprivileged areas. Malnutrition was shown to be an underlying cause in 3.4 per cent of all deaths in young children and associated cause in no less than 46 per cent *(40)*.

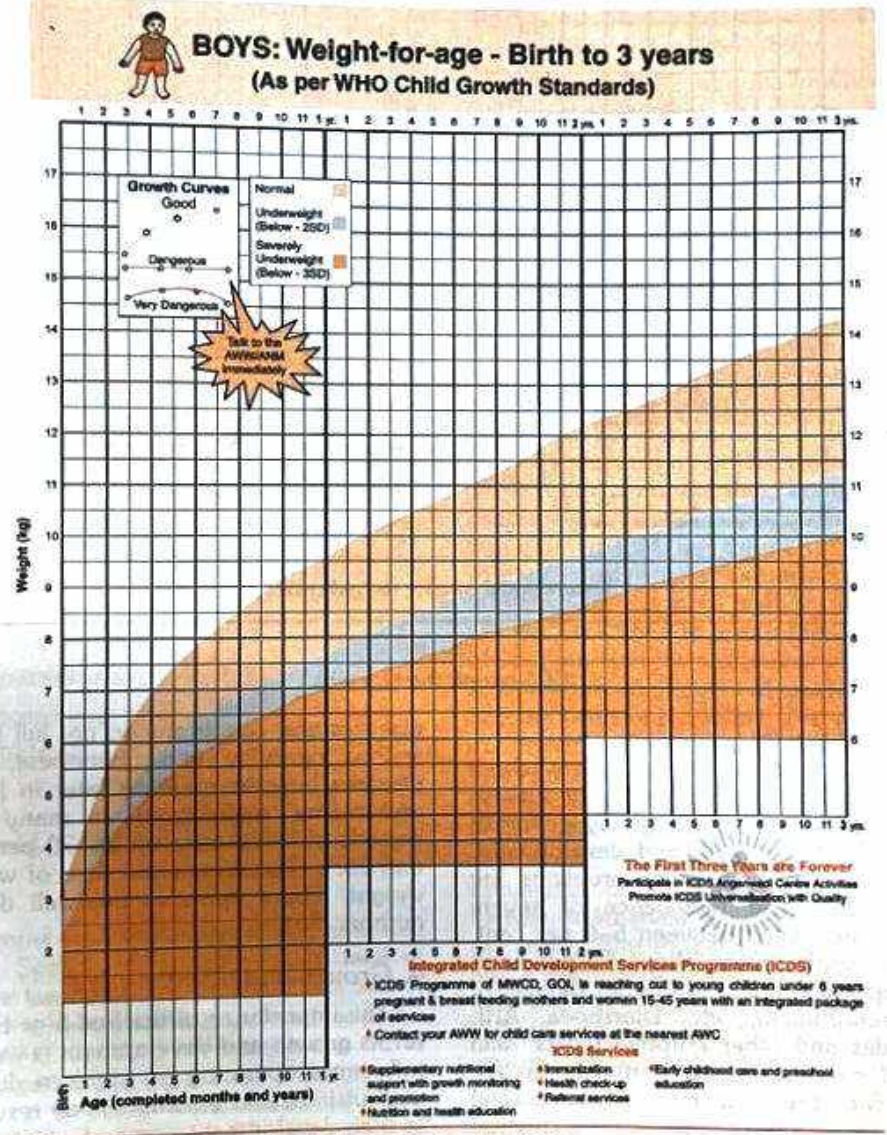


FIG. 7
ICDS growth chart for boys

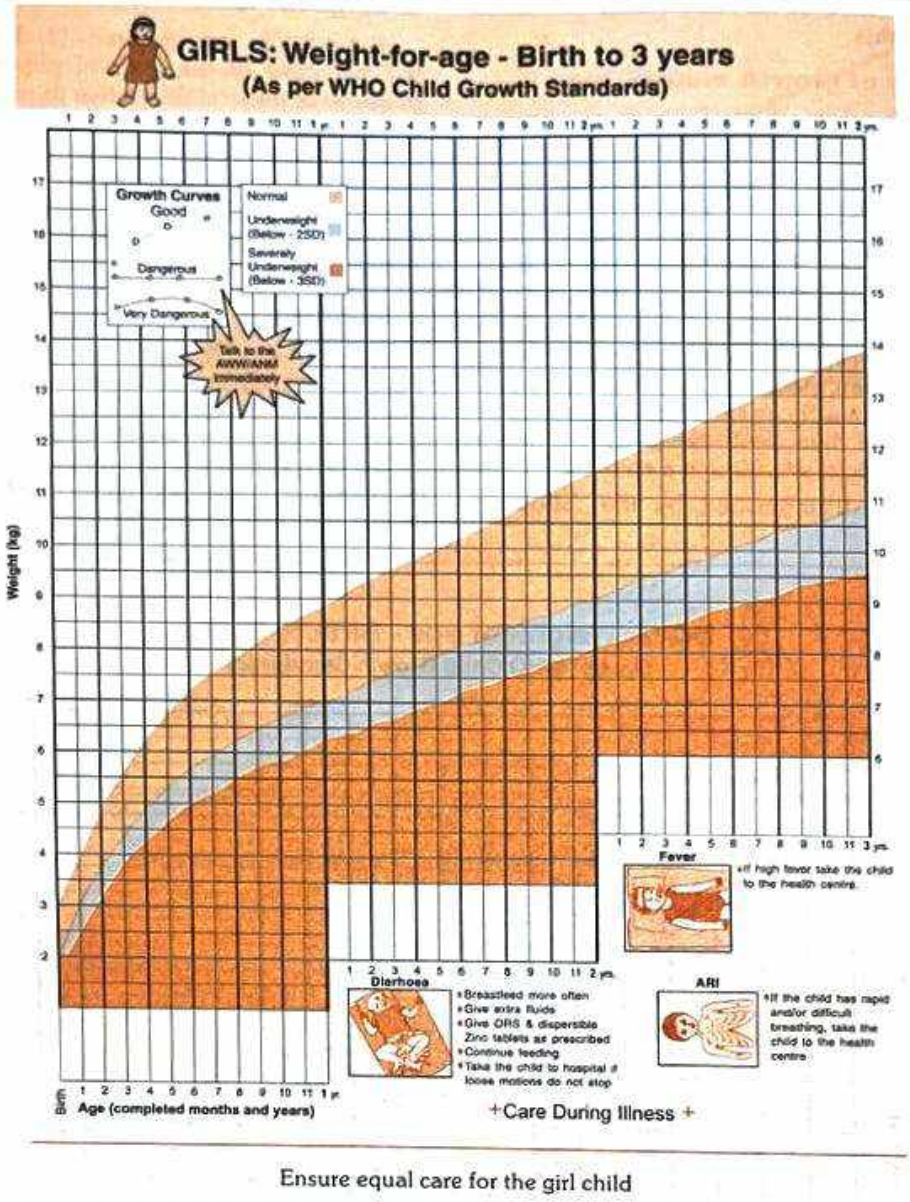


FIG. 8
ICDS growth chart for girls

3. Morbidity

The data on the extent of morbidity of pre-school children are scarce. Some hospital records and a few surveys suggest that children in this age group are usually victims of PEM accompanied by retarded growth and development. Surveys indicate that the main morbidity problems are malnutrition and infections. The prevalence of severe protein-energy malnutrition ranged between 5–6 per cent, and mild protein energy malnutrition about 40 per cent. PEM is often associated with other nutritional deficiency such as anaemia, xerophthalmia, etc. Diarrhoea, ARI, whooping cough, measles and other eruptive fevers, skin and eye infections, and intestinal parasitic infestations are usually common under the existing environmental conditions. Atleast 5 per cent of the pre-school age children belonging to poor socio-economic groups show signs of vitamin A deficiency. Accidents are also becoming frequent, especially burns and trauma from home accidents, and to an increasing degree, traffic accidents. Some childhood diseases and conditions do not kill their victims, but caus serious disability (e.g., blindness, paralysis); and som diseases become manifest later in life (e.g., heart diseas and mental retardation). In many developing countrie periods of illness take up 25–30 per cent of the child's li and each represents either loss of weight or failure to ga weight. These episodes are well documented by sever authors *(55)*.

4. Growth and development

The importance of the first 5 or 6 years of life of a chi for its growth and development is well known. Any adver influences operating on children during this period (e.g malnutrition and infection) may result in severe limitatio in their development, some of which at least are irreversibl The concept of vulnerability calls for preventive care an special actions to meet the biological and psychologic needs inherent in the process of human growth an development *(33)*.

5. Accessibility

While the infant may be easily reached, the toddler is hard to reach, and it is therefore difficult to look after his health. Special inputs are needed (e.g., day care centres, play group centres, children's clubs) to reach the toddler and to bring him into the orbit of health care. Operations research all over the world has demonstrated that parents are unlikely to travel more than 5–8 kms to obtain medical care. For the toddler who needs to be carried, the distance may be reduced even further.

6. Prevention in childhood of health problems in adult life

Results of research indicate how events in early life (e.g. child's diet, infections) affect its health when it becomes an adult, and how many conditions can be prevented through early action, for example, dental diseases in adulthood. Early treatment of streptococcal infection can prevent rheumatic heart disease. Longitudinal studies suggest that the foundations of obesity, hypertension, cardiovascular diseases, and certain mental disorders may be laid in early life. Some of the chronic orthopaedic ailments of the adult are probably connected with anomalies in the development or minor uncorrected infirmities of the infant (e.g. talipes, congenital dislocation of the hip). Many of the measures subsequently undertaken to treat these disorders often do not fully succeed.

Since young children are "vulnerable" to social and health hazards which can retard or arrest their physical and mental development during these critical years, they deserve special attention by the administration, general population and the family.

CHILD HEALTH PROBLEMS

The problems facing the health worker in the developing world are vast and are nowhere more evident than in the field of childcare. The main health problems encountered in the child population comprise the following :

1. low birth weight;
2. malnutrition;
3. infections and parasitosis;
4. accidents and poisoning; and
5. behavioural problems.

1. Low birth weight

This has been discussed in detail earlier.

2. Malnutrition

Malnutrition is the most widespread condition affecting the health of children. Scarcity of suitable foods, lack of purchasing power of the family as well as traditional beliefs and taboos about what the baby should eat, often lead to an insufficient balanced diet, resulting in malnutrition. It is estimated that no less than 50 per cent of the children who died before the age of 5 years were found to have malnutrition as underlying factor and 80 per cent of newborn mortality occurs in babies who are of low birth weight. The global prevalence of stunting in children under 5 years of age is about 22.3 per cent (148.1 million) in the year 2022. The decline occurred more rapidly during MDG era, compared to the decline since the start of the SDG era in 2015. In year 2022, there were 49.8 million (30.1%) children under 5 years of age affected by stunting in South-East Asia region, 56.2 million (31.0%) in African region and 22.9 million (25.1%) in the Eastern Mediterranean region. These numbers may become substantially higher as the global food and nutrition crisis continues to unfold-fueled by conflict, climate change and the enduring effect of the COVID-19 pandemic *(59)*.

Children suffering from wasting have weakened immunity, and are susceptible to long-term developmental delays and face an increased risk of death, particularly when the wasting is severe. In the year 2022, the prevalence of wasting in children under 5 years of age was 6.8 per cent representing 45 million children. Some 2.1 per cent suffered from severe wasting - the most lethal form of undernutrition. It means that 13.7 million children were in critical situation, with 8.1 million of them in South-East Asia region *(59)*. The highest prevalence of wasting is in SEAR where 14.7 per cent (24.2 million) are suffering from wasting, followed by the Eastern Mediterranean region where prevalence rate is 6.9 per cent (6.3 million) *(59)*.

In the year 2022, about 37 million (5.6%) children worldwide were overweight. The region with the highest prevalence in the year 2022 were region of the Americas (8.5 per cent), Western Pacific region (8.1 per cent), European region (7.1 per cent), and Eastern Mediterranean region (6.3 per cent).

In India, the National Family Health Survey (NFHS-5) 2019–21 included survey of the nutritional status of young children. Both chronic and acute undernutrition were found to be high. The prevalence of undernutrition is almost same among girls and boys, although, girls are slightly less well nourished than boys on all three measures. The prevalence of stunting increases with a child's age from 6–8 months through 6–23 months, and it decreases slightly thereafter. Over 44 per cent of children who were reported to be very small at birth are stunted, compared with 35 per cent of children who were of average size or larger. Children born to thin mothers (BMI less than 18.5 kg/m^2) are more likely to be stunted, wasted, and underweight than children born to mothers with a normal BMI, stunting is higher in rural areas (37 per cent) than in urban areas (30 per cent). 46 per cent of children born to mothers with no schooling are stunted, compared to 26 per cent of children born to mothers with 12 or more years of schooling. The corresponding proportion of underweight children are 42 and 23 per cent respectively. The prevalence of stunting decreases steadily with an increase in wealth quintiles, from 46 per cent of children in households in the lowest wealth quintile to 23 per cent of children in households in the highest wealth quintile. Prevalence of stunting in children under five years age is highest in Meghalaya (47 per cent), followed by Bihar (43 per cent), Uttar Pradesh and Jharkhand (40 per cent each), and it is lowest in Puducherry (20 per cent) and Sikkim (22 per cent). Bihar has the highest level of underweight children (41 per cent). Maharashtra has the highest level of wasting (26 per cent) *(58)*.

Malnutrition makes the child more susceptible to infection, recovery is slower and mortality is higher. Undernourished children do not grow to their full potential of physical and mental abilities. Malnutrition in infancy and childhood leads to stunted growth. It also manifests by clinical signs of micronutrient and vitamin deficiencies.

Prevention and appropriate treatment of diarrhoea, measles and other infections in infancy and early childhood are important to reduce malnutrition rates as infection and malnutrition often make vicious cycle. Exclusive breast-feeding in first 6 months of life is very important.

Specific nutritional deficiencies

(a) Protein-energy malnutrition

Protein-energy malnutrition (PEM) has been identified as a major health and nutrition problem in India. It occurs particularly in weaklings and children in the first years of life. It is characterized by low birth weight if the mother is malnourished, poor growth in children and high level of mortality in children between 12 and 24 months, and is estimated to be an underlying cause in 30 per cent of deaths among children under age 5.

As many as 34 per cent of the children in the least developed countries have low height for their age i.e. stunting, and 34 per cent children have low weight for height. The rate of low height for age reflects the cumulative effects of undernutrition and infections since birth or even before birth; high rates are often suggestive of bad environmental conditions and/or early malnutrition. On the other hand, a greater frequency of low weight for height, often reflects current severe undernutrition or disease. The scenario in India is discussed in detail under the heading malnutrition.

(b) Micronutrient malnutrition

Micronutrient malnutrition refers to a group of conditions caused by deficiency of essential vitamins and minerals such as vitamin A, calcium, iodine, iron and zinc. It is estimated that about 2 billion people are affected by this type of malnutrition. Vitamin A deficiency is still the most common cause of preventable childhood blindness worldwide; iodine deficiency causes goitre, cretinism and brain damage; and anaemia results from insufficient iron intake.

Nutritional anaemia : It affects all age groups, including pre-school children, school children and elders. Even mild anaemia reduces resistance to fatigue. It has a profound effect on psychological and physical behaviour. Overall, 67 per cent of children are having same degree of anaemia, 29 per cent of children have mild anaemia, 36 per cent have moderate anaemia, and 2 percent have severe anaemia *(58)*.

Vitamin A deficiency and nutritional blindness : Young children are at greater risk of developing xerophthalmia, partly because their vitamin A requirements are proportionately greater than those of any other group and partly because they suffer most from infections. The result is that severe, blinding corneal destruction is most frequently seen in children between the age of six months and six years. Vitamin A deficiency is in fact, the single most frequent cause of blindness among pre-school children in developing countries. Some 20 per cent children with this deficiency are at increased risk of death from common infections, and around 2 per cent are blinded or suffer serious sight impairment.

Iodine deficiency : Iodine deficiency disorders pose a public health problem as about 1.5 billion people are living in environments lacking this mineral. As a result at least 30,000 babies are stillborn each year and over 120,000 are born mentally retarded, physically stunted, deaf–mute or paralysed. Even when children are born otherwise healthy, lack of iodine may still cause mental dullness and apathy.

Nutritional deficiencies not only lead to severe illnesses, entailing long and costly treatment, but also influence physical development, psychic behaviour and susceptibility to infection.

3. Infectious and parasitic diseases

Young children fall an easy prey to infectious diseases. The leading childhood diseases are : diarrhoea, respiratory infections, measles, pertussis, polio, neonatal tetanus, tuberculosis, and diphtheria. It is known that a child may get affected several times in a year; the incidence increases with the aggravation of a state of malnutrition. Of about 4 million deaths a year from acute respiratory infections in the developing world, a quarter are linked to malnutrition, and a further quarter associated with complications of measles, pertussis, malaria and HIV/AIDS. During 2022, about 9 per cent of under-five mortality worldwide was due to diarrhoeal diseases, about 14 per cent due to ARI, about 2 per cent deaths were due to measles and about 4 per cent due to malaria. In India, during the year 2022, 1,989 cases of diphtheria, 7,434 cases of measles, 12,642 cases of pertussis, 5,182 cases of neonatal tetanus, 5.5 million episodes of acute diarrhoea and 19.3 million episodes of acute respiratory infection were reported *(60)*. The actual figures may be several times higher since there is considerable under-reporting. This is so, for example, in the case of eruptive fevers, malaria, intestinal parasites such as ascariasis, hookworm, giardiasis and amoebiasis etc. which are common because of poor environmental sanitation and paucity of potable drinking water. The prevention and treatment of children's illnesses may interrupt the transmission of infection in the community.

These few facts, which are merely examples and could be multiplied, show that the prevention and treatment of infections and parasitosis of children are bound to have important long-term consequences.

4. Accidents and poisoning

In the developed world, accidents and poisoning have become a relatively more important child health problem. There is every reason to believe that accidents among children are frequent in the developing countries also, especially burns and trauma as a result of home accidents and, to an increasing degree, traffic accidents. Children and young adolescents are particularly vulnerable to domestic accidents – including falls, burns, poisoning and drowning.

5. Behavioural problems

Behavioural disturbances are notable child health problem, the importance of which is increasingly recognized in most countries. Children abandoned by their families present severe social and health problems. Over 60,000 children are abandoned each year in India *(61)*.

6. Other factors affecting the health of children

a. Maternal health

A major determinant of child health is the health of his/her mother. Child health is adversely affected (the risk begin

to appear even before birth) if the mother is malnourished, if she is under 18 years (too young) or over 35 (too old), if her last child was born less than 2 years ago (too close), if she has already more than 4 births (too many) and if she is deprived of basic pregnancy care. A healthy mother brings forth a healthy baby, with better chances of survival.

b. Family

In pre-school years, the child is very much an organic part of the immediate family. Whatever happens to him or her affects the other members of the family, and vice versa. Therefore, "child health" has to be "family health". It depends upon the family's physical and social environment, which includes its lifestyle, customs, culture, traditional habits, and the childbearing and childrearing practices are greatly influenced by this. The family and social environment has a considerable influence on the development of speech, personality and the intellectual potentials of the small child. Other factors are the family size, the family relationships, and family stability. Infancy and early childhood is the time when the child contracts common contagious illness from contact with others (elder brothers and sisters, playmates, schoolmates). Data shows that the number of episodes of infectious diarrhoea increases with the size of the family. Studies also show an increase in the prevalence of malnutrition in families with more than 4 children. In short, fewer children would mean better nutrition, better health care, less morbidity and lower infant mortality.

c. Socio-economic circumstances

The socio-economic situation in which the family is placed is a very important factor in child health. In every region of the world, the physical and intellectual development of children varies with the family's socio-economic level. Under-privileged children of the same age are smaller, lighter and less advanced in psychomotor and intellectual performance, compared to children of privileged group. A detailed analysis of socio-economic factors shows the part played by the parents' education, profession and income, their housing, the urban or rural, industrialized or non-industrialized nature of the population.

Poverty, illiteracy (especially mothers' illiteracy) and sickness create a vicious circle spanning from one generation to the next, and from which it is difficult for the individual to escape. The differences in health between rich and poor, which can be observed in all age-groups are particularly striking among children.

d. Environment

After the first week of a child's life, the environmental factors play a very great role as determinants of infant and childhood morbidity and mortality. Tetanus infection of the newborn may take a heavy toll of the newborn in the first few weeks of life. Diarrhoea, pneumonia and other infections – bacterial, viral and parasitic – are extremely common in children exposed to insanitary and hostile environment. The stages at which these infections occur vary according to the ecological conditions, home and family hygiene, local epidemiological conditions and the extent to which they come into contact with earth, water and above all with adults and other children. An insufficient supply of safe water, inadequate disposal of human excreta and other waste, an abundance of insects and other disease carriers are among the environmental factors continuously menacing family health.

Another important factor which influences child development is environmental stimulations. Children also develop skills if they are given the opportunity. Stimulation, particularly the interaction with people who take interest and talk to them helps children to develop. Other sources of environmental stimulation are the radio, TV and illustrated magazines.

e. Social support and health care

Other factors affecting the health status of children include community and social support measures, ranging from creches and day care facilities to organized health care systems.

RIGHTS OF THE WOMEN AND CHILDREN

Women and children are the most vulnerable section of the society. It is, therefore, vital to improve their health and well-being in order to achieve complete development of overall human resources.

One of the core function assigned to the WHO in its Constitution of 1948 was to "promote maternal and child health and welfare". By the 1950s, national health plans and policy documents from development agencies invariably stressed that mothers and children were vulnerable groups and, therefore, priority "targets" for public health action. The notion of mother and children as vulnerable group was also central to the primary health care movement launched at Alma-Ata in 1978. The plight of mothers and children soon came to be seen as much more than a problem of biological vulnerability. The 1987 Call to Action for Safe Motherhood explicitly framed it as "deeply rooted in the adverse social, cultural and economic environment of the society, and specially the environment that societies create for women". Women's relative lack of decision-making power and their unequal access to employment, finances, education, basic health care and other resources are considered to be the root causes of their ill-health, and that of their children. The unfairness of this situation has made it obvious that the health of mothers and children is an issue of rights, entitlements and day to day struggle to secure these entitlements. The milestones in this establishment of the rights of women and children are as shown in Fig. 9 *(62)*.

RIGHTS OF THE CHILD

One of the most encouraging signs of our times is the awakening of the public to the needs and rights of children. The needs of children and our duties towards them are enshrined in our Constitution; the relevant articles are :

a. Article 24 prohibits employment of children below the age of 14 in factories;
b. Article 39 prevents abuse of children of tender age; and
c. Article 45 provides for free and compulsory education for all children until they complete the age of 14 years.

In the country's Five Year Plans, special attention has been given to the welfare of children particularly the weaker sections. Various schemes have been introduced and

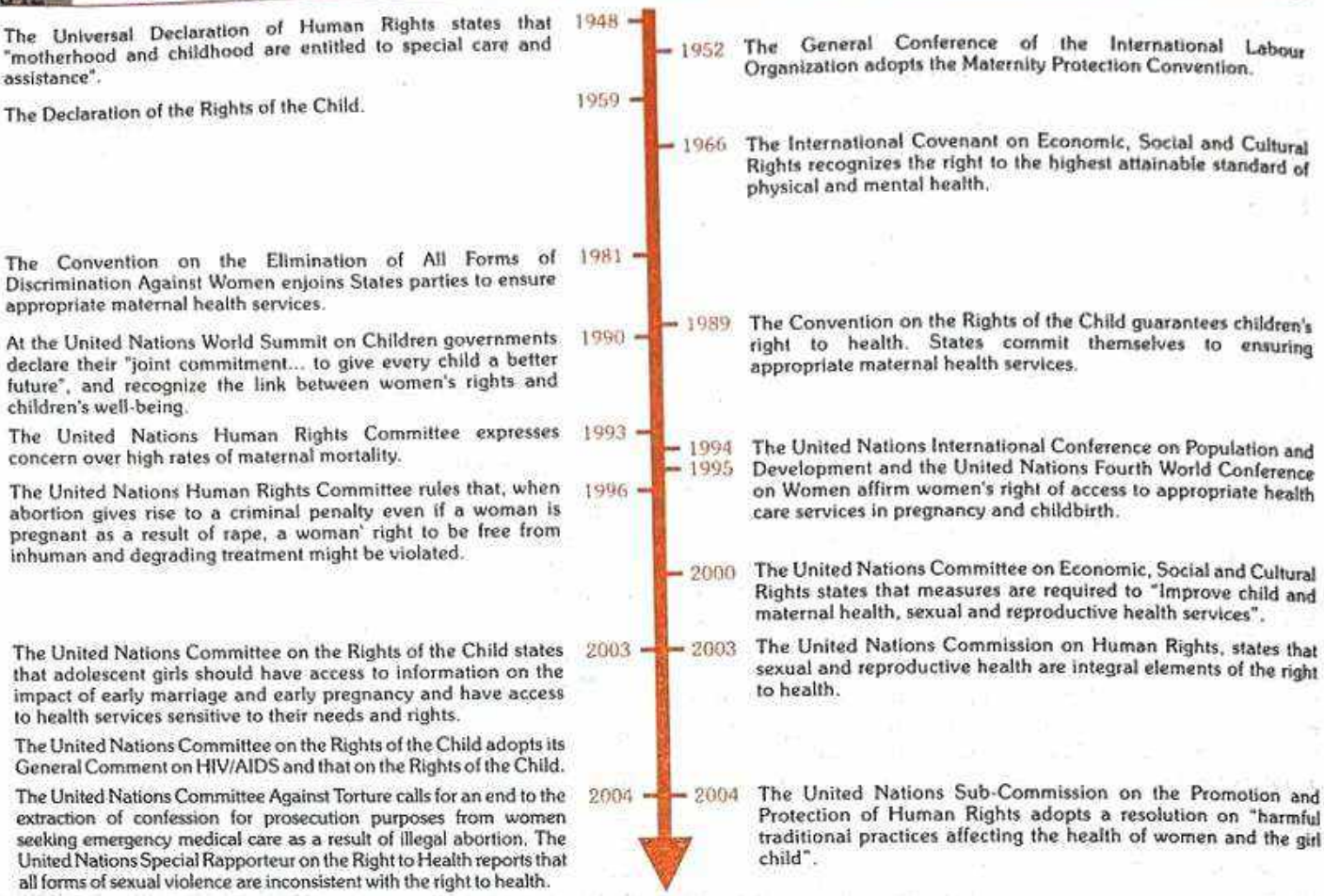


FIG. 9
Milestones in the establishment of the rights of women and children

implemented to achieve this goal. However, despite constitutional provisions, organized efforts for stepping up child welfare services did not take place until 1959.

UN DECLARATION OF THE RIGHTS OF THE CHILD

The year 1959 ushered in a new era in child welfare. To meet the special needs of the child, the General Assembly of the United Nations adopted on 20th November 1959, the Declaration of the Rights of the Child. India was a signatory to this Declaration. The Rights of the Child are :

1. Right to develop in an atmosphere of affection and security and, wherever possible, in the care and under the responsibility of his/her parents;
2. Right to enjoy the benefits of social security, including nutrition, housing and medical care;
3. Right to free education;
4. Right to full opportunity for play and recreation;
5. Right to a name and nationality;
6. Right to special care, if handicapped;
7. Right to be among the first to receive protection and relief in times of disaster;
8. Right to learn to be a useful member of society and to develop in a healthy and normal manner and in conditions of freedom and dignity;
9. Right to be brought up in a spirit of understanding, tolerance, friendship among people, peace and universal brotherhood; and
10. Right to enjoy these rights, regardless of race, colour, sex, religion, national or social origin.

UNIVERSAL CHILDREN'S DAY

November 14 is observed as Universal Children's Day. It was started by the International Union for Child Welfare and the UNICEF. In 1954, the UN General Assembly passed a formal resolution establishing Universal Children's Day and assigned to UNICEF the responsibility for promoting this annual day.

A non-governmental organization (Defence for Children International, Geneva) was set up in 1979 (during the International Year of the Child) to ensure ongoing, systematic international action specially directed towards promoting and protecting the Rights of the Child.

The 1990 World Summit for children agreed on a series of specific social goals for improving the lives of the children including measurable progress against malnutrition, preventable diseases and illiteracy. The vital vulnerable years of childhood should be given a first call on society's concerns and capacities. A child has only one chance to develop normally, and the protection of that one chance, therefore, demands the kind of commitment that will not be

superseded by other priorities. The following are the goals that have been accepted by almost all nations.

Social goals for the year 2000 (63)

The end-of-century goals agreed to by the nations following the 1990 World Summit for children were :

1. A one-third reduction in 1990 under-five death rates (or to 70 per 1000 live births, whichever is less);
2. A halving of 1990 maternal mortality rates;
3. A halving of 1990 rates of malnutrition among the world's under-five (to include the elimination of micronutrient deficiencies, support for breast-feeding by all maternity units, and a reduction in the incidence of low birth weight to less than 10 per cent;
4. Achievement of 90 per cent immunization among under-ones, eradication of polio, elimination of neonatal tetanus, a 90 per cent reduction in measles cases and a 95 per cent reduction in measles deaths (compared to pre-immunization level);
5. A halving of child deaths caused by diarrhoeal disease;
6. A one-third reduction of child deaths from acute respiratory infections;
7. Basic education for all children and completion of primary education by at least 80 per cent girls as well as boys;
8. Clean water and safe sanitation for all communities;
9. Acceptance in all countries of the Convention on the Rights of Child, including improved protection for children in especially difficult circumstances; and
10. Universal access to high quality family planning information and services in order to prevent pregnancies that are too early, too closely spaced, too late or too many.

NATIONAL POLICY FOR CHILDREN

Keeping in view the constitutional provisions and the United Nations Declaration of the Rights of the Child, the Government of India adopted a National Policy for Children in August 1974. The Policy declares :

> *"It shall be the policy of the State to provide adequate services to children, both before and after birth and through the period of growth, to ensure their full physical, mental and social development. The State shall progressively increase the scope of such services so that, within a reasonable time, all children in the country enjoy optimum conditions for their balanced growth".*

According to the Declaration, the development of children has been considered an integral part of national development. The Policy recognizes children as the "nation's supremely important asset" and declares that the nation is responsible for their "nurture and solicitude". It further spells out various measures to be adopted and priorities to be assigned to children's programmes with a focus on areas like child health, child nutrition and welfare of the handicapped and destitute children.

A high level National Children's Board with the Prime Minister as Chairman was established. It provides a forum where problems relating to child welfare and their purposeful development into useful members of society are evolved, reviewed and coordinated into an effective programme (64).

Following the enunciation of the National Policy for Children, a number of programmes were introduced by the Government of India, viz. The ICDS Scheme, programmes of supplementary feeding, nutrition education and production of nutritious food, constitution of the "National Children's Fund" under the Charitable Endowments Act, 1980, institution of National Awards for Child Welfare, Welfare of the Handicapped (65).

Review of existing policies and legislations (66)

The Constitution of India follows the principle of protective discrimination and thereby commits itself to safeguard the rights of children through policies, laws and action. These commitments are reflected through the national polices which are as follows :

1. *National Policy for Children, 1974* provides the conceptual basis for an integrated approach to address the whole child and commits the State to provide adequate services to children, both before and after birth and through the period of growth, to ensure their full physical, mental and social development.
2. *National Policy on Education, 1986* and its *National Plan of Action*, which has a full section on early childhood care and education. It clearly recognizes the holistic nature of child development, and that ECCE is the crucial foundation for human resource development and cumulative lifelong learning. It is viewed as a feeder and support programme for universal elementary education – especially for first generation learners, and an important support service for working mothers and girls.
3. *The National Children's Fund* was created during the international year of the child in 1979 under the Charitable Endowment Fund Act, 1890. The fund provides financial assistance to voluntary agencies for implementing programmes for the welfare of children including rehabilitation of destitute children.
4. *National Health Policy, 2002* accords primacy to preventive and first line curative care at primary health level, and emphasizes convergence, and strategies to change care behaviours in families and communities.
5. *National Charter for Children, 2003* intends to secure for every child its inherent right to be a child and enjoy a healthy and happy childhood, to address the root causes that negate the healthy growth and development of children, and to awaken the conscience of the community in the wider societal context to protect children from all forms of abuse, while strengthening the family, society and the nation.

   The national charter for children affirms India's commitment to the child. However, it does not declare India's acceptance of children's entitlements as their rights. The national policy for children, 1974 still stands as the official policy commitment to children of India. With India's accession to the UNCRC and its two optional protocols rights based framework has

been accepted as the guiding frame for policy measures and programming for children. This is clearly reflected in the national plan of action for children, 2005.

6. *Commission for the Protection of Child Rights Act, 2005* provides for the constitution of a national commission and state commissions for protection of child rights and children's courts for providing speedy trial of offences against children or of violation of child rights and for matters connected therewith or incidental thereto.

7. *National Plan of Action for Children, 2005* articulates clearly the rights, perspective, and agenda for the development of children. It provides a robust framework within which to promote the development and protection of children. The guiding principles of the NPAC are :

   a. To regard the child as an asset and a person with human rights;

   b. To address issues of discriminiation emanating from biases of gender, class, caste, race, religion and legal status in order to ensure equality;

   c. To accord utmost priority to the most disadvantaged, poorest of the poor and the least served child in all policy and programme interventions; and

   d. To recognize the diverse stages and settings of childhood, and address the needs of each, providing all children the entitlements that fulfill their rights and meet their needs in each situation.

Time targets in the NPAC 2005 extend to 2012, the end-year of the Eleventh Plan. The NPAC 2005 has identified 12 key priority areas for the highest and most sustained attention in terms of outreach, programme interventions and resource allocations. These are :

- Reducing infant mortality rate.
- Reducing maternal mortality rate.
- Reducing malnutrition among children.
- Achieving 100% civil registration of births.
- Universalization of early childhood care and development and quality education for all children achieving 100% access and retention in schools, including pre-schools.
- Complete abolition of female foeticide, female infanticide and child marriage and ensuring the survival, development and protection of the girl child.
- Improving water and sanitation coverage in both rural and urban areas.
- Addressing and upholding the rights of children in difficult circumstances.
- Securing for all children all legal and social protection, from all kinds of abuse, exploitation and neglect.
- Complete abolition of child labour with the aim of progressively eliminating all forms of economic exploitation of children.
- Monitoring, review, and reform of policies, programmes and laws to ensure protection of children's interest and rights.
- Ensuring child participation and choice in matters and decisions affecting their lives.

A new alienation of children from their rights has arisen with the plight of children affected by HIV/AIDS. Since the finalization of the NPAC the issues of these children have also been accepted as key priorities by MWCD and therefore found a place in the Eleventh Plan among critical concerns that need to be addressed.

8. *Integrated Child Protection Scheme (ICPS) (67, 68)*

   During the year 2009-10, the Ministry of Women and Child Development launched a new centrally sponsored scheme called "Integrated Child Protection Scheme" (ICPS) with a view to create a safe and secure environment in the country for the comprehensive development of children who are in need of care and protection, children in conflict and in contact with law (either as a victim or as a witness or due to any other circumstances), children of migrant families, children of prisoners, prostitutes, working children, street children, trafficked or sexually exploited children, child drug abusers, child beggars etc.

   The objectives of the scheme are : (1) Improve access to and quality of child protection services; (2) Raise public awareness about child rights; (3) Clearly articulated responsibilities and accountability for child protection; (4) Establish structures at all government levels for delivery of statutory and support services to children in difficult circumstances; and (5) Setting-up of an evidence based monitoring and evaluation system.

The services provided under ICPS are as follows :

(1) Emergency outreach service through 'Child line', dedicated number is 1098. It is a 24-hour toll free telephone service available to all children in distress.

(2) Open shelters for children in need, in urban and semi-urban areas.

(3) Family based non-institutional care through sponsorship, foster-care, adoption, cradle baby centres and after-care.

(4) Institutional services through shelter homes, children homes, observation homes, special homes, and specialized services for children with special needs.

(5) Web-enabled child protection management system including website for missing children.

(6) General grant-in-aid for need based interventions.

9. *National Policy for Children 2013 (NPC) (69)*

   The National Policy for Children 2013 is a long term sustainable, multi-sectoral, and integrated approach for the development and protection of children i.e. 0–18 years age group. Survival, health, nutrition, development, education, protection and participation are the key priorities of the policy. It reiterates the State's commitment to ensure equitable access to essential, preventive, promotive, curative and rehabilitative health care for all children. Towards this goal, NPC envisages that state shall take measures to :

   - Improve maternal health care (pre-natal, natal, post-natal);

- Provide universal access to services for informed choices related to births and spacing;
- Address key causes of child mortality through appropriate interventions including access to safe drinking water and sanitation;
- To improve new born and child care practices;
- To protect children from water borne, blood borne, vector borne, communicable and other childhood diseases by providing universal and affordable access to appropriate services;
- Prevent disabilities, physical and mental through timely measures to take pre-natal, natal, peri-natal and post-natal care of mother and child;
- Ensure availability of services, support and provisions for nutritive attainment in a life cycle approach with focus on infant and young child feeding (IYCF) practices and on the health and nutrition needs of adolescent girls and other vulnerable groups;
- Prevent HIV infections at birth and ensure proper treatment to infected children; and
- Provide the adolescents access to information regarding ill effects of alcohol and substance use, and support for the choice of healthy life style.

The state commits to allocate the required financial, material and human resources for the implementation of NPC 2013. The Ministry of Women & Child Development is the nodal ministry for implementation of NPC.

10. *Protection of Children from Sexual Offences (POCSO) Act, 2012*

In order to effectively address the heinous crime of sexual abuse and sexual exploitation of children through less ambiguous and more stringent legal provisions, the Ministry of Women and Child Development introduced the Protection of Children from Sexual Offences (POCSO) Act, 2012.

The Act defines a child as any person below 18 years of age and regards the best interest and well-being of a child as being of paramount importance at every stage, to ensure a healthy physical, emotional, intellectual and social development of the child. It defines different forms of sexual abuse, including penetrative and non-penetrative assault, as well as sexual harassment and pornography, and deems a sexual assault to be "aggravated" under certain circumstances, such as when abused child is mentally ill or when the abuse is committed by a person in a position of trust or authority vis-a-vis the child, like a family member, police officer, teacher or doctor. People who traffic children for sexual purpose are also punishable under the provisions relating to abetment in the said Act *(70)*.

An ordinance providing the death penalty for rapist of girls below 12 years of age "The Criminal Law Amendment Ordinance, 2018" was promulgated. The salient features of the Ordinance are:

a. Minimum punishment for rape made 10 years;
b. Minimum punishment of 20 years to a person committing rape on a girl aged below 16 years;
c. Minimum punishment of 20 years rigorous imprisonment and maximum death penalty / life imprisonment for committing rape on a girl aged below 12 years,
d. Police officer committing rape anywhere shall be awarded rigorous imprisonment of minimum 10 years;
e. Investigation of rape cases to be completed within 2 months;
f. Appeals in rape cases to be disposed within 6 months; and
g. No anticipatory bail can be granted to a person accused of rape of girl of age less than 16 years.

The POCSO Act 2012 was further amended in the year 2019 with insertion of the following clause :

Under the Act, a person is guilty of using a child for pornographic purposes if he uses a child in any form of media for the purpose of sexual gratification. The Act also penalises persons who use children for pornographic purposes resulting in sexual assault. The Bill defines child pornography as any visual depiction of sexually explicit conduct involving a child including photograph, video, digital or computer generated image indistinguishable from an actual child. The punishment is minimum 5 years in Jail. The Act penalises storage of pornographic material for commercial purposes with a punishment of upto three years, or a fine or both *(71)*.

The POCSO amendment Bill 2020 proposes that child offenders between 15 and 18 years of age should be covered under the ambit of the POCSO Act 2012 and be given the same punishment as is given to adults *(72)*.

The growing vulnerability of children in urban settlements, including those caught in the shifting frame of migratory and transient labour are also now in the MWCD portfolio. Their distress and the difficult circumstances of their childhoods merit special measures of development and protection.

11. *National Plan of Action for Children, 2016*

The Government of India adopted a new National Plan of Action for Children (NPAC) 2016 which is based on the principles embedded in earlier Action Plan. The Action Plan has four key priority areas: survival, health and nutrition; education and development; protection and participation. The NPAC seeks to ensure convergence of ongoing programmes and initiation of new programmes so as to focus on objectives through well-defined strategies and activities to achieve desired level of outcome for children.

Goals and targets set by Government of India for child health under various national and international commitments are as follows *(66)* :

CHILD HEALTH GOALS/TARGETS

Common Minimum Programme	To raise public spending on health to at least 2-3% of GDP over the next five years and focus on primary health care ...special attention will be paid to the poorer sections in the matter of health care.

Twelfth Five Year Plan 2012–17	– Reduction of infant mortality rates to 25 per thousand live births by 2017. – To raise the sex ratio for age group 0–6 from 914 to 950 by 2017. – Prevention and reduction of under-nutrition in children under 3 years to half of NFHS-3 (2005–06) levels.
National Plan of Action for Children, 2005	– To reduce infant mortality rate to below 30 per 1000 live births by 2010. – To reduce child mortality rate to below 31 per 1000 live births by 2010. – To reduce neonatal mortality rate to below 18 per 1000 live births by 2010. – To explore possibilities of covering all children with plan for health insurance.
Millennium Development Goals (MDG)	– Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate (Goal 4). – Reduce by three-quarters, between 1990 and 2015, the maternal mortality rate. – Combat HIV/AIDS, malaria and other diseases.
National Health Policy, 2017	– Reduce under five mortality to 23 per 1000 live births by 2025. – Reduce infant mortality rate to 28 by 2019. – Reduce neo-natal mortality to 16 and stillbirth rate to "single digit" by 2025. – Increase life expectancy at birth from 67.5 to 70 years by 2025. – Reduce prevalence of blindness to 0.25/1000 by 2025, and reduce disease burden by one third from current level. – Achieve global target of HIV/AIDS of 90–90–90 by 2020. – Achieve and maintain a cure rate of > 85% in new sputum positive patients of TB and reach elimination level by 2025. – Achieve and maintain elimination status of leprosy by 2018, Kala-azar by 2017 and lymphatic filariasis in endemic pockets by 2017. – Antenatal coverage and skilled birth attendance at birth above 90 per cent by 2025. – More than 90 per cent full immunization by one year of age by 2025. – Reduction of 40 per cent in prevalence of stunting of under-five children by 2025. – Access to safe water and sanitation to all by 2020.
NITI Aayog Three Year Action Agenda 2017–18 to 2019–20	– Reduce infant mortality rate to 30/1000 live births by 2020. – Reduce under 5 mortality rate to 38/1000 live births by 2020. – Reduce incidence of TB to 130/100,000 by 2020. – Eliminate Kala-azar and lymphatic filariasis.
Global Strategy for Women's, Children's and Adolescent Health (2016–2030) with 2030 Sustainable Development Agenda	– By 2030, end all forms of malnutrition (stunting and wasting in children under 5 years of age). – By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to atleast as low as 12 per 1000 live births and under five mortality to at least as low as 25 per 1000 live births.

DELIVERING THE MCH SERVICES

MCH (mother and child health) is not a new speciality. It is a method of delivering health care to special group in the population which is especially vulnerable to disease, disability or death. These groups (i.e., children under the age 5 years and women in the reproductive age group (15–44 years) comprise about 32.4 per cent of the total population in India.

The MCH services encompass the curative, preventive and social aspects of obstetrics, paediatrics, family welfare, nutrition, child development and health education. The **specific objectives** of MCH are :

1. reduction of morbidity and mortality rates for mothers and children;
2. promotion of reproductive health; and
3. promotion of the physical and psychological development of the child within the family.

Through concern with child development and the health education of parents and children, the ultimate objective of MCH services is life-long health.

Sub-areas

The components of MCH include the following sub-areas:

a. maternal health
b. family planning
c. child health
d. school health
e. handicapped children
f. care of the children in special settings such as day care centres.

The content of MCH care will vary according to the demographic, social and economic patterns. Factors such as urbanization, rural migration, changing patterns of women's work and status have far-reaching effects on childbearing and child-rearing. It is now generally accepted that the MCH

services should always be flexible and based on, and adapted to the local needs and resources of the community it serves; they should be moulded to the local traditions, cultures and other environmental characteristics and cannot be modelled on patterns copied from other countries. Health care, social legislation and social support measures also will have to be adapted to these changing needs and problems of the community.

MCH care is now conceived of as all activities which promote health and prevent or solve health problems of mother and children, irrespective of whether they are curative, diagnostic, preventive or rehabilitative, and whether they are carried out in health centres or in the home by primary health care workers, traditional dais, or highly trained specialists.

Recent trends in MCH care

Maternal and child care was traditionally designed and provided in the form of vertical programmes with "standard" technical content based on models from a few developed countries. Applied in different socio-economic situations, such vertical programmes have been unable to provide more than minimum coverage because of their cost, and they have scarcely been of a kind to solve the priority problems of the majority of mothers and children. The emergence of some new concepts is now changing the organization and management of MCH care in increasing number of countries. These are discussed below :

1. *Integration of care*

Conventional MCH services tended to be fragmented into antenatal care, postnatal care, infant care, family planning etc. The various components were dealt with separately by different staff or departments. This approach has changed over the years. The trend now is an "integrated" approach. This integration is based on the fact that it is inconvenient for the mother to go to one place to receive care for herself, to another for care for her children, and yet another for family planning services.

An integrated approach implies that all those involved in maternity care from the obstetrician down to the local dai, must work as a team. Obstetric and paediatric units should be closely linked so that there can be regular contact between obstetricians, paediatricians, community physicians, health and social workers so that services for the care of the mother and the child in the hospital and community be planned and reviewed including teaching and research. This approach helps to promote continuity of care as well as improves efficiency and effectiveness of MCH care.

2. *Risk approach*

A promising means of improving the coverage and efficiency of MCH care and family planning is the "risk approach". This is a managerial tool for better use of scarce resources. It is based on the early detection of mothers and children with high-risk factors. All mothers and children with high risk factors are given additional and more skilled care including hospitalization, while at the same time essential care is provided for the rest of the mothers and children so that every one gets care appropriate to their need.

It is also possible to assess the "degrees" of risk of each factor, by scoring according to their (a) *magnitude* – i.e., extent and severity; (b) *treatability* – responsiveness to treatment and control; (c) *cost-effect* – in terms of alleviating human suffering; and (d) *community attitude* – social concern. Such an approach when applied on a community-wide basis enables the determination of priority activities, within the MCH programme based on the "degrees" of risk.

Application of the risk approach to the problems of mothers and children is a departure from past or traditional practices to promote the health of mothers and children.

3. *Manpower changes*

The special category of "maternal and child health worker" (e.g., auxiliary-nurse-midwives, health visitors) at the peripheral level is gradually being phased out. A wide range of workers are now considered necessary for maternal and child health work. They include :

(i) *Professionals* : Specialists

(ii) *Field workers* : Multi-purpose workers, Health Guides, dais (traditional birth attendants), Bal Sevikas, Anganwadi workers, extension workers, ASHA etc

(iii) *Voluntary workers* : Members of women's organizations

Taking for example, the local dais in the past were not generally recognized by the national health authorities, who thought that their services were inimical to the safety of the mother and child. The current trend is to assist them perform safe deliveries through training and supervision. In India, where 70 per cent of population lives in rural areas, there are not enough obstetricians to attend to all deliveries. Therefore, a trained dai or midwife is absolutely essential in every village. The same thing can be said about paediatrics. It is now recognized that obstetric and paediatric services can only be improved by cooperation and liaison with these practitioners.

4. *Primary health care*

Primary health care is now recognized as a way of making essential health care available to all. It has all the elements necessary to make a positive impact on the health of mothers and children – i.e., MCH care, family planning, control of infections, education about health problems and how to prevent them, and measures to ensure nutritious food – all closely related. Primary health care emphasizes family oriented care and support, and community self-reliance in health matters. MCH care is an indispensable priority element of primary health care in every country.

Targets for MCH Services

From time to time Government of India has suggested MCH goals with quantifiable time bound targets for achievement. Table 11 shows the MCH indicators with their goal period and the current level of achievement.

Organization of MCH/FP services

The mother and child health, and family planning services were integrated in the Fourth Five Year Plan for better effectiveness. They both are now an integral part of primary health care, which places emphasis on community participation and intersectoral coordination. The National Health Policy 2002 and National Population Policy 2000 has provided the necessary directives for reorienting and restructuring the health services, based on primary health care approach with short and long-term goals.

TABLE 11

MCH goals and current level of achievement (India)

Indicator	Current level	Goals and target period		
		Three Year Action Agenda of Niti Ayog (2018-19-20)	National Health Policy 2017	Sustainable Development Goals (2030)
A. Family Planning Indicators				
Crude birth rate	16 (2024)	–	21	–
Total fertility rate	2.0 (2024)	2.1	2.1 by 2025	–
Couple protection rate (%)	67.0 (2015–19)	–	Meet all needs	–
B. Mortality indicators per 1000				
Infant mortality	26 (2022)	30	< 28 by 2019	–
Neonatal mortality	18 (2022)	–	16 by 2025	< 12
Maternal mortality per 100,000	97 (2018–2020)	120	100 by 2020	70
Under-5 mortality	29 (2022)	38	23 by 2025	≤ 25
C. Services (% coverage)				
Infants immunized (2021)		–	> 90 by 2025	
– $Measles_2$	82	–	–	
– $Pentavalent_3$	86.7	–	–	
– $Polio_3$	80.5	–	–	
– BCG	95	–	–	
– $HepB_3$	83.9	–	–	
– Hib_3	85	–	–	
– Rotavirus	82	–	–	
– PCV_3	25	–	–	
Pregnant women TT	90	–	–	
Antenatal care coverage %	(2016–2021)	–	100	
at least once	85.0			
at least four times	59.0		90	
Institutional deliveries	88.6 (2019–2021)	–	80	
Deliveries by trained personnel	89.0 (2013–2022)	–	100	
D. Prevalence of low-birth-weight babies	28 (2011–2016)	–	–	

Source : *(73, 74)*

The infrastructure in rural areas is based on the complex of community health centres, primary health centres and their subcentres. They provide preventive and promotive health care services. Since deliveries by trained health personnels are crucial in reducing maternal and infant mortality in rural areas, the government of India undertook a scheme to train local dais to conduct safe deliveries. These dais are now available in most villages. Mention must be made of ICDS (Integrated Child Development Services) projects which are functioning all over the country providing a package of basic health services (eg. supplementary nutrition, immunization, health check-up, referral, nutrition and health education, and non-formal education services) to mother and children.

Maternal health care was a part of family welfare programme from its inception. Interventions were introduced on vertical schemes, but family planning remained a separate intervention. In 1992, the Child Survival and Safe Motherhood Programme integrated all the schemes for better compliance. More recently, Reproductive and Child Health Programme was launched in 1997, which integrated family planning, Child Survival and Safe Motherhood Programme, Preventive management of STD/RTI, AIDS, and a client approach to health care. This programme has entered into phase II, with reorientation to make it consistant with the requirement of the National Rural Health Mission.

In urban areas, the general trend is towards institutional delivery. In larger cities, almost 90 per cent of deliveries take place in maternity hospitals and maternity homes. Some of the institutions are under the auspices of the Municipal Corporations and voluntary organizations. The services of obstetricians are available at district hospitals, which are the apical hospitals for MCH care at the district level. For specialized care of children, paediatric units have been established in several district hospitals.

Table 12 shows the evolution of maternal and child health programmes in India.

TABLE 12

Evolution of maternal and child health programmes in India

Year	Milestones
1952	Family Planning programme adopted by Government of India (GOI)
1961	Department of Family Planning created in Ministry of Health
1971	Medical Termination of Pregnancy Act (MTP Act), 1971
1977	Renaming of Family Planning to Family Welfare
1978	Expanded Programme on Immunization (EPI)
1985	Universal Immunization Programme (UIP) + National Oral Rehydration Therapy (ORT) Programme
1992	Child Survival and Safe Motherhood Programme (CSSM)
1996	Target-free approach
1997	Reproductive and Child Health Programme-1 (RCH-1)
2005	Reproductive and Child Health Programme-2 (RCH-2)
2005	National Rural Health Mission
2013	RMNCH + A Strategy
2013	National Health Mission
2014	India Newborn Action Plan (INAP)
2021	NMNCAH + N Strategy

Source : *(75)*

INDICATORS OF MCH CARE

Maternal and child health status is assessed through measurements of mortality, morbidity, growth and development. In many countries, mortality rates are still the only source of information. Morbidity data are scarce and poorly standardized. In recent years, attention has been paid to systematizing the collection, interpretation and dissemination of data on growth and development. The commonly used mortality indicators of MCH care are :

1. Maternal mortality ratio
2. Mortality in infancy and childhood
   a. Perinatal mortality rate
   b. Neonatal mortality rate
   c. Post-neonatal mortality rate
   d. Infant mortality rate
   e. 1–4 year mortality rate
   f. Under-5 mortality rate
   g. Child survival rate.

MATERNAL MORTALITY RATIO

According to WHO, a maternal death is defined as "the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from unintentional or incidental causes" *(1)*.

This definition allows identification of a maternal death, based on the cause of the death being identified as either a direct or indirect maternal cause. It is calculated as :

$$= \frac{\text{Total no. of female deaths due to complications of pregnancy, childbirth or within 42 days of delivery from "puerperal causes" in an area during a given year}}{\text{Total no. of live births in the same area and year}} \times 1000 \text{ (or } 100{,}000\text{)}$$

Direct obstetric deaths (or direct maternal deaths) : those resulting from obstetric complications of the pregnant state (pregnancy, labour and puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above. Deaths due to obstetric haemorrhage or hypertensive disorders in pregnancy, for example, or those due to complications of anaesthesia or caesarean section are classified as direct maternal deaths *(1)*.

Indirect obstetric deaths (or indirect maternal deaths) : those resulting from previous existing disease or disease that developed during pregnancy and which was not due to direct obstetric causes, but which was aggravated by physiological effects of pregnancy. For example, deaths due to aggravation (by pregnancy) of an existing cardiac or renal disease are considered indirect maternal deaths.

The maternal mortality rate, the direct obstetric rate and the indirect obstetric rate are fine measures of the quality of maternity services.

Late maternal death : It is "the death of a woman from direct or indirect obstetric causes, after more than 42 days but less than one year after termination of pregnancy" *(1)*. Like maternal deaths, late maternal deaths also include both direct and indirect maternal/obstetric deaths. Complications of pregnancy or childbirth can lead to death beyond the six-week (42 day) postpartum period, and the increased availability of modern life-sustaining procedures and technologies enables more women to survive adverse outcomes of pregnancy and delivery, and also delays some deaths beyond that postpartum period. Specific codes for "late maternal deaths", are included in the ICD-10 (096 and 097) to capture these delayed maternal deaths, which may not be categorized as maternal deaths in civil registration and vital statistics systems despite being caused by pregnancy-related events.

Maternal deaths and late maternal deaths are combined in the 11th revision of the ICD under the new grouping of "comprehensive maternal deaths".

Pregnancy-related death (also known as death occurring during pregnancy, childbirth and puerperium) : is defined as "The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death (obstetric and non-obstetric)"; this definition includes unintentional/accidental and incidental causes. This definition allows measurement of deaths that occur during pregnancy, childbirth and puerperium while acknowledging that such measurements do not strictly conform to the standard "maternal death" concept in settings where accurate information about causes of death based on medical certification is unavailable *(1)*.

The number of maternal deaths in a population (during a specified time period, usually one calendar year) reflects two factors: (i) the risk of mortality associated with a single pregnancy or a single birth (whether live birth or stillbirth); and (ii) the fertility level (i.e. the number of pregnancies or births that are experienced by women of reproductive age, i.e. age 15–49 years).

Maternal mortality ratio (MMR) : is defined as the number of maternal deaths during a given time period per 100,000 live births during the same time period; thus, it quantifies the risk of maternal death relative to the number of live births, and essentially captures the first factor mentioned above *(1)*.

Maternal mortality rate (MMRate) : is defined and calculated as the number of maternal deaths divided by person-years lived by women of reproductive age in a population. The MMRate captures both the risk of maternal death per pregnancy or per birth (whether live birth or stillbirth), and the level of fertility in the population (i.e. both factors mentioned above) *(1)*.

Adult lifetime risk of maternal death : for women in the population, is defined as the probability that a 15 year-old girl (in the year of the estimate) will eventually die from a maternal cause. This indicator takes into account competing causes of death *(1)*.

The proportion of maternal deaths of women of reproductive age (PM) : The number of maternal deaths in a given time period divided by the total deaths, among women aged 15–49 years.

The 43rd World Assembly in 1990 adopted the recommendation that countries consider the inclusion on death certificates of questions regarding current pregnancy and pregnancy within one year preceding death in order to improve the quality of maternal mortality data and provide alternative methods of collecting data on deaths during pregnancy or related to it, as well as to encourage the recording of deaths from obstetric causes occurring more than 42 days following termination of pregnancy.

Approaches for measuring maternal mortality (1)

In the absence of complete and accurate civil registration systems, MMR estimates are based upon a variety of methods :

(1) Civil registration systems : This approach involves routine registration of births and deaths. Ideally, maternal mortality statistics should be obtained through civil registration data.

(2) Household survey : Where civil registration data are not available, household survey provides an alternative.

(3) Sisterhood methods : Sisterhood methods obtain information by interviewing a representative sample of respondents about the survival of all their adult sisters (to determine the number of ever married sisters, how many are alive, how many are dead, and how many died during pregnancy, delivery, or within six weeks of pregnancy.

(4) Reproductive-age mortality studies (RAMOS) : This approach involves identifying and investigating the causes of all deaths of women of reproductive age in a defined area/population by using multiple sources of data.

(5) Verbal autopsy : This approach is used to assign cause of death through interview with family or community members, where medical certification of cause of death is not available. Records of births and deaths are collected periodically among small populations, under demographic surveillance systems maintained by the research institutions in developing countries.

(6) Census : A national census, with the addition of a limited number of questions, could produce estimates of maternal mortality; this approach eliminates sampling errors and hence allows a more detailed breakdown of the results, including time trends, geographic subdivisions and social strata.

Incidence

WORLD SCENARIO

The methodology employed by the Maternal Mortality Estimation Inter-Agency Group to estimate 1990–2015 maternal mortality ratio followed an improved approach referred to as Bayesian maternal mortality estimation model or BMat model. These results supersede all previously published estimates for the years within that time period and differences with previously published estimates should not be interpreted as representing time trends *(1)*.

An estimated 287,000 maternal deaths occurred globally in 2020, yielding an overall MMR of 223 maternal deaths per 100,000 live births. The global adult life-time risk of maternal mortality (i.e. the probability that a 15 years old woman will die eventually from a maternal cause) is approximately 1 in 210 for the year 2020. For the purpose of categorization, MMR is considered to be high if it is 300–499, very high if it is 500–999, and extremely high if it is ≥ 1000 maternal deaths per 100,000 live births *(1)*.

MMR in the world's least developed countries is high, estimated at 372 maternal deaths per 100,000 live births which is more than 40 times higher than MMR in Europe (13), and almost 60 times higher than in Australia and New Zealand *(4)*. The lifetime risk of maternal death in least developed countries is 1 in 66, Sub Saharan Africa is the only Region with very high MMR for 2020, estimated at 377 with life time risk of maternal death at 1 in 66. Three countries namely, South Sudan (1223), Chad (1063) and Nigeria (1047) fall under extremely high MMR in 2020. Nigeria (82000) and India (24000) had the highest estimated number of maternal deaths accounting for approximately 35 per cent of estimated global maternal deaths *(76)*.

Between 2000 and 2020, the region of South Asia achieved the greatest percentage reduction in MMR, i.e. from 417 to 138 (66.9 per cent). Central Asia and Europe (49.9 per cent), Eastern Asia and Pacific (39 per cent), and Northern Africa and Middle East (47.4 per cent) halved their MMR during that period.

A woman is most vulnerable at the post-partum period. About 50–70 per cent maternal deaths occur in the postpartum period of which 45 per cent deaths occur in the first 24 hours after delivery and more than two-thirds during the first week. Between 11–17 per cent of maternal deaths occur during child birth itself *(77)*.

Maternal mortality ratios strongly reflect the overall effectiveness of health systems, which in many low-income developing countries suffer from weak administrative, technical and logistical capacity, inadequate financial investment and a lack of skilled health personnel. Scaling up key interventions – for example, increasing the number of births attended by skilled health personnel, providing access to emergency obstetric care when necessary and providing post-natal care for mothers and babies – could sharply reduce both maternal and neonatal deaths. Enhancing women's access to family planning, adequate nutrition, improved water and sanitation facilities and affordable basic health care protection from abuse, violence, discrimination, empowerment of women, greater involvement of men in maternal and child care, would lower mortality rates further still. These are not impossible, impractical actions, but proven, cost-effective provisions that women of reproductive age have a right to expect.

The low status of women in the society coupled with their low literacy levels prevent the women from taking antenatal care even if services are available. Most deliveries take place at home without the services of the trained midwifery personnel. There is an inverse relationship between lifetime risk of maternal death and the availability of the trained health worker during pregnancy and at the time of delivery.

It is a tragic situation as these deaths are not caused by disease but occurred during or after a natural process. It is one of the leading cause of death for women of reproductive age in many parts of the world. Most maternal deaths and pregnancy complications can be prevented if pregnant women have access to good-quality antenatal, natal and postnatal care, and if certain harmful birth practices are avoided. Estimates of antenatal care coverage, deliveries conducted by skilled personnel, lifetime risk of maternal death and maternal mortality ratio in some developing and developed countries are shown in Table 13.

Maternal health, however, goes beyond the survival of pregnant women and mothers. For every woman who dies from causes related to pregnancy or childbirth, it is estimated that there are 20 others who suffer pregnancy-related illness or experience other severe consequences. The number is striking: An estimated 10 million women annually who survive their pregnancies experience such adverse outcomes.

Causes

Maternal deaths mostly occur from the third trimester to the first week after birth (with the exception of deaths due to complications of abortion). Studies show that mortality risks for mothers are particularly elevated within the first two days after birth. Most maternal deaths are related to obstetric complications – including postpartum haemorrhage, infections, eclampsia and prolonged or obstructed labour – and complications of abortion. Most of these direct causes of

TABLE 13

Maternal mortality ratio, deliveries conducted by skilled personnel, antenatal care coverage and lifetime risk of maternal deaths in some developing and developed countries.

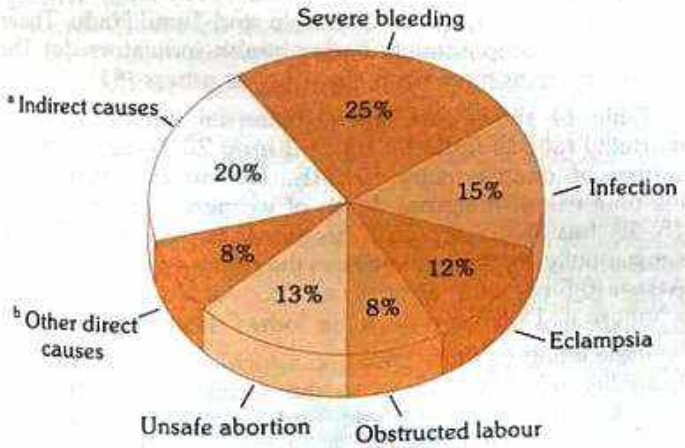
Country	Antenatal care coverage (%) (2016–2021)		Deliveries conducted by skilled personnel (%) (2012–2022)	Lifetime risk maternal death (one in) (2020)	Maternal mortality ratio (per 100,000 live births) (2020)
	At least once	At least four times			
India	85	59	89	470	97 (2018–2020)
Bangladesh	75	37	59	390	123
Bhutan	98	85	93	970	130
Indonesia	98	77	95	280	173
Myanmar	81	59	73	270	179
Nepal	89	78	77	240	174
Thailand	99	90	99	2,500	29
Sri Lanka	99	93	100	17,000	29
Pakistan	91	52	68	170	154
China	100	93	100	22,000	23
Japan	100	100	100	13,000	4
Singapore	100	100	100	5,800	7
UK	–	–	99	2,700	10
USA	–	97	99	2,700	21
World	88	65	86	210	223

Source : *(74, 76)*

maternal mortality can be readily addressed if skilled health personnel are on hand and key drugs, equipment and referral facilities are available.

About 80 per cent of maternal deaths are due to direct causes i.e. obstetric complications of pregnancy, labour and puerperium to interventions or incorrect treatment. As shown in Fig. 10 the single most common cause-accounting for a quarter of all maternal deaths – is obstetric haemorrhage, generally occurring postpartum which can lead to death very rapidly in the absence of prompt life-saving care.

Puerperal infections, often the consequence of poor hygiene during delivery, or untreated reproductive tract infections account for about 15% of maternal mortality. Such infections can be easily prevented. Hypertensive disorders of pregnancy, particularly eclampsia (convulsions), result in about 13% of all maternal deaths. They can be prevented through careful monitoring during pregnancy and treatment with relatively simple anticonvulsant drugs in cases of eclampsia.



[a] Indirect causes including for example: anaemia, malaria, heart diseases

[b] Other direct causes including, for example : ectopic pregnancy, embolism, anaesthesia-related

FIG. 10
Causes of maternal deaths worldwide

Of the estimated 210 million pregnancies that occur every year, about 42 million end in induced abortion, of which only approximately 60 per cent are carried out under safe conditions. More than 20 million induced abortions each year are performed by people lacking the necessary skills or in an environment lacking the minimal medical standards, or both.

Around 8% of maternal deaths occur as a result of prolonged or obstructed labour. Other direct causes include ectopic pregnancies, embolism and deaths related to interventions. Around 20 per cent of maternal deaths are due to indirect causes, that is, the result of pre-existing diseases or disease that developed during pregnancy, which are not due to direct obstetric cause but are aggravated by the physiological effect of pregnancy. One of the most significant is anaemia, which can cause death. Maternal anaemia affects about half of all pregnant women. Pregnant adolescents are more prone to anaemia than older women, and they often receive less care. Infectious diseases such as malaria, and intestinal parasites can exacerbate anaemia, as can poor quality diet – all of which heighten vulnerability to maternal death. Severe anaemia contributes to the risk of death in cases of haemorrhage. Other important causes of indirect death are hepatitis, cardiovascular diseases, diseases of the endocrine and metabolic system and infections such as tuberculosis, malaria and increasingly HIV/AIDS *(78)*. Each year, approximately 50 million women living in malaria-endemic countries throughout the world become pregnant. Around 10,000 of these women die as a result of malaria *(79)*.

Social correlates

A number of social factors influence maternal mortality. The important ones are : (a) *Women's age* : The optimal child-bearing years are between the ages of 20 and 30 years. The further away from this age range, the greater the risks of a woman dying from pregnancy and childbirth.

(b) *Birth Interval* : Short birth intervals are associated with an increased risk of maternal mortality. (c) *Parity*: High parity contributes to high maternal mortality.

Not only are these three variables interrelated, but there are also other factors which are involved, e.g., economic circumstances, cultural practices and beliefs, nutritional status, environmental conditions and violence against women. The social factors often precede the medical causes and make pregnancy and child-birth a risky venture.

Global Strategy for Women's, Children's and Adolescent's Health 2016–2030

The Global Strategy for Women's, Children's and Adolescent's Health, 2016–2030 was launched in the year 2015 with a vision to have by the year 2030, a "world in which every woman, child and adolescent in every setting realize their rights to physical and mental health and well-being, has social and economic opportunities, and is able to participate fully in shaping prosperous and sustainable society" *(80)*. The strategy is a road map for the post-2015 agenda as described by the Sustainable Development Goals and seeks to end all preventable deaths of women, children and adolescents and create an environment in which these groups not only survive, but thrive, and see their environments, health and wellbeing transformed. The global strategy goals of SURVIVE, THRIVE and TRANSFORM and the targets to be achieved by 2030 are as follows *(80)* :

SURVIVE

End preventable deaths

- Reduce global maternal mortality to less than 70 per 100,000 live births
- Reduce newborn mortality to at least as low as 12 per 1000 live births in every country
- Reduce under-5 mortality to at least as low as 25 per 1000 live births in every country
- End epidemics of HIV, tuberculosis, malaria, neglected tropical diseases and other communicable diseases
- Reduce by one third premature mortality from non-communicable diseases and promote mental health and well-being

THRIVE

Ensure health and well-being

- End all forms of malnutrition, and address the nutritional needs of adolescent girls, pregnant and lactating women and children
- Ensure universal access to sexual and reproductive health-care services (including for family planning) and rights
- Ensure that all girls and boys have access to good quality early childhood development
- Substantially reduce pollution-related deaths and illnesses
- Achieve universal health coverage including financial risk protection and access to quality essential services, medicines and vaccines

TRANSFORM

Expand enabling environment

- Eradicate extreme poverty
- Ensure that all girls and boys complete free, equitable and good quality primary and secondary education
- Eliminate all harmful practices and all discrimination and violence against women and girls
- Achieve universal and equitable access to safe and affordable drinking water, and to adequate sanitation and hygiene
- Enhance scientific research, upgrade technological capabilities and encourage innovation
- Provide legal identity for all, including birth registration
- Enhance the global partnership for sustainable development.

INDIA

Despite significant improvements in maternal health over the last decade or so, which is evident in the reductions in maternal mortality in the country, an estimated 24,000 mothers died in the year 2020 due to causes related to pregnancy, childbirth and the post-partum period. The major medical causes of these deaths are haemorrhage, sepsis, abortion, hypertensive disorders, obstructed labor and other causes including anaemia. A host of socio-economic-cultural determinants like illiteracy, low socio-economic status, early age of marriage, low level of women's empowerment, traditional preference for home deliveries and other factors contribute to the delays leading to these deaths.

From year 2000 onwards, SRS (Sample Registration System) included a new method called the "RHIME" or Representative, Re-sampled, Routine Household Interview of Mortality with Medical Evaluation. This is an enhanced form of *"verbal autopsy"* which is the key feature of a prospective study of 1 million deaths within the SRS. RHIME include random re-sampling of field-work by an independent team for maintaining quality of data. For comparability with WHO estimates for India and for other countries, the WHO's "Global Burden of Disease" categorization of maternal deaths have been used, which includes various categories with their ICD-10 codes such as : haemorrhage, sepsis, hypertensive disorder, obstructed labour, abortion, and other conditions.

The SRS report has been grouped into three categories; (a) EAG states of Bihar and Jharkhand, Madhya Pradesh and Chhattisgarh, Odisha, Rajasthan, Uttar Pradesh and Uttaranchal and Assam. These states have high mortality indicators; (b) This category includes southern states of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu. These states have comparatively better health indicators; (c) The remaining states have been classified as others *(81)*.

Table 14 shows live births, maternal deaths, maternal mortality ratio in India by states during 2018–2020, special survey of deaths using RHIME. During this period the life time risk of maternal death of women in the age group 15–49 has been reported to be 0.3 per cent. This is substantially higher for women in the category EAG states and Assam (0.5 per cent) as compared to women in the category southern (0.1 per cent) or in the "other" states (0.2 per cent).

India is among those countries which have a high maternal mortality ratio. According to the estimates the MMR has reduced from 167 per lakh live births in 2011–13 to 97 per lakh live births in 2018–2020. States of Kerala, Maharashtra, Andhra Pradesh, Gujarat, Tamil Nadu, Karnataka, Telangana, Haryana and Jharkhand have already achieved the goal of a MMR of 100 per lakh live births. In EAG and Assam category of states, MMR is about 137 per lakh live births, with Assam on top (195) and Madhya Pradesh (173), Uttar Pradesh (167), Chhattisgarh (137), Odisha (119),

TABLE 14

Maternal Mortality Ratio (MMR), 95% Confidence Interval (CI), Maternal Mortality Rate and lifetime risk; India, EAG and Assam, South and other states, 2018–2020

India and major states	MMR	95% CI	Maternal mortality rate	Lifetime risk
India Total	97	(88–106)	6.0	0.21%
Assam	195	(117–272)	12.1	0.42%
Bihar	118	(78–157)	11.2	0.39%
Jharkhand	56	(10–101)	4.2	0.15%
Madhya Pradesh	173	(126–220)	15.3	0.53%
Chhattisgarh	137	(54–219)	9.9	0.35%
Odisha	119	(71–167)	7.3	0.25%
Rajasthan	113	(71–155)	9.6	0.33%
Uttar Pradesh	167	(126–207)	14.3	0.50%
Uttarakhand	103	(52–154)	6.3	0.22%
EAG and Assam Subtotal	137	(121–154)	11	0.38%
Andhra Pradesh	45	(13–78)	2.4	0.08%
Telangana	43	(4–83)	2.3	0.08%
Karnataka	69	(35–103)	3.5	0.12%
Kerala	19	(0–42)	0.9	0.03%
Tamil Nadu	54	(24–85)	2.7	0.09%
South Subtotal	49	(35–64)	2	0.09%
Gujarat	57	(28–86)	3.9	0.14%
Haryana	110	(58–162)	8.0	0.28%
Maharashtra	33	(10–56)	1.8	0.06%
Punjab	105	(40–170)	5.4	0.19%
West Bengal	103	(64–143)	5.0	0.18%
Other states	77	(55–98)	3.9	0.14%
Other Subtotal	76	(63–89)	4	0.15%

Source : *(81)*

Rajasthan (113) closely following. Assam, Madhya Pradesh and Rajasthan have shown an acceleration in reduction in last three years *(81)*.

The age distribution of maternal and non-maternal deaths from the 2018–2020 Special Survey of Deaths are given in Table 15. It shows that more than two-thirds of the maternal deaths are of women in age group 20–34 years. In contrast, non-maternal deaths are more evenly distributed over the reproductive age span of 15–49 years.

TABLE 15

Age distribution of maternal and non-maternal deaths, India, 2018–2020

Age groups	Maternal deaths		Non-maternal deaths	
	Proportion	95% CI	Proportion	95% CI
15–19	6%	(4–8)	9%	(8–9)
20–24	32%	(27–36)	11%	(11–12)
25–29	30%	(25–34)	12%	(12–13)
30–34	20%	(16–24)	13%	(12–14)
35–39	8%	(6–11)	14%	(13–15)
40–44	3%	(1–4)	18%	(17–19)
45–49	2%	(1–3)	22%	(21–23)
15–49	**100%**		**100%**	

(Figures may not add to 100 due to round-off)

Source : *(81)*

Causes

The major causes of maternal mortality according to the 2001–2003 SRS survey are haemorrhage (38 per cent), sepsis (11 per cent), hypertension (5 per cent), obstructed labour (5 per cent), abortion (8 per cent) and other conditions (34 per cent). Anaemia (19 per cent) is not only the leading cause of death but also an aggravating factor in haemorrhage, sepsis and toxaemia. Illegal abortions are also one of the leading causes of maternal death. That this should continue despite MTP facilities points to the need for wider dissemination of information about these facilities. Induced abortions also point to a large unmet need for contraceptives, as with each pregnancy the woman faces increased risk of death. The percentage distribution of causes of maternal deaths during the year 2001–2003 are as shown in Fig. 11.

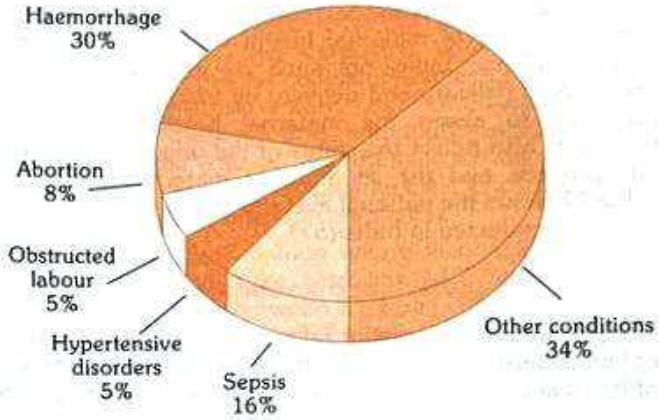


FIG. 11

Major causes of maternal deaths in India (2003)

(Figures may not add to 100 due to round-off)

Source : *(82)*

The determinants of maternal mortality in India are as listed in Table 16.

TABLE 16

Determinants of maternal mortality in India

Medical causes	Social factors
Obstetric causes:	
Toxaemias of pregnancy	Age at child birth
Haemorrhage	Parity
Infection	Too close pregnancies
Obstructed labour	Family size
Unsafe abortion	Malnutrition
	Poverty
	Illiteracy
	Ignorance and prejudices
	Lack of maternity services
Non-obstetric causes:	Shortage of health manpower
Anaemia	Delivery by untrained dais
Associated diseases, e.g., cardiac, renal, hepatic metabolic and infectious	Poor environmental sanitation
	Poor communications and transport facilities
Malignancy	Social customs, etc.
Accidents	

Newer approaches such as "risk approach" and primary health care are steps in the right direction to reduce maternal mortality and morbidity. Despite best antenatal care, some women may develop complications without warning signs

and require emergency care. Essential obstetric care and establishment of first referral units (FRUs) for emergency obstetric care is, therefore, a high priority under the safe motherhood component of Reproductive and Child Health Programme. Janani Suraksha Yojna, Janani Shishu Suraksha Karyakram, establishment of MCH wings and mother and child traking system; and RMNCH+A and more recently RMNCAH+N are key strategies to accelerate the pace of decline of MMR. Equally important is an attack on social and cultural factors (e.g., ignorance, low levels of female literacy, prejudices inherent in the socio-cultural milieu, low levels of nutrition and poor environmental sanitation). It calls for socio-economic development of the community through active community involvement.

National maternal health care indicators

The estimates of maternal mortality can only be used as a rough indicator of maternal health situation in any given country. Hence indicators such as antenatal check-up, institutional delivery and delivery by trained personnel etc. are used to assess the maternal health status. These indicators also reflect the status of the ongoing programme interventions and the situation of maternal health *(60)*. Table 17 shows the national average of key indicators as per NFHS-5 conducted in India *(57)*.

Preventive and social measures

High maternal mortality reflects not only in inadequacy of health care services for mothers, but also a low standard of living and socio-economic status of the community. In the world as a whole, the problem of maternal mortality is principally one of applying existing obstetric knowledge through antenatal, intranatal and postnatal services rather than developing new skills. Any attempt to lower MMR must take into consideration the following measures :

1. Early registration of pregnancy;
2. At least four antenatal check-ups;
3. Dietary supplementation, including correction of anaemia;
4. Prevention of infection and haemorrhage during puerperium;
5. Prevention of complications, e.g., eclampsia, malpresentations, ruptured uterus;
6. Treatment of medical conditions, e.g., hypertension, diabetes, tuberculosis, etc;
7. Anti-malaria and tetanus prophylaxis;
8. Clean delivery practice;
9. In India, a large number of maternal deaths could be prevented with the help of trained village level health workers;
10. Institutional deliveries for women with bad obstetric history and risk factors;
11. Promotion of family planning – to control the number of children to not more than two, and spacing of births;
12. Identification of every maternal death, and searching for its cause; and
13. Safe abortion services.

TABLE 17

National average of key indicators (per cent) in India 2019–2021

Indicators	NFHS-5 (2019–2021)		
Maternal and Child Health	Urban	Rural	Total
Maternity Care (for last birth in the 5 years before the survey)			
Mothers who had antenatal check-up in the first trimester (%)	75.5	67.9	70.0
Mothers who had at least 4 antenatal care visits (%)	68.1	54.2	58.1
Mothers whose last birth was protected against neonatal tetanus (%)	92.7	91.7	92.0
Mothers who consumed iron folic acid for 100 days or more when they were pregnant (%)	54.0	40.2	44.1
Mothers who consumed iron folic acid for 180 days or more when they were pregnant (%)	34.4	22.7	26.0
Registered pregnancies for which the mother received Mother and Child Protection (MCP) card (%)	94.9	96.3	95.9
Mothers who received postnatal care from a doctor/nurse/LHV/ANM/midwife/other health personnel within 2 days of delivery (%)	84.6	75.4	78.0
Average out of pocket expenditure per delivery in public health facility (Rs.)	3,385	2,770	2,916
Children born at home who were taken to a health facility for check-up within 24 hours of birth (%)	3.8	4.3	4.2
Children who received postnatal care from a doctor/nurse/LHV/ANM/midwife/other health personnel within 2 days of birth (%)	85.7	76.5	79.1
Delivery Care (for births in the 5 years before the survey)			
Institutional births (%)	93.8	86.7	88.6
Institutional births in public facility (%)	52.6	65.3	61.9
Home births that were conducted by skilled health personnel (%)	2.1	3.7	3.2
Births attended by skilled health personnel (%)	94.0	87.8	89.4
Births delivered by caesarean section (%)	32.3	17.6	21.5
Births in private health facility that were delivered by caesarean section (%)	49.3	46.0	47.4
Births in a public health facility that were delivered by caesarean section (%)	22.7	11.9	14.3

Source : *(58)*

MORTALITY IN INFANCY AND CHILDHOOD

Mortality rates are good indicators to measure the level of health and health care in different countries. They also help in assessing the overall socio-economic development of a country and correlate well with certain economic variables such as GNP. Medical and social progress have substantially reduced mortality in childhood.

It has become customary to consider mortality in and around infancy in a number of time periods convenient from both the analytical and programmatic point of view as under :

a. perinatal period
b. early neonatal period
c. late neonatal period
d. neonatal period
e. post neonatal period

These are as illustrated in Fig. 12.

FOETAL DEATH : Foetal death is death prior to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy; the death is indicated by the fact that after such separation the foetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles *(83)*. Defined variously as death after the 20th or 28th week of gestation (the definition of length of gestation varies between countries).

Some observers have expressed the view that vital statistical reports are less reliable on foetal deaths occurring at 20–27 weeks than on those occurring after 28 completed weeks, and have preferred to analyze the data separately for the two intervals. Stillbirths are seldom reported in developing countries.

Because of the above difficulties WHO has recommended that within any country the term "stillbirth" be applied to a foetus born dead, and weighing over 500 g – the birth weight most frequently associated with a gestation period of 22 weeks. But for international comparison, however, they suggested a boundary of 1000 g or more, which is more frequently associated with a gestation period of 28 weeks.

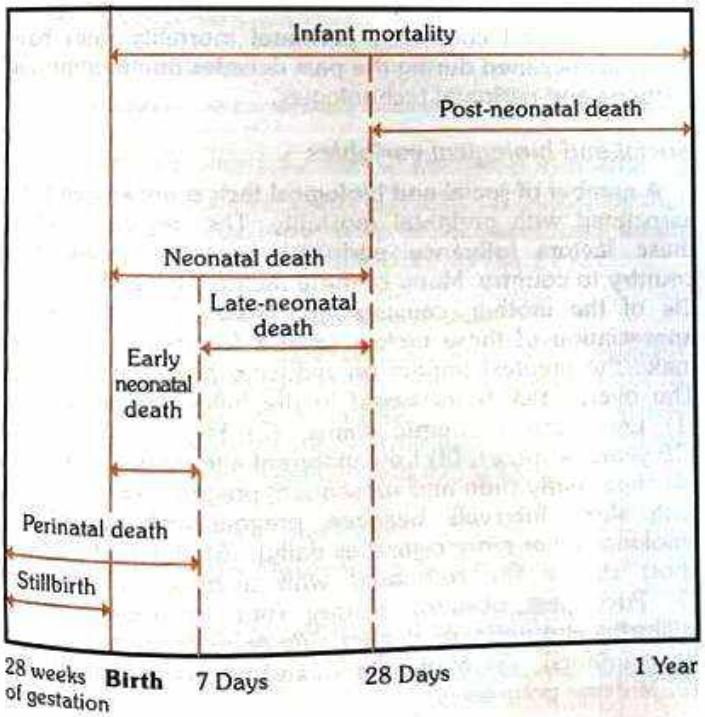


FIG. 12
Mortality in and around infancy

STILLBIRTH RATE

The most widespread use of the term is, "death of a foetus weighing 1000 g (this is equivalent to 28 weeks of gestation) or more" occurring during one year in every 1000 total births (live births plus stillbirths). Stillbirth rate is given by the formula :

$$\text{Stillbirth rate} = \frac{\text{Foetal deaths weighing over 1000 g at birth during the year}}{\text{Total live + stillbirths weighing over 1000 g at birth during the year}} \times 1000$$

It is a frequent occurrence in the developing countries. Its prevention involves the detection and treatment of infectious pathology in the course of pregnancy as well as of high blood pressure and its complications, Rh incompatibility, diabetes and premature rupture of the membrane. Some causes are difficult or impossible to eliminate, such as multiple pregnancies, cord anomalies, foetal malformations, placenta anomalies.

Approximately 1.88 million babies were stillborn in the year 2021 worldwide, the rate was 13.9 per 1000 total births. The rate varies between 21.1 per 1000 total births in least developed countries to 2.8 in high income countries *(84)*. In India, the SRS estimates for the year 2020 for the whole country was about 3 per 1000 total births (4 for the rural and 3 for the urban areas). Among the bigger states, the highest level of stillbirths has been estimated for Odisha (10). Table 18 shows the statewise break-up of stillbirth rate.

TABLE 18
Perinatal mortality rates and stillbirth rates by residence, India and bigger states, 2020

India and bigger states/UTs	Perinatal mortality rate			Stillbirth rate		
	Total	Rural	Urban	Total	Rural	Urban
India	18	21	12	3	4	3
Andhra Pradesh	14	16	9	1	1	3
Assam	17	18	8	3	3	2
Bihar	17	18	12	1	1	1
Chhattisgarh	26	26	24	6	6	6
Delhi	6	8	6	0	0	0
Gujarat	15	18	11	4	4	3
Haryana	21	23	17	7	6	7
Himachal Pradesh*	13	14	10	4	4	4
Jammu & Kashmir	11	11	10	3	2	4
Jharkhand	15	16	10	2	2	2
Karnataka	14	17	9	3	4	2
Kerala	8	6	10	4	4	4
Madhya Pradesh	28	30	20	5	6	4
Maharashtra	11	14	6	3	4	1
Odisha	30	32	20	10	10	6
Punjab	12	11	13	3	3	4
Rajasthan	20	21	16	4	4	5
Tamil Nadu	8	11	5	2	3	1
Telangana	13	14	11	2	1	4
Uttar Pradesh	24	27	15	4	4	2
Uttarakhand	18	17	20	6	6	6
West Bengal	15	15	11	4	5	4

*(Based on three year period 2018–20)

Source : *(73)*

The estimates provided by Lancet Stillbirth Series for India is 22 per 1000 live births for the year 2009. This estimate is being used as a target-setting excercise by India Newborn Action Plan (launched in June 2014). With the current level of average annual rate of reduction, which is less than 1 per cent, India is expected to reach SBR of 19 per 1000 live births by 2030 *(85)*.

PERINATAL MORTALITY RATE

As currently defined, the term "perinatal mortality" includes both late foetal deaths (stillbirths) and early neonatal deaths. The Eighth Revision of the International Classification of Diseases (ICD) defined the "perinatal period" as lasting from the 28th week of gestation to the seventh day after birth. The Tenth Revision (1993) of ICD added that :

i) Babies chosen for inclusion in perinatal statistics (this means late foetal deaths, live births and early neonatal deaths) should be those above a minimum birth weight, i.e., 1000 g at birth (A birth weight of 1000 g is considered equivalent to gestational age of 28 weeks);

ii) if the birth weight is not available, a gestation period of at least 28 weeks should be used; and

iii) where (i) and (ii) are not available, body length (crown to heel) of at least 35 cm should be used. But the preferred criterion is birth weight.

The Conference for the Tenth Revision (ICD-10) made no changes to these definitions.

DEFINITIONS *(86)*

The WHO's definition, more appropriate in nations with well established vital records of stillbirths is as follows :

$$\text{PMR} = \frac{\text{Late foetal deaths (28 weeks gestation and more) + early neonatal deaths (first week) in one year}}{\text{Live births + late foetal deaths (28 weeks gestation and more) in the same year}} \times 1000$$

The WHO's definition, more appropriate in nations with less well established vital records, is :

$$\text{Perinatal mortality rate} = \frac{\text{Late foetal deaths (28 weeks + of gestation) + postnatal deaths (first week) in a year}}{\text{Live births in a year}} \times 1000$$

There is a difference in denominator of the perinatal mortality rate defined by the WHO and industrially developed nations. This makes international comparisons difficult.

International comparisons

For international comparisons, the WHO Expert Committee on the Prevention of Perinatal Mortality and Morbidity (1970) recommended a more precise formulation : "Late foetal and early neonatal deaths weighing over 1000 g at birth, expressed as a ratio per 1000 live births weighing over 1000 g at birth". It is calculated as :

$$\text{Perinatal mortality rate} = \frac{\text{Late foetal and early neonatal deaths weighing over 1000 g at birth}}{\text{Total live births weighing over 1000 g at birth}} \times 1000$$

Why perinatal mortality rate ?

With the decline of infant mortality rate to low levels in many developed countries, perinatal mortality rate has assumed greater significance as a yardstick of obstetric and paediatric care before and around the time of birth.

First, two types of death rate i.e., stillbirths and deaths under the first week of life are combined in perinatal mortality rate because the factors responsible for these two types of deaths are often similar, being those operating before and around the time of birth. *Secondly*, a proportion of deaths which occur after birth are incorrectly registered as stillbirths, thereby inflating the stillbirth rate and lowering the neonatal death rate. The perinatal mortality rate, being a combination of stillbirths and early neonatal deaths, is not influenced by this error, by removing from consideration the dividing line between a stillbirth and a live birth with death shortly after birth.

Although perinatal period occupies less than 0.5 per cent (less than 168 hours) of the average life span, there are more deaths within this period than during the next 30–40 years of life in many developing countries *(87)*. The value of perinatal mortality rate is that it gives a good indication of the extent of pregnancy wastage as well as the quality and quantity of health care available to the mother and the newborn. It reflects the results of maternity care more clearly than the neonatal death rate.

Incidence

Perinatal mortality is a problem of serious dimensions in all countries. It now accounts for about 90 per cent of all foetal and infant mortality in the developed countries. In India, stillbirths are seldom registered. Consequently, most studies on perinatal mortality in this country are hospital-based. The SRS estimates for perinatal mortality rate in India for the year 2020 was about 18 per 1000 live births and stillbirths, with about 21 for rural areas and 12 for the urban areas. The statewise perinatal mortality rate is shown in Table 18.

In developed countries, perinatal mortality rates have gradually declined during the past decades due to improved obstetric and perinatal technologies.

Social and biological variables

A number of social and biological factors are known to be associated with perinatal mortality. The degree to which these factors influence perinatal mortality varies from country to country. Many of these factors also endanger the life of the mother, causing high maternal mortality. An appreciation of these factors (at-risk factors) will certainly make the greatest impact on reducing perinatal mortality. The overall risk is increased in the following categories : (1) Low socio-economic status; (2) High maternal age (35 years or more); (3) Low maternal age (under 16 years); (4) High parity (fifth and subsequent pregnancies, especially with short intervals between pregnancies); (5) Heavy smoking (10 or more cigarettes daily); (6) Maternal height – short stature (as compared with average for locality); (7) Poor past obstetric history (one or more previous stillbirths and neonatal deaths, one or more premature live-born infants); (8) Malnutrition and severe anaemia; and (9) Multiple pregnancy.

For further details see page 662 under "factors affecting infant mortality".

Causes of perinatal mortality

About two-thirds of all perinatal deaths occur among infants with less than 2500 g birth weight. The causes involve one or more complications in the mother during pregnancy or labour, in the placenta or in the foetus or neonate.

Main causes : The main causes of death are intrauterine and birth asphyxia, low birth weight, birth trauma, and intrauterine or neonatal infections. The various causes of perinatal mortality may be grouped as below :

(a) Antenatal causes

(1) Maternal diseases : hypertension, cardiovascular diseases, diabetes, tuberculosis, anaemia
(2) Pelvic diseases : uterine myomas, endometriosis, ovarian tumours
(3) Anatomical defects : uterine anomalies, incompetent cervix
(4) Endocrine imbalance and inadequate uterine preparation
(5) Blood incompatibilities
(6) Malnutrition
(7) Toxaemias of pregnancy
(8) Antepartum haemorrhages
(9) Congenital defects
(10) Advanced maternal age

(b) Intranatal causes

(1) Birth injuries
(2) Asphyxia
(3) Prolonged effort time
(4) Obstetric complications

(c) Postnatal causes

(1) Prematurity
(2) Respiratory distress syndrome
(3) Respiratory and alimentary infections
(4) Congenital anomalies

(d) Unknown causes

In some cases; the causes are not clinically ascertainable.

Interventions for the reduction of perinatal mortality

Measures to reduce perinatal mortality rates are essential to accelerate the declining trend in neonatal and infant mortality rates. For further details, refer to Table 21.

International certificate of perinatal death

For international comparability, the 9th (1975) Revision of International Classification of Diseases (ICD-9) recommended a special certificate of cause of perinatal death. The ICD has also a list of 100 causes (the "P" list) for tabulation of perinatal morbidity and mortality *(28)*.

Prevention of perinatal mortality

See page 664 under Preventive & Social Measures.

NEONATAL MORTALITY RATE

Neonatal deaths are deaths occurring during the neonatal period, commencing at birth and ending 28 completed days after birth. Neonatal mortality rate is the number of neonatal deaths in a given year per 1000 live births in that year.

The neonatal mortality rate is tabulated as :

$$= \frac{\text{Number of deaths of children under 28 days of age in a year}}{\text{Total live births in the same year}} \times 1000$$

Causes of neonatal mortality

The main causes of neonatal death globally are as shown in Fig 13.

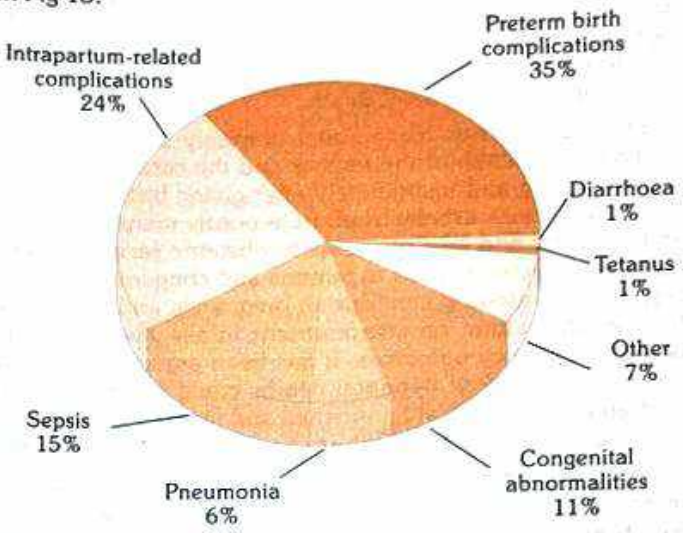


FIG. 13
Global distribution of neonatal deaths by cause, 2018

Source : *(88)*

No woman should die giving life. Nor should any mother endure pregnancy and childbirth, only to go through the agony of having her child born dead or watching the baby die minutes after birth. Yet for countless women around the world this scenario remains a tragic reality. The first 28 days of life – the neonatal period, is the most vulnerable time for a child's survival. In order to continue to accelerate progress in under-five mortality, focussing on newborns is critical.

Neonatal mortality is a measure of intensity with which "endogenous factors" (e.g., low birth weight, birth injuries) affect infant life. The neonatal mortality is directly related to the birth weight and gestational age. Intrapartum related complications, low birth weight and preterm birth is a causal factor in 60 per cent of neonate deaths.

Prematurity and congenital anomalies account for about 60 per cent of newborn deaths, and these often occur in the first week of life. A further quarter of neonatal deaths are attributable to asphyxia – also mainly in the first week of life. In the late neonatal period, that is, after the first week, deaths attributable to infection (including diarrhoea and tetanus) predominate. The importance of tetanus as a cause of neonatal death, however, has diminished sharply due to intensified immunization efforts.

Neonatal mortality rates of babies born to mothers with no education are nearly twice as high as those of babies born to mothers with secondary education or higher. The family's wealth and rural/urban residence also remain powerful determinant of inequities in neonatal mortality. Ending child marriage, reducing adolescent pregnancy and extending birth intervals are crucial to reducing the risk of newborn mortality.

Direct causes of newborn death vary from region to region. In general, the proportions of deaths attributed to prematurity and congenital disorders increase as the neonatal mortality rate decreases, while the proportions caused by infections, asphyxia, diarrhoea and tetanus decline as care improves. Patterns of low birth weight vary considerably between countries. Babies with a low birth weight are especially vulnerable to the hazards of the first hours and days of life, particularly if they are premature. Majority of low-birth-weight babies are not actually premature but have suffered from *in utero* growth restriction, usually because of the mother's poor health. These babies too are at increased risk of death.

The main causes of neonatal mortality are intrinsically linked to the health of the mother and the care she receives before, during and immediately after giving birth. Asphyxia and birth injuries usually result from poorly managed labour and delivery, and lack of access to obstetric services. Many neonatal infections, such as tetanus and congenital syphilis, can be prevented by care during pregnancy and childbirth. Inadequate calorie or micronutrient intake also results in poorer pregnancy outcomes. It has been argued that nearly three quarters of all neonatal deaths could be prevented if women were adequately nourished and received appropriate care during pregnancy, childbirth and in the postnatal period.

However, neonatal mortality is the most difficult part of infant mortality to alter, because of the endogenous factors which are not sensitive to improvements in environmental conditions. Neonatal mortality is greater in boys throughout the world, because newborn boys are biologically more fragile than girls.

Incidence

About 2.4 million newborns died before they are 4 weeks old and half of them died in their first 24 hours in the year 2022. 98 per cent of these deaths occur in developing countries.

The global number of neonatal deaths declined from 5.0 million in 1990 to 2.3 million in 2022 – 6,300 deaths every day in 2022, compared to 14,000 in 1990. Neonatal deaths accounted for about 47 per cent of all under-five deaths in 2022, increasing from 41 per cent in 2000 due to faster global decline in mortality among children aged 1–59 months, than in their first month of life. Based on a recent systematic review, about a third of all neonatal deaths occur on the day of birth and close to three quarters die in the first week of life. These findings suggest that focusing on the critical period before and immediately following birth is essential to saving more newborn lives *(6)*.

The mortality rate comparison for children under 19 years of age is as shown in Fig. 14.

In 2022, the neonatal mortality rate was estimated to be at 17 deaths per 1000 live births globally. The probability of dying after the first month, in post-neonatal period was 11 per 1000, and probability of dying after reaching 1 year of age and before reaching 5 years of age was at 9 per 1000 live births.

The burden of neonatal mortality is uneven across regions. Some countries have relatively high neonatal mortality given their level of under-five mortality. Most of these countries are in Southern Asia. Sub-Saharan Africa had the highest neonatal mortality rate in 2022, at 27 deaths per 1000 live births, followed by Central and Southern Asia with 21 deaths per 1000 live births. A child born in

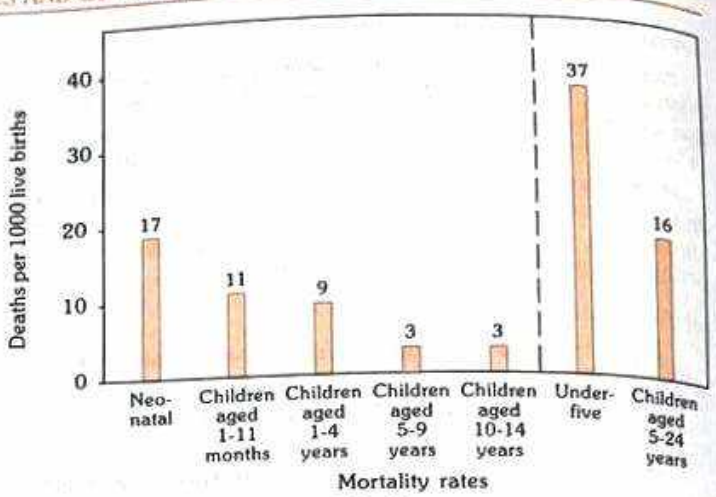


FIG. 14
Global mortality rates by age, 2022

Source : *(6)*

Sub-Saharan Africa is 11 times more likely to die in the first month than a child born in high-income country *(6)*.

India

In India the SRS estimates for the year 2020 was about 15 per 1000 live births, in early-neonatal period (0–7 days), with about 17 for rural areas and 9 for urban areas. Table 19 shows the early neonatal mortality rate and percentage share of early neonatal mortality to infant deaths in the country and the major states. Among the bigger states,

TABLE 19
Early neonatal mortality rates and percentage share of early neonatal deaths to infant deaths by residence, India and bigger states/UTs, 2020

India and bigger states/UTs	Early neonatal mortality rate			Percentage of early neonatal deaths to infant deaths		
	Total	Rural	Urban	Total	Rural	Urban
India	15	17	9	53.3	54.7	46.8
Andhra Pradesh	13	15	6	52.6	57.9	35.1
Assam	14	15	6	39.6	39.6	38.1
Bihar	16	17	12	59.5	60.9	47.4
Chhattisgarh	20	20	18	51.9	50.5	59.5
Delhi	6	8	6	49.0	40.0	49.4
Gujarat	11	14	8	50.5	51.5	48.1
Haryana	14	17	10	51.4	54.4	43.7
Himachal Pradesh*	10	10	6	54.9	55.6	41.3
Jammu & Kashmir	8	8	6	47.3	48.3	42.9
Jharkhand	13	15	8	53.6	56.4	39.3
Karnataka	11	13	6	55.5	61.8	40.8
Kerala	4	2	6	60.7	48.9	66.7
Madhya Pradesh	23	25	16	52.8	52.5	54.6
Maharashtra	8	11	5	50.8	54.1	43.1
Odisha	21	22	14	58.1	58.8	52.3
Punjab	9	9	9	46.8	44.6	50.3
Rajasthan	16	18	11	50.4	50.6	49.0
Tamil Nadu	6	9	4	50.0	56.6	41.1
Telangana	10	13	7	48.4	51.3	41.8
Uttar Pradesh	21	23	13	54.8	56.5	45.9
Uttarakhand	13	12	15	51.7	48.1	62.1
West Bengal	10	11	8	54.2	56.9	44.7

*(Based on three year period 2018–2020)

Source : *(73)*

Kerala (4), Madhya Pradesh (23), and Odisha (21) are the two extremes. The percentage of early neonatal deaths to the total infant deaths during the year 2020, at the national level, has been 53.3, and it varied from 54.7 in rural areas to 46.8 in urban areas. In most of the states rural proportion is relatively higher than the urban proportion. Among the bigger states, the percentage for total varied from 39.6 in Assam to 60.7 in Kerala.

Table 20 shows the neonatal mortality rate in the country and the percentage of neonatal deaths to infant deaths for the year 2020, both at the national and state levels. At the national level, the neonatal mortality rate was 20 and ranged from 12 in urban areas to 23 in rural areas. Among the bigger states neonatal mortality ranges from 31 in Madhya Pradesh to 4 in Kerala. The percentage of neonatal deaths to total infant deaths was 71.9 per cent at the national level and varied from 62.4 per cent in urban areas to 74.1 per cent in rural areas. Among the bigger states Bihar (77.7) registered the highest percentage of neonatal deaths to infant deaths, and the lowest was in Assam (53.0).

TABLE 20

Neonatal mortality rates and percentage share of neonatal deaths to infant deaths by residence, India and bigger states, 2020

India and bigger states/UTs	Neonatal mortality rate			Percentage of neonatal deaths to infant deaths		
	Total	Rural	Urban	Total	Rural	Urban
India	20	23	12	71.9	74.1	62.4
Andhra Pradesh	17	21	8	70.3	77.7	45.4
Assam	19	20	10	53.0	52.6	61.7
Bihar	21	22	17	77.7	79.0	66.6
Chhattisgarh	26	28	20	68.8	69.3	65.9
Delhi	9	12	9	71.3	60.0	71.8
Gujarat	16	20	9	68.7	73.6	56.8
Haryana	19	22	15	68.6	70.3	64.2
Himachal Pradesh*	13	13	10	72.7	73.0	66.5
Jammu & Kashmir	12	12	10	71.1	70.5	73.9
Jharkhand	17	19	11	68.8	71.8	53.2
Karnataka	14	18	8	74.7	85.0	50.5
Kerala	4	3	6	66.4	66.0	66.7
Madhya Pradesh	31	34	19	70.8	71.8	64.8
Maharashtra	11	15	6	70.2	75.3	58.3
Odisha	28	29	20	77.6	78.2	72.1
Punjab	12	12	12	65.7	63.7	69.0
Rajasthan	23	26	14	71.5	73.6	60.7
Tamil Nadu	9	12	6	70.5	78.6	59.6
Telangana	15	17	13	71.8	68.7	79.0
Uttar Pradesh	28	31	18	74.1	76.1	63.8
Uttarakhand	17	17	18	71.0	70.1	73.8
West Bengal	14	15	11	72.9	76.1	61.5

*(Based on three year period 2018–2020)

Source : *(73)*

CAUSES OF NEONATAL DEATHS IN INDIA

The major causes of neonatal deaths are shown in Fig. 15.

It is estimated that 40 per cent of all stillbirths and neonatal deaths take place during labour and the day of birth, and about 75 per cent of total neonatal deaths occur within the first week of life. Notably half of all the maternal deaths also take place in this period *(85)*.

India accounts for 40 per cent of the global burden of low birth weight babies with 7.5 million babies (or about 30 per cent of the country's total annual live births) being born with a birth weight less than 2500 grams. Of these 7.5 million babies, about 60 per cent are born at term after foetal growth retardation, while the remaining 40 per cent are born preterm, constituting one fourth of global burden of preterm births. Preterm babies in addition to being at a higher risk of neonatal mortality, are at an increased risk of post-neonatal mortality, stunting, and long-term neuro-developmental impairment during childhood *(85)*.

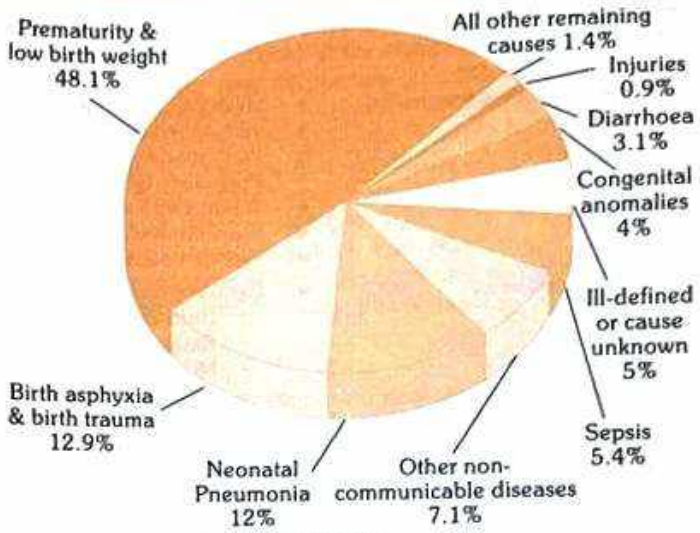


FIG. 15

Causes of neonatal deaths in India, 2017

Source : *(89)*

Interventions for the reduction of neonatal mortality

Measures to reduce neonatal mortality rates and to improve newborn health are enumerated in Table 21.

POST-NEONATAL MORTALITY RATE

Deaths occurring from 28 days of life to under one year are called "post-neonatal deaths". The post-neonatal death rate is defined as : "the ratio of post-neonatal deaths in a given year to the total number of live births in the same year; usually expressed as a rate per 1000" *(90)*.

The post-neonatal mortality rate is tabulated as :

$$= \frac{\text{Number of deaths of children between 28 days and one year of age in a given year}}{\text{Total live births in the same year}} \times 1000$$

Whereas neonatal mortality is dominated by endogenous factors, post-neonatal mortality is dominated by exogenous (e.g., environmental and social) factors. Diarrhoea and respiratory infections are the main causes of death during the post-neonatal period. Malnutrition is an additional factor, reinforcing the adverse effects of the infections. In the developed countries, the main cause of post-neonatal mortality is congenital anomalies. Studies show that post-neonatal mortality increases steadily with birth order, and that infants born into already large families run a higher risk of death from infectious diseases.

In some areas of South East Asia (including India), during the post-neonatal period girls die more frequently than boys. This is attributed to neglect of the female children in terms of nutrition and health care.

The SRS estimates for post-neonatal mortality rate in

TABLE 21
Priority areas to improve newborn health

Before and during pregnancy	• Delayed child-bearing. • Well-timed, well-spaced and wanted pregnancies • Well-nourished and healthy mother • Pregnancy free of drug abuse, tobacco and alcohol • Tetanus and rubella immunization • Prevention of mother-to-child transmission of HIV • Female education
During preganancy	• Early contact with health systems including : – Birth and emergency preparedness – Early detection and treatment of maternal complications – Monitoring of foetal well-being and timely interventions for foetal complications – Tetanus immunization – Prevention and treatment of anaemia – Prevention and treatment of infections (malaria, hookworm, syphilis and other STIs) – Voluntary HIV counselling and testing, and prevention of mother-to-child transmission of HIV • Good diet • Prevention of violence against women
During and soon after delivery	• Safe and clean delivery by skilled attendant • Early detection and prompt management of delivery and foetal complications • Emergency obstetric care for maternal and foetal conditions • Newborn resuscitation • Newborn care ensuring warmth and cleanliness • Newborn cord, eye and skin care • Early initiation of exclusive breast-feeding • Early detection and treatment of complications of the newborn • Special care for infants born too early or too small and/or complications • Prevention and control of infections • Prevention of mother-to-child transmission of HIV • Information and counselling on home care, danger signs and care seeking
During the first month of life	• Early post-natal contact • Protection, promotion and support of exclusive breast feeding • Prompt detection and management of diseases in newborn infant • Immunization • Protection of girl child

Source : *(91)*

India for the year 2020 was about 8 per 1000 live births for the whole country, and 8 for rural areas and 7 for the urban areas. The state-wise break-up is shown in Table 22.

TABLE 22
SRS estimates of post neonatal mortality in India, 2020

State	Post-neonatal mortality rate		
	Total	Urban	Rural
Andhra Pradesh	7	10	6
Assam	17	6	18
Bihar	6	8	6
Chhattisgarh	12	11	12
Gujarat	7	7	7
Haryana	9	8	9
Himachal Pradesh	5	5	5
Jharkhand	8	10	7
Karnataka	5	8	3
Kerala	2	3	1
Madhya Pradesh	13	10	13
Maharashtra	5	4	5
Odisha	8	8	8
Punjab	6	5	7
Rajasthan	9	9	9
Tamil Nadu	4	4	3
Telangana	6	4	8
Uttar Pradesh	10	10	10
Uttarakahand	7	6	7
West Bengal	5	7	5
India	8	7	8

Source : *(73)*

INFANT MORTALITY RATE

Infant mortality rate (IMR) is defined as "the ratio o infant deaths registered in a given year to the total numbe of live births registered in the same year; usually expresse as a rate per 1000 live births" *(92)*. It is given by th formula :

$$IMR = \frac{\text{Number of deaths of children less than 1 year of age in a year}}{\text{Number of live births in the same year}} \times 1000$$

IMR is universally regarded not only as a most importa indicator of the health status of a community but also the level of living of people in general, and effectivene of MCH services in particular. Infant mortality is given separate treatment by demographers because : (a) infa mortality is the largest single age–category of mortalit (b) deaths at this age are due to a peculiar set of diseas and conditions to which the adult population is less expos or less vulnerable; (c) infant mortality is affected rath quickly and directly by specific health programm and hence may change more rapidly than the general dea rate.

International comparisons

During the past decades, there has been a steady decli in infant mortality (Table 23)

TABLE 23

Infant mortality rate in selected countries (1990–2022)

Country	1990	2022
India	88	26
Sri Lanka	18	6
Bangladesh	100	24
Pakistan	106	51
Thailand	30	7
Myanmar	78	32
China	42	5
Nepal	99	22
New Zealand	9	4
USA	9	5
UK	8	4
Japan	5	2
World	63	28

1990 is the baseline for MDGs

Source : *(6)*

There are wide variations between countries or regions in the levels of infant mortality. The world average of IMR for 2022 has been estimated at about 28 per 1000 live births. However, IMR varies from 4 per 1000 live births in the developed countries to 46 per 1000 live births in the least developed countries. The average in the South Asian countries was 31 per 1000 live births. Although infant mortality declined significantly, the drop was greatest for the developed countries and lowest for least developed countries. The developed world had a much greater reduction in infant mortality compared to child mortality, while in the developing world the situation was reverse *(6)*.

The IMRs in industrialized countries were around 200 or even more, some 150 years ago. Even at the beginning of the 20th century. USA, UK, Japan, France, etc, had rates above 140 per 1000 live births. Within 50 years (1950) a spectacular fall in the rate was observed in all developed countries. By 1980s, most developed countries achieved IMR rates below 10 per 1000 live births. Demographers opine that in most developed countries, further decline in IMRs would be difficult to achieve without some revolutionary advances in perinatology. Any further reduction in infant mortality in developed countries will depend upon preventing one of its principal causes, namely, congenital abnormalities.

In general, the infant mortality rates reflect the socio-economic development of a country. Deaths during the first four weeks are largely preventable by good health care. Much of the variations between developed and developing world in death among newborn can be explained by differences in antenatal care – about half of all pregnant women in the least developed countries have no antenatal care, and 7 out of 10 babies are born without the help of a trained birth attendant. The other major factors being malnutrition and high parity of the mother, low birth weight of the baby, and congenital anomalies.

The decline in infant mortality has been attributed to : (a) improved obstetric and perinatal care, e.g., availability of oxygen, foetal monitoring during labour, improved techniques for the induction of labour (b) improvement in the quality of life, that is, economic and social progress (c) better control of communicable diseases, e.g., immunization and oral rehydration (d) advances in chemotherapy, antibiotics and insecticides (e) better nutrition, e.g., emphasis on breast feeding, and (f) family planning, e.g., birth spacing.

In the industrial world, the dominant factor in the decline of infant mortality was economic and social progress (i.e., quality of life), with medical services playing secondary role. On the other hand, in most of the developing countries, this pattern has been almost turned upside down. That is, medical services (e.g., mass control of disease, immunization, antibiotics and insecticides) have made the major impact, with social and economic progress taking the supporting role. Therefore, infant mortality rates are reluctant to fall below 100 per 1000 live births in many developing countries. It is now conceded that only socio-economic development can re-accelerate the progress and lead to further significant fall in infant deaths.

Infant mortality in India

India is still among high infant mortality rate countries (28 in the year 2020). IMR has declined slowly from 204 during 1911–15, to 129 per 1000 live births in 1970 and remained static at around 127 for many years, and then declined a bit once again to 114 in 1980 and coming down to 28 in the year 2020. Despite this significant decline, the rates are high as compared to developed countries (Table 23) which are now mostly in the range of 3–7 per 1000 live births.

India is a vast country with widely differing populations. The all-India rate masks variations that exist among sub-groups of the population. An examination of state-wise IMR for the year 2020 shows a vast regional variation, with Madhya Pradesh having IMR of 43 and Kerala as low as 6 per thousand live births during the year 2020. Among the larger States Kerala, Maharashtra, Punjab, Tamil Nadu, West Bengal, Andhra Pradesh, Haryana, Karnataka, Gujarat, Himachal pradesh, Bihar, and Jharkhand have achieved IMR below the national average of 28. Within each state there is rural urban variation. A critical infant mortality belt runs through Odisha, Madhya Pradesh, Assam, Chhattisgarh, Uttar Pradesh, and Rajasthan; all these states have infant mortality rates above the national average.

Table 24 shows infant mortality rates in major states of India.

TABLE 24

Infant mortality rates in major states of India (2020)

India and major states/UTs	Total	Rural	Urban
Andhra Pradesh	24	26	18
Assam	36	39	17
Bihar	27	27	25
Chhattisgarh	38	40	31
Delhi	12	20	12
Gujarat	23	27	17
Haryana	28	31	23
Himachal Pradesh*	17	18	15
Jammu & Kashmir	17	18	13
Jharkhand	25	26	21
Karnataka	19	21	16
Kerala	6	4	9
Madhya Pradesh	43	47	30
Maharashtra	16	20	11
Odisha	36	37	28
Punjab	18	19	17
Rajasthan	32	35	23
Tamil Nadu	13	15	10
Telangana	21	24	17
Uttar Pradesh	38	40	28
Uttarakhand	24	25	24
West Bengal	19	19	17
India	28	31	19

Source : *(73)*

There is plenty of evidence to show that better control of infant mortality is related to a wider spread of literacy (particularly female literacy) and primary health care. Also, the states with the highest infant mortality are also the states with the highest fertility. Table 25 illustrates the impact of the above variables on infant mortality.

TABLE 25
IMR, female literacy rate and birth rate in major Indian States

State	IMR per 1000 live births (2020)	Female literacy rate (2011)	Birth rate per 1000 population (2020)
Andhra Pradesh	24	59.74	15.7
Assam	36	67.27	20.8
Bihar	27	53.33	25.5
Chhattisgarh	38	60.59	22.0
Gujarat	23	70.73	19.3
Haryana	28	66.77	19.9
Himachal Pradesh	17	76.60	15.3
Jharkhand	25	56.21	22.0
Karnataka	19	63.13	16.5
Kerala	6	91.98	13.2
Madhya Pradesh	43	60.20	24.1
Maharashtra	16	70.48	15.0
Odisha	36	64.36	17.7
Punjab	18	71.34	14.3
Rajasthan	32	52.66	23.5
Tamil Nadu	13	73.86	13.8
Telangana	21	–	16.4
Uttar Pradesh	38	59.26	25.1
Uttarakhand	24	–	16.6
West Bengal	19	71.16	14.6

Source : *(73, 93, 94)*

Table 25 shows that Kerala has managed to surpass all the Indian states in certain important measures of social development. It has the lowest infant mortality rate, the lowest birth rate and the highest literacy rate.

Mortality pattern

(a) *Age* : Deaths in the age–group 0–1 year account for 10.5 per cent of the total deaths in the country. About 71.7 per cent of infant deaths occur within the first month (neonatal period) of life. Of these, 54.6 per cent may die during the first week of birth *(73)*. The risk of death is the greatest during the first 24–48 hours after birth. The problem is more acute in rural areas where expert obstetric care is scarce. (b) *Sex* : Whereas in all developed countries, male death rates are higher than female deaths, in India, after the age of one month (post-neonatal period) female deaths are invariably higher than male deaths. Social scientists have attributed this phenomenon to social factors unfavourable to females in India *(95)*.

Medical causes of infant mortality

The causes of infant mortality are multifactorial. The medical causes are shown in Table 26 under two subdivisions – neonatal and post-neonatal mortality.

TABLE 26
Causes of infant mortality

Neonatal mortality (0–4 weeks)	Post-neonatal mortality (1–12 months)
1. Low birth weight and prematurity	1. Diarrhoeal diseases
2. Birth injury and difficult labour	2. Acute respiratory infections
3. Sepsis	3. Other communicable diseases
4. Congenital anomalies	4. Malnutrition
5. Haemolytic diseases of newborn	5. Congenital anomalies
6. Conditions of placenta and cord	6. Accidents
7. Diarrhoeal diseases	
8. Acute respiratory infections	
9. Tetanus	

The principal causes of infant mortality in India are low birth weight (57%), respiratory infections (17%), diarrhoeal diseases (4%), congenital malformations (5%) and cord infection (2%), birth injury (3%) and unclassified about (18%) *(62)*. Neonatal deaths make a major contribution to infant mortality. Whereas in developing countries, the high infant mortality is mainly due to low birth weight, and the combined effects of infection (e.g., diarrhoea, respiratory infections) and malnutrition, in developed countries, it is mainly due to congenital anomalies, anoxia and hypoxia.

Factors affecting infant mortality

Infant mortality is due to the interaction of several factors in combination. They may be classified as biological, economic and social factors.

1. BIOLOGICAL FACTORS

(a) *Birth weight*

Birth weight is a major determinant of infant and perinatal mortality and morbidity. Babies of low birth weight (under 2.5 kg) and high birth weight (over 4 kg) are at special risk. Virtually, all infants weighing less than 1000 g at birth succumb. One major cause of low birth weight is poor maternal nutrition – not only during pregnancy, but even before that. It has been observed that the mother who was adequately nourished during her own growing-up years has an excellent chance of delivering a normal size baby even if she has taken an inadequate diet during her pregnancy. An increase in birth weight would lower the perinatal and neonatal mortality.

(b) *Age of the mother*

There is a definite relationship between the age of the mother and the fate of the child. Infant mortality rates are greater when the mother is either very young (below the age of 19 years) or relatively older (over 30 years). Very young mothers also tend to be poorer and less educated *(96)*.

(c) *Birth order*

The live births are classified according to their order of rank. The highest mortality is found among first born, and the lowest among those born second. The risk of infant mortality escalates after the third birth. The fate of the 5th and later children is always worse than the fate of the 3rd child. Infant mortality from nutritional deficiencies are 3–4 times higher for infants born with fifth or higher birth order compared to the first three. These deaths occur mostly in post-neonatal period.

(d) *Birth spacing*

Repeated pregnancies exert a great influence on infant mortality. They cause malnutrition and anaemia in the

mother, again predispose to low birth weight, which results in higher infant death. The mother who becomes pregnant again too early and whose youngest baby is displaced from the breast, and prematurely weaned – that baby is more prone to develop (a) protein energy malnutrition (b) diarrhoea and dehydration, both of which cause an increased mortality in infants and young children. The Khanna Study in India showed that IMR was highest for infants born after an interval of one year, lower for those born after an interval of 2–3 years, and lowest for those born after an interval of 4 years *(97)*. A WHO study in rural India also showed similar findings *(98)*. Evidence from the World Fertility Survey – the largest survey into human behaviour ever undertaken – suggests that the risks to life for babies born within a year of each other is 2–4 times higher than for babies born more than 2 years apart. Wider spacing of births curtails infant mortality, and is considered as important part of health care as immunization *(99)*.

(e) *Multiple births*

Infants born in multiple births face a greater risk of death than do those in single births due in large part to the greater frequency of low birth weight among the former.

(f) *Family size*

Studies show the infant mortality increases with family size. The number of episodes of infectious diarrhoea, prevalence of malnutrition, and severe respiratory infections have been found to increase with family size. Besides the frequency of disease, the duration of illness is also affected by the family size. It was found that the duration of illness is much longer in families with 3 or more children. Deprivation of maternal care is also found in large families. Fewer children would mean better maternal care, a better share of family resources, less morbidity and greatly decreased infant mortality.

(g) *High fertility*

Fertility is one of the most important factors that influence infant mortality. High fertility and high infant mortality go together.

(2) ECONOMIC FACTORS

One of the most important variables affecting infant mortality rates, both directly and indirectly, is socio-economic status. The availability and quality of health care and the nature of the child's environment are closely related to socio-economic status. Statistics reveal that infant mortality rates are highest in the slums and lowest in the richer residential localities. Major improvements in health status and a decrease in infant mortality require continuing socio-economic development, including provision of health services.

(3) CULTURAL AND SOCIAL FACTORS

(a) *Breast-feeding*

Infant health is related to breast feeding because of the nutritional content and natural immunizing agents contained in breast milk, at least for fully breast-fed infants. Early weaning and bottle-fed infants living under poor hygienic conditions are more prone to die than the breast-fed infants living under similar conditions.

(b) *Religion and caste*

The differences are attributed to socio-cultural patterns of living, involving age-old habits, customs, traditions affecting cleanliness, eating, clothing, child care and almost every detail of daily living.

(c) *Early marriages*

The baby of teen-age mother has the highest risk for neonatal and post-neonatal mortality.

(d) *Sex of the child*

In most parts of India, female infants receive far less attention than males. This is especially the case, where there are already several female children. In many families, the birth of a female child is unwelcome. Statistics show that female infant mortality is higher than the male infant mortality. But when the total infant mortality is split into neonatal and postneonatal deaths, the picture gets reversed, i.e., neonatal death rate is higher for males than for female infants; post-neonatal death rate is higher for female infants than male infants *(95)*.

(e) *Quality of mothering*

The art of child care has to be learnt. Even in conditions of extreme poverty, children could reasonably survive if they had an efficient mother. It is the "quality of mothering" that helps to reduce infant mortality.

(f) *Maternal education*

Illiteracy is the greatest barrier to any improvement in the health conditions. Mother's education level, even within the same socio-economic class is a key determinant of their children's health. There is extensive evidence (e.g. Kerala experience) that maternal education plays a major role in the decline of infant and child mortality, presumably reflecting personal health behaviour, care and access to and use of health services. Women with schooling tend to marry later, delay child-bearing and are more likely to practice family planning. They generally have fewer children with wider spacing between births.

(g) *Quality of health care*

Another likely factor affecting infant mortality in contemporary India is inadequate prenatal care and infrequent attendance at delivery.

The percentage of deliveries attended by untrained persons or relatives is very high in rural India. Shortage of trained personnel like dais, midwives and health visitors is another determinant of high infant mortality in India. According to estimates only 47 per cent of the deliveries are attended by trained birth attendants.

(h) *Broken families*

Infant mortality tends to be high where the mother or father has died or separated.

(i) *Illegitimacy*

Illegitimacy is also an important factor contributing to high infant mortality rate. A child born out of wedlock is generally unwanted both by the mother as well as society. Consequently such a child does not receive the care in terms of nutrition and medical care that it needs.

(j) *Brutal habits and customs*

Certain age-old customs and beliefs greatly influence infant mortality rate. These include depriving the baby of the first milk or colostrum, frequent purgation, branding the skin, application of cowdung to the cut end of umbilical cord, faulty feeding practices and early weaning.

(k) *The indigenous dai*

The untrained midwife is greatly responsible for the high infant mortality in India. She is usually an illiterate person devoid of all knowledge of rules of hygiene. Her unhygienic delivery practice is an important cause of high infant mortality.

(l) *Bad environmental sanitation*

Infants are highly susceptible to bad environmental sanitation. Lack of safe water supply, poor housing conditions, bad drainage, overcrowding, and insect breeding, all increase the risk of infant mortality.

The fourth National Family Health Survey conducted in India during 2019–2021 provides vast information on factors associated with mortality in infancy and childhood.

Preventive and social measures

There is no single specific health programme or a single set of action that can reduce IMR. Since the aetiology of infant and perinatal mortality is multifactorial, nothing less than a multipronged approach will reduce infant and perinatal mortality. Under ideal conditions of Social Welfare, no baby should die, except possibly the few who are born with serious handicaps such as congenital abnormalities or disorders originating in uterine life. The measures needed to achieve reduction of infant mortality comprise the following :

1. *Prenatal nutrition*

The risk of death begins to appear even before birth, if the mother is malnourished. Therefore, the very first need is to improve the state of maternal nutrition. There is mounting evidence that the addition of even a small amount of extra food by way of supplementation to the mother's basic diet goes a long way in improving the birth weight of babies. In a controlled study in India, poor women were fed an additional 500 kcals and 10 g of protein during the last 4 weeks of pregnancy. Their infants' birth weights were on an average 300 g above those infants born to the control group *(100, 101)*. This points to the need for food supplementation programmes during pregnancy. ICDS (Integrated Child Development Services) in India is active in this field.

2. *Prevention of infection*

The major causes of sickness and death of children in India are infectious diseases, many of which are preventable by immunization, as for example, neonatal tetanus. A large number of cases of EPI targeted diseases are reported each year. The Universal Immunization Programme launched in 1985 aims at providing protection to all the expectant mothers and children against 9 vaccine preventable diseases, and thereby ensure greater child survival.

3. *Breast-feeding*

The most effective measure for lowering infant mortality is to promote breast-feeding, which is a safeguard against gastrointestinal and respiratory infections and PEM.

4. *Growth monitoring*

It is a low cost technology available for reducing infant mortality. All infants should be weighed periodically (at least once a month) and their growth charts maintained. These charts help to identify children at risk of malnutrition early. Babies who do not thrive or show growth failure are given special health care to pull them on to the road-to-health. Thus systematic use of growth chart will help to promote health in children.

5. *Family planning*

Family limitation and spacing of births contribute substantially to lowering of infant mortality rate. The risk of death is greatly enhanced if the last child was born less than 2 years ago, and if the mother already has four or more children. Smaller sibship and longer spacing between pregnancies are associated in all societies with improved infant and child survival.

6. *Sanitation*

For infants and young children, the risk of dying is very closely related to the environment in which they live. Exposure to infections through contaminated food and polluted water, lack of elementary hygiene, flies and poor housing pose hazards which the young cannot escape. This is why infant mortality rate is universally recognized not only as a most important indicator of the health status of the children, but also of the level of social environment.

7. *Provision of primary health care*

(a) All those involved in maternity care, from the obstetrician down to the local dai should collaborate and work together as a team, (b) Prenatal care must be improved with a view to detecting mothers with "high-risk factors", and those with prenatal conditions associated with high-risk (e.g., toxaemia of pregnancy, antipartum haemorrhage, diabetes mellitus) are hospitalized and treated. (c) "Special care baby units" must be provided for all babies weighing less than 2000 g. (d) Proper referral services.

8. *Socio-economic development*

Since the causes of infant and perinatal mortality are also social, there is no getting away from the fact that the ultimate solution for lowering IMR and PMR lies in socio-economic development. This must include spread of education (especially female literacy), improvement of nutritional standards, provision of safe water and basic sanitation, improvement of housing conditions, the growth of agriculture and industry and the availability of commerce and communication; in short, it implies allround health and social development of the community.

9. *Education*

Education of females as a driving force for better health has been extensively studied and documented. Educated women generally do not have early pregnancies, are able to space their pregnancies, have better access to information related to personal hygiene and care of their children, and make better use of health care services. Higher literacy rate among women is associated with low fertility and low maternal mortality, as well as low infant mortality. A study during 1991 in the Indian State of Tamil Nadu, with a population of more than 60 million, showed that a mid-day meal programme for school children together with improvement of health care for women and their babies raised retention levels in school, reduced child mortality, increased immunization rates and led to dramatic fall in infant deaths from 90 per 1000 live births in 1984 to 57 in 1991. This in turn seems to have reduced the fertility level to 2.5 children per women in 1991 *(40)*, and Tamil Nadu has now achieved zero population growth.

1–4 YEAR MORTALITY RATE
(Child death rate)

Child death rate is the number of deaths of children aged 1–4 years per 1000 children in the same age group in a given year. It thus excludes infant mortality. The rate is computed by the formula :

$$= \frac{\text{No. of deaths of children aged 1–4 years during a year}}{\text{Total no. of children aged 1–4 years at the middle of the year}} \times 1000$$

The child death rate is a more refined indicator of the social situation in a country than infant mortality rate. It reflects the adverse environmental health hazards (e.g., malnutrition, poor hygiene, infections and accidents), including economic, educational and cultural characteristics of the family. Mortality in this age group no longer depends on perinatal hazards and other endogenous factors, which often cause loss of life during the first year of life.

In the age group 1–4 years, the second year is the period when the young child runs the highest risk of dying. In the developing countries, death in the second year of life commonly accounts for 50 per cent of all deaths between 1–4 years of age. After the second year, death rates decline progressively. The infectious diseases of childhood such as measles, whooping cough, diphtheria, diarrhoea and acute respiratory infections affect mostly this age group, and can lead to high case-fatality rate in malnourished children.

Mortality rate at ages 1–4 years is about 30 in some developing countries whereas it is less than one in developed countries. The contrast is glaring. While on an average, the IMR is 10–20 times higher in developing countries than in the developed countries, the average mortality rate between the age 1–4 years is 30–50 times higher.

In India, for the year 2020, 1–4 years age crude death rate was estimated to be 1.0 per cent of total deaths. Like infant mortality, 1–4 year age mortality also shows wide state-wise variations as shown in Table 27. The states reporting rates higher than the national average are Madhya Pradesh 2.0, Rajasthan 1.9, Himachal Pradesh 1.7, Uttar Pradesh 1.4, and Haryana with 1.2 *(73)*. Tamil Nadu recorded the lowest with 0.2 per cent followed by Gujarat with 0.3 per cent.

TABLE 27

SRS estimates for child death (1-4 years) and under-five mortality in major states of India, 2020

State	Child death (1–4 years) crude death rate	Under-five mortality rate (per 1000 live births)		
		Total	Rural	Urban
Andhra Pradesh	0.7	27	29	21
Assam	0.9	40	42	19
Bihar	0.8	30	31	27
Chhattisgarh	0.8	41	43	31
Delhi	0.6	14	20	14
Gujarat	0.3	24	28	17
Haryana	1.2	33	37	25
Himachal Pradesh*	1.7	24	24	18
Jammu & Kashmir	0.2	17	18	14
Jharkhand	0.4	27	28	22
Karnataka	0.6	21	23	18
Kerala	0.5	8	5	12
Madhya Pradesh	2.0	51	56	33
Maharashtra	0.6	18	23	12
Odisha	0.9	39	40	31
Punjab	0.9	22	24	18
Rajasthan	1.9	40	43	27
Tamil Nadu	0.2	13	16	11
Telangana	0.4	23	25	19
Uttar Pradesh	1.4	43	46	32
Uttarakhand	0.4	26	26	26
West Bengal	0.8	22	22	20
India	1.0	32	36	21

*(Based on three year period 2018–2020)

Source : *(73)*

Leading causes of death

The leading causes of death in the 1–4 years age group are as shown in Table 28.

TABLE 28

Leading causes of death in 1–4 years age group

Developing countries	Developed countries
Diarrhoeal diseases	Accidents
Respiratory infections	Congenital anomalies
Malnutrition	Malignant neoplasms
Infectious diseases (e.g., measles, whooping cough)	Influenza
Other febrile diseases	Pneumonia
Accidents and injuries	

The leading causes of death in 1–4 years age group in developing countries are diarrhoeal diseases and respiratory infections, closely followed by other communicable diseases such as whooping cough and measles. When combined with malnutrition these diseases have high case fatality rates. In the developed countries deaths from infectious diseases are quite rare, while accidents are the leading cause of death from the age of one year. Four groups of home accidents have been identified – (a) falls from unprotected stairs, and balconies (b) suffocation (c) burns and scalds (d) poisoning. Almost all accidents are preventable. The factors such as congenital anomalies and neoplasms are not easy to prevent or to cure. These conditions also affect children in developing countries, but their relative importance is overshadowed by infections.

UNDER-5 MORTALITY RATE
(Child mortality rate)

UNICEF defines this as the "annual number of deaths of children age under 5 years, expressed as a rate per 1000 live births." More specifically, it measures the probability of dying between birth and exactly 5 years of age. UNICEF considers this as the best single indicator of social development and well-being rather than GNP per capita, as the former reflects income, nutrition, health care and basic education etc *(102)*. The rate is calculated by the formula :

$$\text{Child mortality rate} = \frac{\text{Number of deaths of children less than 5 years of age in a given year}}{\text{Number of live births in the same year}} \times 1000$$

Around the world, remarkable progress in child survival has been made and millions of children have better survival chances than in 1990. The under-5 mortality rate fell to 37 deaths per 1000 live births in 2022, from 126 in 1990 – a 62 per cent reduction. This is equivalent to 1 in 11 children dying before reaching age 5 years in 1990, compared to 1 in 26 in 2022. In most of the SDG regions, the under-5 mortality rate was reduced by at least half since 1990. The total number of under-5 deaths dropped to 4.9 million in 2022 from 12.6 million in 1990. On average, 13,400 children died every day in 2022, as compared to 34,000 in 1990 *(88)*.

Despite progress over the past 2 decades, millions of newborns and children die every year, mostly from preventable or treatable causes such as infectious diseases and injuries. These deaths reflect the limited access of children and communities to basic medical treatment of infectious diseases, adequate nutrition, health interventions such as vaccination, clean water and sanitation. Children face wide-spread regional and income disparities in their chances of survival. Sub-Saharan Africa continues to be the region with the highest under-five mortality rate in the world – 71

deaths per 1000 live births in 2022. This translates to 1 child in 13 dying before his fifth birthday - 14 times higher than the average ratio of 1 in 185 in high income countries and 20 times higher than the ratio of 1 in 263 in the region of Australia and New Zealand. In 2022, about 26 per cent under-five mortality occurred in Southern Asia. About 38 per cent of all deaths occur in least developed countries. The number of countries with gender disparities in child mortality continues to decline. On an average, boys are expected to have a higher probability of dying before reaching age 5 years than girls. The estimated under-5 mortality rate in 2022 was 39 deaths per 1000 lives birth for boys and 35 deaths per 1000 live births for girls. In 2022, an estimated 2.7 million boys and 2.3 million girls under 5 years of age died *(6)*.

A recent analysis showed that children in the poorest households are nearly twice likely to die before the age of 5 as those from the richest. The risk of death in rural areas is 1.5 times higher than for children in the urban areas and within urban areas children from poorer household tend to have higher mortality rates. Children of mothers who lack any education are 2.6 times more likely to die before reaching 5 years age. Poor air quality is another risk factor for child mortality *(103)*.

Table 29 shows child mortality rate in some selected developed and developing countries.

TABLE 29

Under-5 mortality rate in some selected countries during 1990 and mid 2022

(Per 1000 live births)

Country	1990	2022
India	126	29.0
Sri Lanka	21	6.0
Thailand	37	8.0
Nepal	142	27.0
China	54	7.0
Bangladesh	144	29.0
Pakistan	139	61.0
UK	9	4.0
USA	11	6.0
Japan	6	2.0
Singapore	8	2.0
World	90	37.0

Source : *(6)*

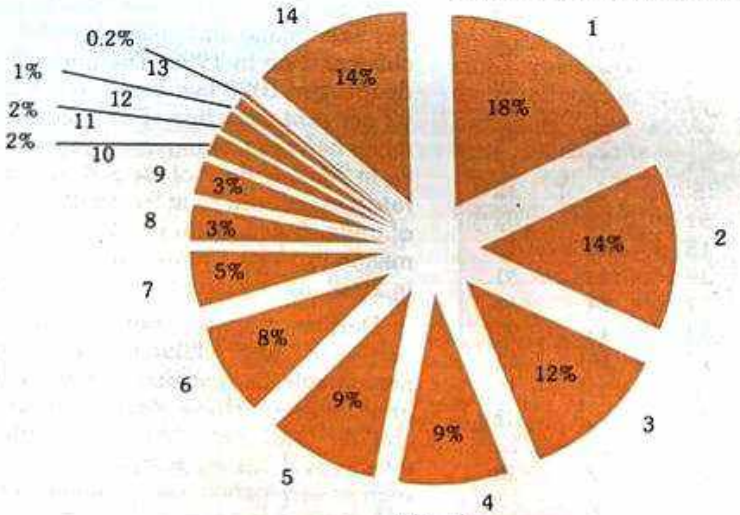
Causes of under five deaths

Understanding the causes of child mortality provides important public health insights. Of the 5.3 million deaths in children under-5, that occurred in 2018, almost 40% were caused by infectious diseases and conditions such as pneumonia, diarrhoea, malaria, meningitis, tetanus, HIV and measles. Around 47% of all under-five deaths occurred in the neonatal period (within the first 28 days of life), the majority from preterm birth complications and intrapartum-related complications (complications during delivery). Globally, more than half of the under-five deaths are attributable to undernutrition *(104)*.

Worldwide, the leading causes of death among children under-5 years include pneumonia (12% of all under-five deaths), preterm birth complications (16%), diarrhoea (8%), intrapartum-related complications (11%), malaria (5%), and neonatal sepsis (7.0%), meningitis (2.1%), tetanus (0.1%), measles (2%), injury (6%) and others (12%). Cross-country comparisons show a wide variation among countries in the proportions of under-five deaths attributable to specific causes. Such variations indicate that optimal programmatic approaches for child survival will differ from country to country. Fig. 16 shows the causes of death of children under-five in 2018.

Summarizing data across regions and countries masks substantial differences in the distribution of causes of death. Approximately 90% of all malaria and HIV/AIDS deaths in children, more than 50% of measles deaths and about 40% of pneumonia and diarrhoeal deaths are in the African Region. On the other hand, deaths from injuries and non-communicable diseases other than congenital anomalies, account for 20–30% of under-five deaths in the region of the Americas and in the European and Western Pacific Regions *(105)*.

The steady improvement in under-five survival is explained by a combination of advances. They include developments in science and technology (for example, oral rehydration salts that treat diarrhoeal dehydration and insecticide-treated mosquito nets for malaria prevention), improved health-seeking behaviours (such as women's increasing use of antenatal care and skilled providers for care around the time of birth), improved sanitation and improved coverage of effective interventions to prevent or treat the most important causes of child mortality. Each one



1. Prematurity
2. Lower respiratory infections (pneumonia)
3. Birth asphyxia/trauma
4. Malaria
5. Diarrhoea
6. Congenital anomalies
7. Injuries
8. Sepsis
9. Tuberculosis
10. Measles
11. Meningitis/encephalitis
12. HIV/AIDS
13. Tetanus
14. Other under-five deaths

FIG. 16
Global distribution of deaths among under five children by cause (2022)

Source : *(6)*

of these advances is due to the political will of committed governments and the expansion of innovative partnerships involving civil society and the public and private sectors. Taken together, these efforts are reducing the number of young lives claimed by the leading causes of under-five mortality: pneumonia, diarrhoea, malaria, measles and AIDS. As a result 3 million fewer children died from these five diseases in 2015 than in the year 2000 *(105)*.

The Expanded Programme on Immunization started in 1974 and widened range of vaccines routinely provided, from smallpox, BCG and DPT to include polio and measles and more recently hepatitis B, Hib, Rota virus vaccine and JE vaccine. It set-out to increase coverage in line with the international commitment to achieve the universal child immunization goal of 80 per cent coverage in every country.

As mortality from diarrhoeal diseases and vaccine preventable diseases decreased, pneumonia came to the forefront as a cause of death, and in the 1980s programmes were developed around simplified diagnostic and treatment techniques. In the meantime, promotion of breast-feeding continued, backed by international initiative and countries widely implemented the Baby-Friendly Hospitals initiative.

The Integrated Management of Childhood Illness (IMCI) strategy addresses the principal causes of child mortality i.e. diarrhoeal disease, acute respiratory infection, measles, malaria and underlying malnutrition. Several countries like India have added neonatal care in the national adaptations. It combines effective interventions for preventing death and for improving healthy growth and development, e.g., oral rehydration therapy for diarrhoea; antibiotics for sepsis, pneumonia and ear infection, antimalarials and insecticide-treated bed-nets; vitamin A, treatment of anaemia, promotion of breast-feeding and complementary feeding for healthy nutrition and for recovery from illness; and immunization. Some countries have included guidelines to treat children with HIV/AIDS, others for dengue fever, wheezing or sore throat, or for the follow-up of healthy children.

More recently, Every Newborn Action Plan proposes five strategic objectives for achieving two clear and measurable targets : (1) Ending preventable newborn deaths – By 2035, all countries reach a national target of 10 or fewer newborn deaths per 1000 live births and continue to reduce death and disability; and (2) Ending preventable stillbirths – By 2035, all countries reach the target of 10 or fewer stillbirths per 1000 total births and continue to narrow gaps in equity. Developed under WHO and UNICEF, the ENAP recommends the integrated delivery of high-impact interventions across the full continuum of maternal and newborn care, including care during labour, newborn care during the first week of life and care of small and sick newborns. Fig. 17 shows the package of interventions.

Child mortality rate in India

Each year about 27 million children are born in India. Around 10 per cent of them do not survive to 5 years of age. In absolute figures, India contributes to 25 per cent of the over 5.3 million under-five deaths occurring worldwide every year. Nearly 62 per cent of the under-five deaths occur in neonatal period, 20 per cent takes place on the day of birth, and 49 per cent within the first 7 days *(86)*. The mortality rates for children below age 5 years for the year 2020, by residence are shown in Table 27. At the national level the mortality rate was estimated at 27 per 1000 live births, and the rate varies from 8 in Kerala to 51 in Madhya Pradesh. The rate for rural areas is about 36 and for urban areas 21. The mortality rate in female children in India is higher than the male children *(73)*.

Among children who die before their fifth birthday, almost one-third die of infectious causes nearly all of which are preventable. The estimates of the cause of death for the year 2016 are shown in Fig. 18.

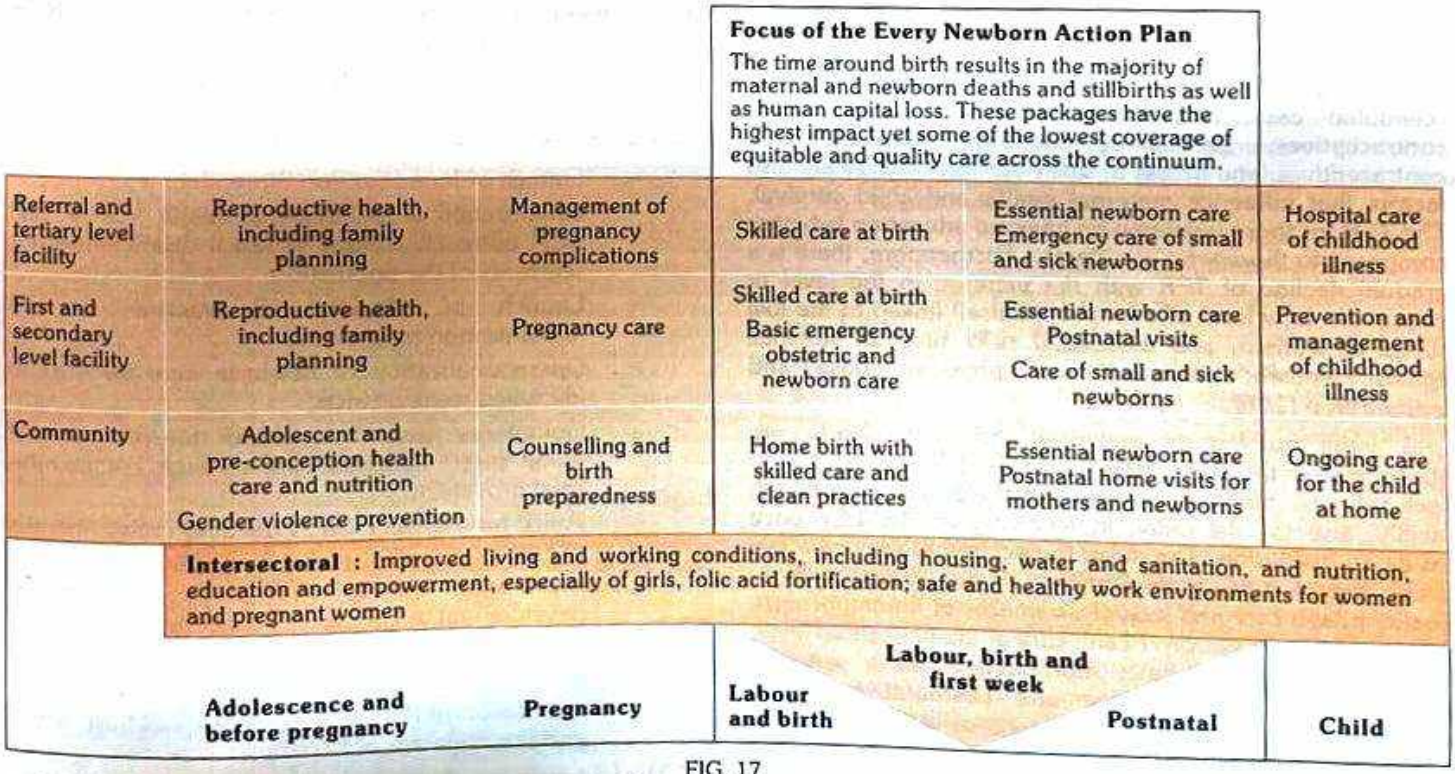


FIG. 17

Packages of interventions in the continuum of care

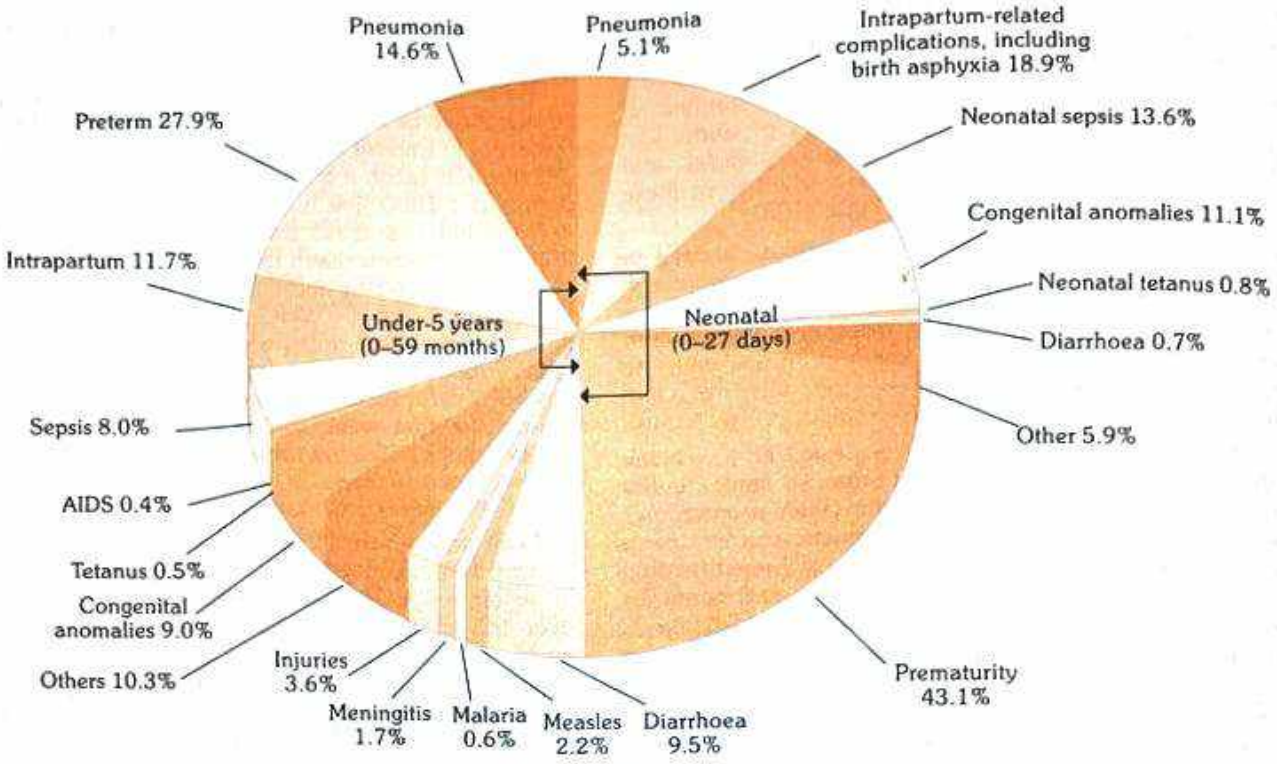


FIG. 18

Causes of death among children under 5 years, India, 2016

Source : *(104)*

Preterm birth has emerged as the leading cause of neonatal death, underlying the need for rapid scale-up of maternal health interventions in order to improve neonatal health outcomes.

Social determinants for maternal and child mortality include marriage and childbirth at a very young age, less spacing between births and low literacy level among women, in particular those belonging to the urban poor and rural settings, and socially-disadvantaged groups (such as scheduled caste and tribes). Access to and use of contraceptives, particularly modern, non-permanent contraceptives, and access to safe abortion services are also factors that influence maternal health and child survival. The TFR for those women who have no education is higher compared to those who are literate. Furthermore, there is a gradual decline of TFR with the increase in the level of education. Low level of education is itself linked to the low status of women, and associated risks such as violence against women, emotional and physical abuse and malnutrition *(106)*.

A large number of maternal and child deaths are attributable to the 'three delays' : (1) the delay in deciding to seek care, (2) the delay in reaching the appropriate health facility, and (3) the delay in receiving quality care once inside an institution. The delay in deciding to seek care can occur due to inadequate resources, poor access to high-quality health care and lack of awareness of the importance of maternal and newborn health care at the household level. The unavailability of basic reproductive health services, including contraceptives, pre and postnatal care and emergency obstetric and neonatal care, as well as delays in seeking institutional care and the poor quality of care provided in the health facility can potentially contribute to child deaths *(106)*.

The reproductive, maternal, neonatal and child health packages that are currently being implemented under the NRHM address the most common causes of maternal and child deaths. However, the coverage of key interventions, such as antenatal care, deliveries by skilled birth attendants, and use of oral rehydration solution (ORS) for the management of childhood diarrhoea during the NRHM period has been slow and of variable quality across states.

To pursue the goals of NPP, the Government of India constituted a National Technical Committee on Child Health in June 2000. New initiatives taken on the basis of this are *(64)* :

- Launch of Immunization Strengthening Project;
- Organization of RCH camps, health "melas" and RCH outreach scheme to reach disadvantageous segments of the population;
- Launch of Hepatitis B vaccine in the immunization programme;
- Operationalization of newborn care facilities in identified weak districts;
- Operations research by ICMR for provision of home-based neonatal care through community-level providers;
- Policy for exclusive breast-feeding upto 6 months of age;
- Preparation and approval of concept note on development of community based mid-wives;
- Implementation of Dai training to provide key messages for newborn health in 166 districts; and
- Adaptation of IMCI to incorporate newborn issues and development of IMNCI.

The Government of India established an IMCI Adaptation Committee that has led the development of Integrated

Management of Newborn and Childhood Illnesses (IMNCI). Separate tools and guidelines have been produced that focus on newborn issues; these are used to train field staff and for supervision and monitoring purposes.

In the year 2013, RMNCH+A strategy and in the year 2014, India Newborn Action Plan were launched in view to reduce the mortality rates in children. Newer vaccines were introduced in the national immunization schedule. Please refer to chapter 7 for details.

The Global Strategy for Women's, Children's and Adolescent's Health (2016–2030) and the 2030 agenda for Sustainable Development have three overarching objectives – Survive, Thrive and Transform. The SDGs contain ambitious targets for child mortality with SDG 3.2 seeking to end preventable deaths of newborns and children under 5 year. These include national targets of a U5MR of no more than 25 per 1000 live births and neonatal mortality rate to no more than 12 per 1000 live births *(107)*. Target 4.2, which calls for efforts to ensure that all girls and boys have access to quality early childhood development, care and pre-primary education; which is likely to have an impact on child mortality, while also improving children's chances of long and rewarding lives *(107)*.

CHILD SURVIVAL INDEX

The basic measure of infant and child survival is the Under-5 mortality (number of deaths under the age of 5 years, per 1000 live births). A child survival rate per 1000 births can be simply calculated by subtracting the Under-5 mortality rate from 1000. Dividing this figure by ten shows the percentage of those who survive to the age of 5 years *(108)*.

$$\text{Child survival rate} = \frac{1000 - \text{under-5 mortality rate}}{10}$$

The following table (Table 30) shows the child survival rates of some countries.

TABLE 30

Child survival rates of some countries during 1990 and 2022

Country	1990	2022
India	87.4	97.1
Sri Lanka	97.9	99.4
Bangladesh	85.6	97.1
Nepal	85.8	97.3
Pakistan	86.1	93.9
China	94.6	99.3
UK	99.1	99.6
USA	98.4	99.4
Japan	99.4	99.8
Singapore	99.2	99.8

The difference in the survival rates of children in developed and developing countries is a grim pointer to the Third World's need for preventive services. Through breast-feeding, adequate nutrition, clean water, immunization programmes, oral rehydration therapy and birth spacing, a virtual revolution in child survival could be achieved. The impact would be dramatic in humanitarian and fertility terms.

INTEGRATED MANAGEMENT OF CHILDHOOD ILLNESS (IMCI)

The notion of integration has a long history. Integration is supposed to tackle the need for complementarity of different independent services and administrative structures, so as to better achieve common goals. In 1950s, the goals were defined in terms of outcome, in 1960s of process and in the 1990s of economic impact. Integration has different meanings at different levels. (1) At the patient level it means case management. (2) At the point of delivery it means that multiple interventions are provided through one delivery channel, e.g., where vaccination is used as an opportunity to provide vitamin A to the child, boosting efficiency and coverage. (3) At the system level integration means bringing together management and support function of different sub-programmes and ensuring complimentarity between different levels of care. IMCI is now the only child health strategy that aims for improved integration at these three levels simultaneously. More than just adding more programmes to a single delivery channel, it has sought to transform the way the health system looks at the child care.

Most sick children present with signs and symptoms related to more than one conditions. This overlap means that a single diagnosis may not be possible or appropriate, and that treatment may be complicated by the need to combine therapy for several conditions. Surveys of the management of sick children at these facilities reveal that many children are not properly assessed and treated and that their parents are poorly advised. Providing quality care to sick children in these conditions is a serious challenge. In response to these challenge, WHO and UNICEF developed a strategy known as IMCI. The strategy combines improved management of childhood illness with aspects of nutrition, immunization, and other important disease prevention and health promotion elements. The objectives are to reduce deaths and the frequency and severity of illness and disability and to contribute to improved growth and development.

The strategy includes three main components :

(1) Improvements in the case-management skills of health staff through the provision of locally adapted guidelines on IMCI and through activities to promote their use;

(2) Improvements in the health system required for effective management of childhood illness; and

(3) Improvements in family and community practices.

The core of the IMCI strategy is integrated case management of the most common childhood problems, with a focus on the most important causes of death i.e. diarrhoea, ARI, malaria, measles and malnutrition. A guided process of adaptation ensures that the guidelines, and the learning materials that go with them, reflect the epidemiology within a country and are tailored to fit the needs, resources and capacity of a country's health system.

The clinical guidelines, which are based on expert clinical opinion and research results, are designed for the management of sick children aged 1 week up to 5 years. They promote evidence-based assessment and management, using a syndromic approach that supports the rational, effective and affordable use of drugs. They include methods for assessing signs that indicate severe disease; assessing a child's nutrition, immunization, and feeding; teaching parents how to care for a child at home; counselling

parents to solve feeding problems; and advising parents about when to return to a health facility. The guidelines also include recommendations for checking the parent's understanding of the advice given and for showing them how to administer the first dose of treatment.

When assessing a sick child, a combination of individual signs leads to one or more classifications, rather than to a diagnosis. IMCI classifications are action oriented and allow a health care provider to determine if a child should be urgently referred to another health facility, if the child can be treated at the first-level facility (e.g. with oral antibiotic, antimalarial, ORS, etc.) or if the child can be safely managed at home.

The complete IMCI case management process involves the following elements *(109)* :

a. **Assess** a child by checking first for danger signs (or possible bacterial infection in a young infant), asking questions about common conditions, examining the child, and checking nutrition and immunization status. Assessment includes checking the child for other health problems.

b. **Classify** a child's illnesses using a colour-coded triage system. Because many children have more than one condition, each illness is classified according to whether it requires :
   - urgent pre-referral treatment and referral (pink), or
   - specific medical treatment and advice (yellow), or
   - simple advice on home management (green).

c. After classifying all conditions, **identify** specific treatments for the child. If a child requires urgent referral, give essential treatment before the patient is transferred. If a child needs treatment at home, develop an integrated treatment plan for the child and give the first dose of drugs in the clinic. If a child should be immunized, give immunization.

d. Provide practical **treatment** instructions, including teaching the caretaker how to give oral drugs, how to feed and give fluids during illness, and how to treat local infections at home. Ask the caretaker to return for follow-up on a specific date, and teach her how to recognize signs that indicate the child should return immediately to the health facility.

e. Assess feeding, including assessment of breast-feeding practices, and **counsel** to solve any feeding problems found. Then counsel the mother about her own health.

f. When a child is brought back to the clinic as requested, **give follow-up care and,** if necessary, reassess the child for new problems.

The IMCI guidelines address most, but not all, of the major reasons a sick child is brought to a clinic. A child returning with chronic problems or less common illnesses may require special care. The guidelines do not describe the management of trauma or other acute emergencies due to accidents or injuries.

Although AIDS is not addressed specifically, the case management guidelines address the most common reasons children with HIV seek care : diarrhoea and respiratory infections. When a child, who is believed to have HIV, presents with any of these common illnesses, he or she can be treated the same way as any child presenting with an illness. If a child's illness does not respond to the standard treatments described or if a child becomes severely malnourished, or returns to the clinic repeatedly, the child is referred to a hospital for special care.

Case management can only be effective to the extent that families bring their sick children to a trained health worker for care in a timely way. If a family waits to bring a child to a clinic until the child is extremely sick, or takes the child to an untrained provider, the child is more likely to die from the illness. Therefore, teaching families when to seek care for a sick child is an important part of the case management process.

The case management process is presented on two different sets of charts : one for children age 2 months up to five years, and one for children age 1 week up to 2 months. Annexure 'A' at the end of this chapter shows the flowchart about the IMNCI guidelines for the management of various conditions of childhood.

The Indian version of IMCI is known as IMNCI (Integrated Management of Neonatal and Childhood Illness) as it includes the first 7 days of age in the programme. Please refer to page 539 chapter 7 for further details.

CONGENITAL MALFORMATIONS

Definitions

Congenital disorders are defined as "those diseases that are substantially determined before or during birth and which are in principle recognizable in early life" *(112)*. Some are obvious at birth like, cleft palate; some are obvious in early life like congenital dislocation of hip which may escape detection until walking should commence; and some may not become apparent until much later in life, like patent ductus arteriosus which may escape diagnosis until school age or even later. Internal defects, when they are not lethal, may go unrecognized. In addition to the list of late diagnoses are a host of inborn errors of metabolism like PKU, Tay-Sachs disease, galactosaemia, and mental retardation. Some defects are classified as major which may require surgical intervention, and some are classified as minor that have no functional implications like skin tags in front of the ear. Thus a broad definition of **congenital malformation** includes not only anatomical defects but also molecular and cellular abnormalities present at birth *(110)*. A WHO document in 1972, however, held that the term **congenital malformation** should be confined to structural defects at birth, and the term **congenital anomaly** being used to include all biochemical, structural and functional disorders present at birth *(90)*. Thus the basic difficulty in the study of congenital defects is the actual definition of the term without which comparisons between studies are difficult to make.

Incidence

Congenital anomalies (also referred as birth defects) affect approximately 1 in 33 infants and result in approximately 3.2 million birth defect-related disabilities every year. An estimated 270,000 newborns die during the first 28 days of life every year from congenital anomalies. Congenital anomalies may result in long-term disability, which may have significant impacts on individuals, families, health-care systems and societies. The most common serious congenital disorders are heart defect, neural tube defects and Down's syndrome. Congenital anomalies may have a genetic, infectious or environmental origin; although in most of the cases it is difficult to identify their cause *(111)*.

Causes

The aetiology of most congenital anomalies is poorly understood; both genetic and environmental factors have been implicated. They include :

1. GENETIC FACTORS : The congenital disorders with genetic aetiology are : (a) *Chromosomal abnormalities* : The chromosome is either missing or in excess. The examples include Down's syndrome, Klinefelter's syndrome and Turner's syndrome. (b) *Inborn errors of metabolism* : These include PKU, Tay-Sachs disease and galactosaemia (c) *Others* : Other genetically inherited disorders, presumably due to single gene defects, are much more common than conditions with demonstrable chromosomal abnormalities. Single gene disorders may be dominant (e.g., Huntington's chorea), recessive (e.g., thalassaemia, sickle cell disease) or sex-linked disorders (e.g., haemophilia) (d) *Those with probable or possible genetic aetiology* : This applies to congenital dislocation of hip, club foot and neural tube defects.

2. ENVIRONMENTAL FACTORS : These include intra-uterine Infections (e.g., rubella, cytomegalovirus, toxoplasmosis, syphilis), Drugs (e.g., thalidomide, stilboestrol, anti-convulsants, tobacco, high dose of vitamin A during early pregnancy, alcohol, anaesthetics, etc.), Maternal diseases complicated by pregnancy (e.g., diabetes, cardiac failure), Irradiation, and Dietary factors (e.g., folic acid deficiency).

Risk factors

The factors significantly associated with the occurrence of congenital malformations are : (a) *Maternal age* : Advanced maternal age at conception is a recognized risk factor. The overall risk of giving birth to an infant with Down's syndrome is 1 : 800. The risk rises sharply with age; it is 1 : 67 for those aged 40–45. (b) *Consanguinity* : In consanguineous marriages (e.g., first-cousin and uncle-niece marriages), there is a relatively high incidence of mental retardation and congenital malformations.

Prenatal diagnosis

It is now possible to detect certain congenital anomalies *in utero* using the following techniques : (a) **Alpha fetoprotein** : Neural tube defects can be detected by measurement of a specific protein of foetal origin, called alpha fetoprotein in maternal blood and in amniotic fluid during pregnancy. (b) **Ultrasound** : This can be used to visualize the foetus and detect many abnormalities of the foetus. (c) **Amniocentesis :** This test is possible only in the second trimester (i.e., after the completion of 12 weeks). It can detect many abnormalities (e.g., Down's syndrome, Neural tube defects). (d) **Chorionic villus sampling** : This new technique allows prenatal diagnosis at 9 to 11 weeks of pregnancy. By this test, the chromosome status can be easily determined. Prenatal diagnosis of congenital abnormalities offers the parents the option of therapeutic abortion.

PREVENTION OF CONGENITAL DEFORMITIES

There are 3 main approaches to the reduction of congenital abnormalities: *(113)*. (1) By discouraging further reproduction after the birth of a malformed child; after such a birth, the frequency of malformations in subsequent pregnancies is increased by about 10 times; (2) The avoidance of pregnancy in circumstances where malformations are likely to occur, e.g., advanced maternal age and Down's syndrome; (3) the identification and removal of teratogens such as certain drugs (e.g., thalidomide, steroid hormones, folate antagonists, anti-convulsants); infective agents (e.g., rubella, cytomegalovirus, herpes simplex virus, varicella zoster virus, *Toxoplasma gondii*); and physical agents such as X-rays and irradiation, alcohol and pesticides. Immunization against rubella is now routine in many countries which is bound to lead to some reduction in congenital abnormalities. A largely untapped preventive measure is the avoidance of drugs in pregnancy except where they are absolutely necessary *(114)*.

Congenital malformations may be regarded as one form of reproductive failure. The most unfavourable environmental and genetic factors result in sterility, and the favourable factors lead to normal reproduction. Between these extremes there may be abortions, stillbirths, premature births or neonatal deaths. Malformation represent a relative reproductive "success" when compared with sterility or early abortion *(105)*. Penrose (1961) stressed that major advances in the prevention of malformations must be achieved by attention to environmental factors rather than by attempting to improve heredity. It is more within reach than genetic control *(106)*.

SCHOOL HEALTH SERVICE

School health is an important branch of community health. According to modern concepts, school health service is an economical and powerful means of raising community health, and more important, in future generations. The school health service is a personal health service. It has developed during the past 70 years from the narrower concept of medical examination of children to the present-day broader concept of comprehensive care of the health and well-being of children throughout the school years.

Historical development

The beginning of School Health Service in India dates back to 1909, when for the first time medical examination of school children was carried out in Baroda city. The Bhore Committee (1946) *(117)* reported that School Health Services were practically non-existent in India, and where they existed, they were in an under-developed state. In 1953, the Secondary Education Committee emphasized the need for medical examination of pupils and school feeding programmes. In 1960, the Government of India constituted a School Health Committee to assess the standards of health and nutrition of school children and suggest ways and means to improve them. The Committee submitted its report in 1961, which contains many useful recommendations *(118)*. During the Five Year Plans, many State Governments have provided for school health, and school feeding programmes. In spite of these efforts to improve school health, it must be stated that in India, as in other developing countries, the school health services provided are hardly more than a token service because of shortage of resources and insufficient facilities.

HEALTH PROBLEMS OF THE SCHOOL CHILD

Any discussion of a school health service must be based on the local health problems of the school child, the culture of the community and the available resources in terms of money, material and manpower. While the health problems of school children vary from one place to another, surveys carried out in India indicate that the main emphasis will fall in the following categories (1) malnutrition; (2) infectious diseases; (3) intestinal parasites; (4) diseases of skin, eye and ear; and (5) dental caries.

OBJECTIVES OF SCHOOL HEALTH SERVICE

The objectives of the programme of a school health service are as follows *(119, 120)* :

1. the promotion of positive health;
2. the prevention of diseases;
3. early diagnosis, treatment and follow-up of defects;
4. awakening health consciousness in children; and
5. the provision of healthful environment.

Aspects of School Health Service

The tasks of a school health service are manifold, and vary according to local priorities. Where resources are plentiful, special school health services may be developed. Some aspects of a school health service are as follows :

1. Health appraisal of school children and school personnel.
2. Remedial measures and follow-up.
3. Prevention of communicable diseases.
4. Healthful school environment.
5. Nutritional services.
6. First-aid and emergency care.
7. Mental health.
8. Dental health.
9. Eye health.
10. Health education.
11. Education of handicapped children.
12. Proper maintenance and use of school health records.

1. Health appraisal

The health appraisal should cover not only the students but also the teachers and other school personnel. Health appraisal consists of periodic medical examinations and observation of children by the class teacher. *(a) Periodic Medical Examination* : The school health committee (1961) in India recommended medical examination of children at the time of entry and thereafter every 4 years *(118)*. In big cities, where facilities for medical examination are available, this could be more frequent. The initial examination should be thorough and unhastened and should include a careful history and physical examination of the child, with tests for vision, hearing and speech. A routine examination of blood and urine should be carried out. Clinical examination for nutritional deficiency, and examination of faeces for intestinal parasitosis are particularly important in India. Tuberculin testing or mass screening should not be withheld. The parents should be persuaded to be present at these examinations. The teacher should help in the medical inspection by recording the medical history, regular (quarterly) recording of height and weight, annual testing of vision, and preparing children for the medical examination by helping them understand the "how" and "why" of health appraisal. *(b) School Personnel* : Medical examination should be given to teachers and other school personnel as they form part of the environment to which the child is exposed. *(c) Daily Morning Inspection* : The teacher is in a unique position to carry out the "daily inspection", as he is familiar with the children and can detect changes in the child's appearance or behaviour that suggest illness or improper growth and development. The following clues will help the school teacher in suspecting children who need medical attention : (1) unusually flushed face (2) any rash or spots (3) symptoms of acute cold (4) coughing and sneezing (5) sore throat (6) rigid neck (7) nausea and vomiting (8) red or watery eyes (9) headache (10) chills or fever (11) listlessness or sleepiness (12) disinclination to play (13) diarrhoea (14) pains in the body (15) skin conditions like scabies and ringworm (16) pediculosis *(121)*. Children showing any such signs or symptoms should be referred to the school medical officer. Teacher observation of school children is of particular importance in India because of the limited number of trained personnel for school health work. For this work, the teachers should be adequately trained during Teacher Training Courses and subsequently by short In-service Training Courses.

2. Remedial measures and follow-up

Medical examinations are not an end in themselves; they should be followed by appropriate treatment and follow-up. Special clinics should be conducted exclusively for school children at the primary health centres in the rural areas, and in one of the selected schools or dispensaries for a group of about 5,000 children in the urban areas *(118)*. The clinic days and time should be intimated to all the concerned schools. Considering the high prevalence of dental, eye, ear, nose and throat defects in the school children in India, special clinics should be secured or provided for the exclusive use of school children for examination and treatment of such defects. In the big cities, the required number of specialists should be employed in the School Health Service. There should be provision for beds in the existing referral hospitals for the children to be admitted for investigation and treatment as and when required.

3. Prevention of communicable diseases

Communicable diseases control through immunization is the most emphasized school health service function. A well planned immunization programme should be drawn up against the common communicable diseases.

A record of all immunizations should be maintained as part of the school health records. When the child leaves school, the health record should accompany him.

4. Healthful school environment

The school building, site and equipment are part of the environment in which the child grows and develops. A healthful school environment therefore is necessary for the best emotional, social and personal health of the pupils. Schools should also serve as demonstration centres of good sanitation to the community. The following minimum standards for sanitation of the school and its environs have been suggested in India *(119, 120, 122)*.

(1) *Location* : The school should normally be centrally situated with proper approach roads and at a fair distance from busy places and roads, cinema houses, factories, railway tracks and market places. The school premises should be properly fenced and kept free from all hazards. (2) *Site* : The site should be on suitable high land, and not subject to inundation or dampness and can be properly drained. The School Health Committee (1961) had recommended that 10 acres of land be provided for higher elementary schools and 5 acres for primary schools with an additional one acre of land per 100 students. In congested areas, the nearest public park or playground should be made available to the students. (3) *Structure* : Nursery and secondary schools, as far as possible, be single storied. Exterior walls should have a minimum thickness of 10 inches and should be heat resistant. (4) *Classroom* : Verandhas should be attached to classrooms. No classroom should accommodate more than 40 students. Per capita

space for students in a classroom should not be less than 10 sq. ft. *(5) Furniture* : Furniture should suit the age group of students. It is desirable to provide single desks and chairs. Desks should be of "minus" type. Chairs should be provided with proper back-rests, with facilities for desk-work. *(6) Doors and windows*: The windows should be broad with the bottom sill, at a height of 2'–6" from the floor level; combined door and window area should be at least 25 per cent of the floor space; windows should be placed on different walls for cross-ventilation; the ventilators should not be less than 2 per cent of the floor area. *(7) Colour* : Inside colour of the classroom should be white and should be periodically white-washed. *(8) Lighting* : Classrooms should have sufficient natural light, preferably from the left, and should not be from the front. *(9) Water supply* : There should be an independent source of safe and potable water supply, which should be continuous, and distributed from the taps. *(10) Eating facilities* : Vendors other than those approved by the school authorities should not be allowed inside school premises; there should be a separate room provided for mid-day meals. *(11) Lavatory* : Privies and urinals should be provided – one urinal for 60 students and one latrine for 100 students. Arrangements should be separately made for boys and girls.

5. Nutritional services

A child who is physically weak will be mentally weak, and cannot be expected to take full advantage of schooling. The diet of the school child should, therefore receive first attention. The diet should contain all the nutrients in proper proportion, adequate for the maintenance of optimum health. Studies in India have shown that nutritional disorders are widely prevalent among school children, particularly deficiencies relating to proteins; vitamins A, C, thiamine and riboflavin, calcium and iron.

Mid-day School Meal: In order to combat malnutrition and improve the health of school children, it is now an accepted procedure in all advanced countries to provide a good nourishing meal to school children. The School Health Committee (1961) recommended that school children should be assured of at least one nourishing meal *(123)*. Those who can afford it may bring their lunch packets from home, and during lunch hours take their meals in school. Otherwise, schools should have some arrangement for providing mid-day meals through their own cafeteria on a 'no profit no loss' basis. In view of the limited finances in India, it is recommended that the school meal should provide at least one-third of the daily calorie requirement and about half of daily protein requirement of the child.

Applied Nutrition Programme: UNICEF is assisting in the implementation of the Applied Nutrition Programme in the form of implements, seeds, manure and water supply equipment. Wherever land is available, the facilities provided by the UNICEF should be utilized in developing school gardens. The produce may be utilized in the school feeding programmes as well as for nutrition education.

Specific Nutrients : Advances in the knowledge of nutrition have revealed that specific nutrients may be necessary for the prevention of some nutrient disorders. Dental caries, endemic goitre, nightblindness, protein malnutrition, anaemias and a host of other nutrient disorders are eminently preventable. Use of specific nutrients is indicated where such nutrient disorders are problems in a community.

6. First-aid and emergency care

The responsibility of giving first-aid and emergency care to pupils who become sick or injured on school premises rests with the teacher and therefore all teachers should receive adequate training during "Teacher Training Programmes" or "In-service Training programmes" to prepare them to carry out this obligation. The emergencies commonly met within schools are – (a) accidents leading to minor or serious injuries, and (b) medical emergencies such as gastroenteritis, colic, epileptic fits, fainting, etc. In every school a fully equipped First-Aid-Post should be provided as per regulations of St. John Ambulance Association of India.

7. Mental health

The mental health of the child affects his physical health and the learning process. Juvenile delinquency, maladjustment and drug addiction are becoming problems among school children. The school is the most strategic place for shaping the child's behaviour and promoting mental health. The school teacher has both a positive and preventive role – he should be concerned with helping all children attain mental health, so that they may develop into mature, responsible and well adjusted adults. The school routine should be so planned that there is enough relaxation between periods of intense work, and every effort should be made to relieve the tedium of the class room. No distinction should be made between race, religion, caste or community; between the rich and poor; and between the clever and the dull. It is now increasingly realized that there is a great need for vocational counsellors and psychologists in schools for guiding the children into careers for which they are suited.

8. Dental health

Children frequently suffer from dental diseases and defects. Dental caries and periodontal diseases are the two common dental diseases in India. A school health programme should have provision for dental examination, at least once a year. In the developed countries, dental hygienists are employed in schools to assist the school dentist with the examination of the teeth. They make preliminary inspection of the teeth and do prophylactic cleansing which is of great value in preventing gum troubles and in improving personal appearance. They take part in the teaching of dental hygiene as they work with the children.

9. Eye health services

Schools should be responsible for the early detection of refractive errors, treatment of squint and amblyopia, and detection and treatment of eye infections such as trachoma. Administration of vitamin A to children at risk, has shown gratifying results. In other words, basic eye health services should be provided in schools.

10. Health education

The most important element of the school health programme is health education. The goal of health education should be to bring about desirable changes in health knowledge, in attitudes and in practice, and not merely to teach the children a set of rules of hygiene.

Health education in schools should cover the following areas: *(1) Personal hygiene* : Health education programme in schools should be lively, practical and based on everyday needs and interests of children. The need for hygiene of skin, hair, teeth and clothing should be impressed upon

them. Attention to posture is also important. Children often adopt bad postures while sitting and standing. Such tendencies, should be observed and corrected. It is increasingly recognized that the major degenerative diseases of adults have their origin in poor health habits formed early in life. Cigarette smoking is an example of a public health problem that should be tackled in schools. *(2) Environmental Health* : Encouraging young people to take part in health activities and keep their environment clean is an important function of school health services. Visits to observe community health programmes, and even better participation in community action programmes (e.g., vaccination, fly control campaigns, construction of sanitary wells and latrines) are excellent opportunities for health education. *(3) Family life* : Family life education is being increasingly recognized as a priority in both developed and developing countries. The school health service is concerned not only with the development of healthy lives but also with healthy attitudes towards human reproduction.

Health education in schools is a function of the school teacher. The health officer and the public health nurse/ health worker/health assistant may furnish teaching materials and advice, but the teacher is the key person in the presentation of the material to the children. To do this important work, the teacher should be well versed in health education techniques, and sincerely interested in the welfare of the pupils. Children take back to their parents the health instructions they receive in schools, and even more important, when they become adults they apply this knowledge to their own families. In developing countries, where ill-health is a major problem, "every school child is a health worker".

11. Education of handicapped children

The ultimate goal is to assist the handicapped child and his family so that the child will be able to reach his maximum potential, to lead as normal a life as possible, to become as independent as possible, and to become a productive and self-supporting member of the society. The resources for managing handicapped child vary from country to country. It requires the cooperation of health, welfare, social and educational agencies.

12. School health records

A cumulative health record of each student should be maintained. Such records should contain (a) Identifying data – name, date of birth, parent's name and address, etc. (b) past health history (c) record of findings of physical examination and screening tests and record of services provided. The purpose of maintaining school health records is to have cumulative information on the health aspects of school children in order to give continuing intelligent health supervision. These records will also be useful in analysing and evaluating school health programmes and providing a useful link between the home, school and the community.

School health programme under Ayushman Bharat

The programme has been developed based on the learning and experiences from a variety of global and national school based interventions. Two teachers, preferably one male and one female, in every school, designated as "Health and Wellness Ambassadors" will be trained to transact heath promotion and disease prevention information in the form of interesting activities for one hour every week. These health promotion messages will also have bearing on improving health practices in the country as students will act as "Health and Wellness Messengers" in the society *(124)*.

Activities in school

Weekly

- Classroom transactions by health and wellness ambassadors
- Administration of IFA tablets

Fortnightly/Monthly

- Thematic school assembly
- Question box responses

Quarterly

- Thematic AHDs
- Parent teacher meetings

Bi-annual

- Administration of albendazole tablet (National deworming day)

The Health and Wellness Ambassadors will facilitate linkages with other ongoing school based programmes like WIFS, NDD, MHS and RBSK; and coordinate referral of students requiring any support or treatment to the Adolescent Friendly Health Centres and Health & Wellness Clinics. For any greater information that the students require, they may also be referred to the Adolescent friendly health resource centres at the district level.

School health promotion activities

The health promotion activities will be given a special focus. Age appropriate health education for the students will be taken up to influence behaviour and enhance skills. The framework developed pays special attention to physical, psycho-social and mental aspects based on the developmental stages of the child. The broad components are :

Age appropriate health promotion

Primary school	*Middle school*	*High school*
• Health, growth and development	• Puberty and related changes	• Prevention of substance abuse
• Personal safety	• Eye care, oral hygiene	• Sexual & reproductive health
• Nutrition and physical activity	• Nutrition	• Violence prevention
• Hygiene practices	• Bullying prevention	• Unintentional injury
• Prevention of diseases like malaria, dengue, TB, worms infestation, diarrhoea and vaccine preventable diseases	• Meditation and yoga	• Road safety
	• Internet safety and media literacy	• Nutrition
	• Prevention of substance abuse	• Meditation and Yoga
	• HIV/AIDS	
	• Mental health	

Health screening *(124)*

Rashtriya Bal Swasthya Karyakram (RBSK) is an important initiative aiming at early identification and early intervention for children from birth to 18 years to cover 4 'D's viz. Defects at birth, Deficiencies, Diseases, Development delays including disability. The 0–6 years age group will be specifically managed at District Early Intervention Center (DEIC) level while for 6–18 years age group, management of conditions will be done through existing public health facilities. DEIC will act as referral linkage for both the age groups. Once the child is screened and referred from school, it would be ensured that the necessary treatment/intervention is delivered at zero cost to the family.

Provision of services *(124)*

Weekly iron folic acid supplementation through 6–19 years of age will follow the existing guidelines in the schools. These services will continue to be delivered through school teachers.

Age groups	6–10 years	10–19 years
Intervention/ dose	Tablets of 45 mg elemental iron and 400 mcg of folic acid	Tablets of 100 mg elemental iron and 500 mcg of folic acid
Regime	Weekly, throughout the period 6–10 years of age	Weekly, throughout the period 10–19 years of age
Service delivery	Through teachers	Through teachers

Deworming : To combat parasitic worm infections, Government of India has declared 10th August and 10th February as fixed days to provide Albendazole tablets for deworming school-age children. During NDD, Albendazole 400mg chewable tablets will be administered to children at government, government-aided, and private schools. This will continue to follow the current NDD guidelines.

Menstrual hygiene management : Sanitary napkins may be provided in the schools for adolescent girls as per MHS guidelines.

Health screening : Under RBSK, identification of 30 diseases including malnutrition and anaemia with appropriate referrals. Identification of children with refractive errors may be done and spectacles provided.

Physical and mental fitness : Classes on yoga and meditation through Health & Wellness Ambassadors may be promoted on the lines of 'International Yoga Day' to inculcate the habits of yoga and meditation among children since their childhood.

Research : Provisions may be made for research and studies on health, wellness and nutrition for children to assess the impact of the programme.

Other preventive services in the form of regular age appropriate vaccination of children through local health staff are being considered.

Electronic health records

It is envisaged to develop an electronic health record for each student. Student Health Card will include health screening and service access data for each student. Under the RBSK, the screening and referral records of all the school children will be digitalized .The relevant information related to school health activities will be added to existing electronic records maintained under RBSK.

Upgrading skills in emergency care

A child spends a considerable part of the day in school, which makes it the responsibility of the school to ensure the safety of all children in every possible way during their stay at school. Thus students and teachers should know the basis of first aid and should be able to respond to emergencies. There should be a first aid box available in each school. The teachers and students will be made aware of the various services available in each school to emergencies like the ambulance, fire brigade, police, closest health facility etc. Sessions of the basic first aid will be taken up and linkage with local disaster response team will be made, to build the capacity of school teachers and children to respond to emergencies.

School health administration

The health of the school child is the responsibility of the parents, teachers, health administrators and the community. The success or efficiency of school health service depends largely on effective coordination between the participating agencies. There is no uniform pattern of school health administration, both here and abroad. In England, school health service is part of the Education service of the country. In India, school health service is administered by different departments in different States – these are usually the departments of Health and Education. The School Health Committee set up by the Government of India, in 1960 recommended that school health service should be an integral part of the general health services. The general health services in India are administered largely through the primary health centres in the rural areas, where the bulk of India's population lives. School health service is, therefore, an important function of the primary health centres.

(a) Primary health centres

The primary health centres are charged with the responsibility of administering school health service within their jurisdiction. It requires a whole-time, medical officer to cover 5,000 to 6,000 children a year. The School Health Committee (1961) has, therefore, recommended that the staff of the primary health centres should be augmented by additional staff to carry out effectively the school health programme.

(b) School Health Committees

The School Health Committee (1961) in India recommended the formation of school health committees at the village level, block level, district level, state level and national level. These Committees should mobilize community resources and make the school health programme continuous and self-supporting. The National School Health Council will be an advisory and coordinating body.

HANDICAPPED CHILDREN

Definitions

"Handicap" may be defined as "reduction in a person's capacity to fulfil a social role as a consequence of an impairment, inadequate training for the role, or other circumstances. Applied to children, the term usually refers to the presence of an impairment or other circumstances that are likely to interfere with normal growth and development or with the capacity to learn" *(125)*.

International Classification of Impairments, Disabilities and Handicaps (ICIDH) : First published by WHO in 1980,

this is an attempt to produce a systematic taxonomy of the consequences of injury and disease. In the year 2001, International Classification of Functioning, Disability and Health (ICF, WHO 2001) was published.

An *impairment* is defined as "any loss or abnormality of psychological, physiological, or anatomical structure or function". Impairments are disturbances at the level of the organ and include defects, loss of limb, organ or other body structure and defects or loss of mental function.

A *disability* is defined as "any restriction or lack (resulting from an impairment) of ability to perform an activity in a manner or within the range considered normal for a human being". The term disability reflects the consequences of impairment in terms of functional performance and activity by the individual; disability thus represents disturbances at the level of the person.

A *handicap* is defined as a disadvantage for a given individual, resulting from an impairment or a disability, that limits or prevents the fulfilment of a role that is normal (depending on age, sex, and social and cultural practice) for that individual. The term handicap thus reflects interaction with and adaptation to the individual's surroundings.

Handicap may be intrinsic or extrinsic. For example, blindness is an intrinsic handicap, and loss of parents is an extrinsic handicap. One handicap can give rise to further handicaps and the terms "primary" and "secondary" are used to denote this relationship. Blindness is a primary handicap; it can lead to poverty, which will be secondary handicap.

Extent of the problem

Nearly 83 million of the world's population are estimated to be mentally retarded, with 41 million having long-term or permanent disability. It ranks fourth in the list of leading causes of disability. Hearing loss (41 decibels and above) over the age of 3 is estimated to affect 42 million people, ranking 3rd in the list. Disability resulting from poliomyelitis has affected about 10 million people *(41)*. It is difficult to state how many people are mentally retarded in India as the census estimates do not cover mental handicap. About 16.15 million persons (1.9 per cent of the population) suffer from some or the other physical disability in the country. About 3 per cent child population in 1–14 years age group is affected by developmental delays *(126)*.

Classification

It is usual to classify handicapped children into the following groups :

1. Physically handicapped
2. Mentally handicapped
3. Socially handicapped.

1. Physically handicapped children

This category includes children who are blind, deaf and mute; those with hare-lip, cleft palate, talipes; and the "crippled" – e.g., resulting from polio, cerebral palsy, congenital heart disease, road accidents, burns, injuries, etc. These conditions fall into three broad causative groups : (a) birth defects (b) infections, and (c) accidents. These are all preventable to a large extent through adequate prenatal, natal, postnatal services, and genetic counselling.

2. Mentally handicapped children

Mental handicap is the present term used for mental retardation. It is a condition of sub-average intellectual function combined with deficits in adaptive behaviour. Terms which were previously used such as idiot, moron and imbecile are now discarded. At least 2 per cent of India's population is said to be suffering from some kind of mental disability *(127)*.

Causes

Mental handicap has many causes. These may be genetic, or environmental and include prenatal as well as postnatal causes. The possible and earliest time to recognize the problem of mental retardation is to look for any delayed milestones and development.

The known causative factors include the following : (a) *Genetic conditions* : Down's syndrome, Klinefelter syndrome, PKU, Tay-Sach disease, galactosaemia, microcephaly, congenital hypothyroidism involving both single and multiple gene action and chromosomal abnormalities. (b) *Antenatal factors* : These comprise neural tube defects, Rh incompatibility, certain infections (e.g., rubella, cytomegalovirus, toxoplasmosis, syphilis), drugs and irradiation. (c) Perinatal *factors* : These include birth injuries, hypoxia and cerebral palsy. (d) *Postnatal factors* : Head injuries, accidents, encephalitis, physical and chemical agents such as lead and mercury poisoning may result in mental retardation. (e) *Miscellaneous* : Maternal malnutrition, protein-energy malnutrition, iodine deficiency (endemic goitre), consanguineous marriages, pregnancy after the age of 40 (late marriages) are all known to be associated with mental retardation.

Categories of mental retardation

Psychologists have used the concept of IQ to classify the degree of mental retardation. The IQ scores rest on the assumption that intelligence distribution in the general public follow the normal or Gaussian curve, with a mean of 100. The half of the general population achieve scores above 100, and one half below. The lower 3 per cent or so of the population achieve scores of 70 or less. They are usually considered to be mentally retarded. The WHO gave the following classification of mental retardation :

Mild mental retardation	....	IQ	50–70
Moderate mental retardation	....	IQ	35–49
Severe mental retardation	....	IQ	20–34
Profound mental retardation	....	IQ	under 20

Children scoring above 70 are no longer described as mentally handicapped. The number of mild cases far exceed the severe and profound cases. English statistics which have been widely quoted suggest that, among 100 mentally handicapped persons, the following proportion will be found : 70 mild, 20 moderate and 5 severe cases. In other words, a very great majority of cases of mental handicap are of the mild type and potentially capable of being taught to make a fairly adequate social adaptation in appropriate circumstances *(128)*.

Severe mental retardation is uncommon. The great majority of severely handicapped children remain more or less dependant throughout life. Mental retardation often involves psychiatric disturbances. It has been stressed that the IQ range suggested must not be applied too rigidly. IQ level is not necessarily constant during the individual's life span.

3. Socially handicapped children

A "socially handicapped child" may be defined as a child whose opportunities for a healthy personality development

and a full unfolding of potentialities are hampered by certain elements in his social environment such as parental inadequacy, environmental deprivation (i.e. lack of stimulation of learning process), and emotional disturbances. Such children would include children who are orphaned either due to death or loss of parents; neglected and destitute children; those who are exploited or victimized; and, delinquent children. It may be pointed out that a child who is physically or mentally handicapped also meets with social handicaps to the extent to which he is subject to social rejection or misunderstanding and cannot make use of the normal value of social fulfilment.

More recently, WHO has come out with International classification of functioning disability and health (IFC).

International Classification of Functioning, Disability and Health (ICF) *(69)*

Like ICD-10, ICF is a core classification in the WHO-FIC, where ICD-10 provides users an aetiologic framework for classification of disease, disorder and other health conditions, ICF classifies functioning and disability associated with health conditions. ICD-10 and ICF are complementary classifications and WHO encourages users to use both systems together to create a broader and more meaningful picture of health of individuals and populations.

Developed by WHO, ICF represents a revision of the International Classification of Impairment, Disability and Handicaps (ICIDH). The focus of ICIDH was consequences of disease whereas focus of ICF is "components of health". ICF is a classification of health and health related domain that describe body function and structure, activities and participation. Since an individual's functioning and disability occur in a context, ICF is a tool for measuring functioning in society, no matter what the reason for one's impairment.

The model of ICF

Two major model of disability have been proposed. The *medical* model views disability as a feature of the person, directly caused by disease, trauma or other health conditions; which requires medical care provided in the form of individual treatment by professionals. The *social model* of disability, on the other hand, sees disability as a socially-created problem and not at all an attribute of an individual. On the social model, disability demands a political response, since the problem created by an unaccomodating physical environment brought about by attitude and other features of the social environment.

Components of ICF

The ICF framework consists of two parts:

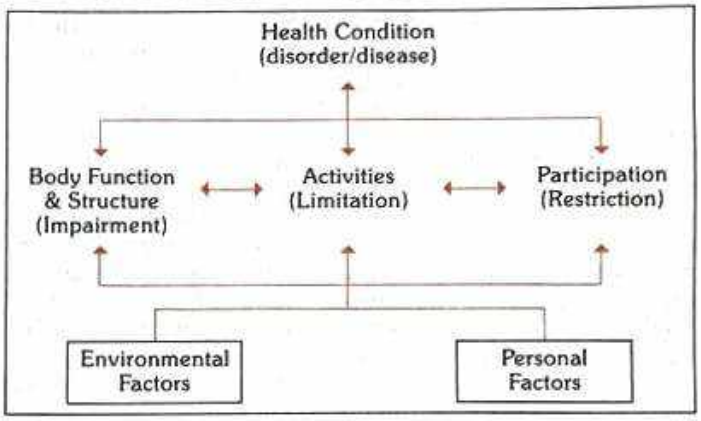
a. Functioning and disability
b. Contextual factors

a. Functioning and disability includes :
   - *Body function and structure* – describes actual anatomy and physiology/psychology of human body.
   - *Activity and participation* – describes the person's functional status, including communication, mobility, interpersonal interactions, self-care, learning, applying knowledge, etc.

b. Contextual factors includes :
   - *Environmental factors* – factors that are not within the person's control, such as family, work, government agencies, laws, and cultural beliefs.
   - *Personal factors* – include race, gender, age, educational level, coping styles, etc.

ICF is used by persons with disability and professionals alike to evaluate health care settings that deal with chronic illness and disability, such as rehabilitation centres, nursing homes, psychiatry institutions and common services.

The overall organization of the classification of ICF



Source : *(69)*

Approaches to prevention

One of the objectives of Mother and Child Health Services is the prevention of handicapping conditions, and the early management of illness to prevent crippling sequelae.

1. Primary prevention

The ideal is to prevent the handicap from occurring through the application of preventive measures during preconceptional, prenatal and intranatal periods and during infancy, childhood and adolescence. The approaches in primary prevention include (a) *Genetic counselling* : The optimum maternal age for producing normal babies is between 20 and 30 years. After the age of 30 or 35 years, there is a greater chance of producing a genetically abnormal child, especially one with Down's syndrome. The mother should be advised accordingly. In some communities consanguineous marriages are common. The incidence of such marriage should be reduced through educational efforts. (b) *At-risk approach* : People "at-risk" of transmitting inherited diseases (e.g., chromosomal or sex–linked diseases) should be identified. They should be offered all the investigations currently available and should have competent advice about future risks. (c) *Immunization* : In India, the main cause of disability is poliomyelitis which is preventable by immunization *(129)*. Immunization against other diseases such as rubella should also be considered. (d) *Nutrition* : Proper nutrition of the expectant mother is important for the welfare of the unborn child, especially to reduce the incidence of prematurity which is associated with mental handicaps. (e) *Others* : These include health care of mothers and children through prenatal, natal and postnatal periods; avoidance of infectious diseases, potentially teratogenic drugs, X-rays and smoking; special care of high risk women especially during labour, and accident prevention. The Medical Termination of Pregnancy Act of 1971 allows abortion of the foetus which may be seriously handicapped. In short, the obstetrician has a major role to play in reducing the frequency of handicaps in the population.

2. Secondary prevention

The broad objective for all children whatever their condition or problem is to bring them as close to normality as possible – physically, mentally and socially. This will involve : (a) *Early diagnosis of handicap* : Parents themselves have the responsibility to bring the child to paediatrician and seek advice. Investigation of the child requires full history, assessment of the degree of handicap and perhaps special investigations including the natural potentialities of the child. This should be done through MCH and School Health Services and such other agencies. (b) *Treatment* : Handicapped children need specialized treatment facilities such as physiotherapy, (the deformities are corrected, the weakened muscles are given exercise as in polio, infrared rays, diathermy etc.); occupational therapy (the child is taught, according to his ability and taste, things like music, painting, weaving, woodwork, pottery, basket making etc.); speech therapy (the child is trained to talk normally); and prosthetics (provision of artificial limbs, hearing aids and other equipment). The modern term for this branch of medicine is "Physical Medicine and Rehabilitation". The purpose of treatment is to improve the physical condition of the patient. (c) *Training and education* : the handicapped child is trained for an independent living. This is called "vocational guidance". He is trained to "work with what is left", so that he is not a burden on others. In India, there are over 150 schools and institutions for the handicapped. The following are some of the important ones : (1) Occupational Therapy School, Mumbai; (2) Physical Therapy School, Mumbai; (3) Occupational Therapy School, Nagpur; (4) All India Institute of Physical Medicine and Rehabilitation, Mumbai; (5) Institute of Physical Medicine and Rehabilitation, Christian Medical College, Vellore; and (6) Occupational Therapy College, New Delhi. Beside these, there are schools for the blind, deaf, and special hospitals and wards for crippled children. Institutional care of the handicapped children is being replaced by various social support measures and services, enabling families to assume a larger share of rehabilitation within the family cycle *(33)*.

The mentally handicapped children can be helped to reach their optimal capacity through attention to the following : (a) they should get love and warmth, patience and tolerance, besides discipline (b) their natural potentials should be identified, and the child must be helped to develop in that direction in all possible manner.

The mentally handicapped require attention from diverse disciplines such as medicine, psychology, education, rehabilitation and social welfare. Taking into account the gravity of the problem, the Ministry of Social Welfare, Govt. of India, has set-up the National Institute for Mentally Handicapped (NIMH) in 1984 at Secunderabad. It has Regional Branches at Mumbai, New Delhi and Kolkata. The NIMH serves as an apex organization for developing appropriate models for care for the mentally handicapped *(127)*.

Apart from NIMH, 3 other premier National Institutes are working in specific disabilities : (a) Ali Yavar Jung National Institute for the Hearing Handicapped, Mumbai with Regional branches at New Delhi, Kolkata and Secunderabad; (b) National Institute for the visually Handicapped, Dehradun with Regional branch at Chennai; (c) National Institute for the Orthopaedically Handicapped, Kolkata. Apart from developing models for care and services, these institutions conduct research, promote human resource development, crises management, education, placement and employment, development and supply of appropriate aids and appliances, and documentation and dissemination of information *(126)*.

In India, the Ministry of Social Welfare operates through five major schemes of assistance to voluntary organizations providing services to disabled persons. These are : (a) Assistance to voluntary organizations for the disabled : Assistance upto 90 per cent in urban and 95 per cent in rural areas is given to NGOs for education, training and rehabilitation of the disabled; for rehabilitation of people recovering from mental illness; emphasis on vocational guidance and training; liaison with nearest psychiatrist centre or hospital; provision for Half-way Homes. (b) Assistance for aids and appliances : Aids and appliances upto Rs 3,600 are provided to people with disabilities free, if the monthly income is up to Rs 1,200, and at 50 per cent cost if the monthly income is between Rs 1,201 to 2,500. (c) Assistance to voluntary organizations for rehabilitation of leprosy-cured persons : Assistance to voluntary organizations working for leprosy-cured persons is given upto 90 per cent for public education and awareness, early intervention, educational and vocational training, economic rehabilitation and social integration. (d) Development in the field of cerebral palsy and mental retardation : For manpower training of professionals and also for developing organizational infrastructure such as class room/library/hostel in the field of cerebral palsy and mental retardation. (e) Assistance to voluntary organization for establishment of special schools : For setting up special schools NGOs receive grants upto 90 per cent. Preference is given for opening schools in new districts and upgradation of existing schools.

On 26th August 1995, Ministry of Social Welfare, Govt. of India introduced a comprehensive Bill in the Parliament known as "Persons with disabilities (equal opportunities, protection of right and full participation) Bill 1995". It deals with preventive and promotional aspects of rehabilitation.

The Rights of Persons with Disabilities Bill - 2016

The Lok Sabha has passed "The Rights of Persons with Disabilities Bill-2016". The Bill replaced the existing PWD Act, 1995, which was enacted 21 years back. The Rajya Sabha has already passed the Bill on 14.12.2016. The salient features of the Bill are *(130)*:

Disability has been defined based on an evolving and dynamic concept. The types of disabilities have been increased from existing 7 to 21 and the Central Government will have the power to add more types of disabilities. The 21 disabilities are given below:

1. Blindness
2. Low-vision
3. Leprosy cured persons
4. Hearing impairment (deaf and hard of hearing)
5. Locomotors disability
6. Dwarfism
7. Intellectual disability
8. Mental Illness
9. Autism spectrum disorder
10. Cerebral palsy
11. Muscular dystrophy
12. Chronic neurological conditions
13. Specific learning disabilities
14. Multiple sclerosis

15. Speech and language disability
16. Thalassemia
17. Haemophilia
18. Sickle cell disease
19. Multiple disabilities including deaf blindness
20. Acid attack victim
21. Parkinson's disease

Speech and language disability and specific learning disability have been added for the first time. Acid attack victims have been included. Dwarfism, muscular dystrophy have been indicated as separate class of specified disability. The new categories of disabilities also include three blood disorders, thalassemia, hemophilia and sickle cell disease. In addition, the government has been authorized to notify any other category of specified disability. Responsibility has been cast upon the appropriate governments to take effective measures to ensure that the persons with disabilities enjoy their rights equally as others.

In considering the management of the socially handicapped child, we must remember that such children are normal in their needs and development. Their needs should be identified and met. The children Act, 1960 provides for the "care, protection, maintenance, welfare, training, education and rehabilitation" of the socially handicapped children.

Lastly, we need to strengthen the family. The family is the most effective bulwark to prevent children from becoming socially handicapped. There were times when the handicapped child was considered a liability to the parents and to the society. All over the world, there is an awakening that handicapped children can and must be helped to make their lives as happy and useful as possible.

BEHAVIOUR PROBLEMS

The behaviour problems in children may be classified as below :

(a) *Problems antisocial in nature* : Stealing, lying, gambling, cruelty, sexual offences, destructiveness.

(b) *Habit disorders* : Thumb sucking, nail-biting, bed-wetting, masturbation.

(c) *Personality disorders* : Jealousy, temper-tantrums, timidity, shyness, day-dreaming, fears and anxieties, unsociability, hysterical manifestations.

(d) *Psychosomatic complaints* : Tremors, headache, asthma, depression, delusion, hallucinations.

(e) *Educational difficulties* : Backwardness in studies, school phobia, school failures, etc.

Some of the behaviour disorders are due to mental deficiency; some are due to organic disease and some due to failure in adjustment to external environment. The answer to these problems lies in improvement of living conditions, better social environment and education.

JUVENILE DELINQUENCY

The Children Act, 1960 in India defines delinquent as "a child who has committed an offence". Juvenile means a boy who has not attained the age of 16 years and a girl who has not attained the age of 18 years. In a broad sense, delinquency is not merely "juvenile crime". It embraces all deviations from normal youthful behaviour and includes the incorrigible, ungovernable, habitually disobedient and those who desert their homes and mix with immoral people, those with behaviour problems and indulge in antisocial practices.

INCIDENCE : In the United States it is reported that 2 per cent of children between 7 and 17 years attend juvenile courts. Comparable statistics are not available in India to denote the size of the problem, but it is agreed that juvenile delinquency is on the increase in India during the past few decades, due to changes in the cultural pattern of the people, urbanization and industrialization. The highest incidence is found in children aged 15 and above. The incidence among boys is 4 to 5 times more than among girls.

CAUSES : (1) *Biological causes* : Certain biological causes such as hereditary defects, feeble-mindedness, physical defects and glandular imbalance may be at the bottom of juvenile delinquency. Recent studies indicate that chromosome anomaly might be associated with a tendency for delinquency and crime. A survey of criminal patients in Scotland and elsewhere demonstrated such a link – some of the patients showing an extra Y chromosome. The XYY men suffer from severe disturbance of the whole personality *(131)*. (2) *Social causes* : Among the social causes may be mentioned broken homes, e.g., death of parents, separation of parents, step mothers and disturbed home conditions, e.g., poverty, alcoholism, parental neglect, ignorance about child care, too many children, etc. (3) *Other causes* : Absence of recreation facilities, cheap recreation, sex-thrillers, urbanization and industrialization, cinemas and television, slum-dwelling, etc.

PREVENTIVE MEASURES : (1) *Improvement of family life* : A well adjusted family can stem the tide of delinquency. Parents should be prepared for parenthood. The needs of children should be appreciated and met. (2) *Schooling* : The school comes next to home in the community in ordering the behaviour of children. There should be a healthy teacher–pupil relationship. The school teacher can play an important part by detecting early signs of maladjustment. (3) *Social welfare services* : These comprise recreation facilities, parent-counselling, child guidance, educational facilities and adequate general health services.

Children in difficult circumstances *(66)*

In a globalized economy, the increased vulnerability of some children due to their identity, and/or their socio-economic and geo-political circumstances calls for more focused attention as well as coordination of social and economic policies and monitoring of child impact. Besides being victims of globalization, these children may be barred from benefits meant for all children simply because they belong to a group or community with difficulties of access. These barriers must be overcome.

Over the years, some children have been categorized as children in difficult circumstances and these categorizations include :

- Homeless children (pavement dwellers, displaced/ evicted, etc.).
- Orphaned or abandoned children.
- Children whose parents cannot or are not able to take care of them.
- Children separated from parents.
- Migrant and refugee children.
- Street children.
- Working children.
- Trafficked children.

- Children in bondage.
- Children in prostitution.
- Children of sex workers/prostitutes/sexual minorities.
- Children of prisoners.
- Children affected by conflict.
- Children affected by natural disasters.
- Children affected by HIV/AIDS.
- Children suffering from terminal diseases.
- The girl child.
- Children with disabilities and related special needs.
- Children belonging to the ethnic and religious minorities, and other minority communities, and those belonging to the Scheduled Castes and Scheduled Tribes.
- Children in institutional care, be it in state-run institutions or religious and other charitable institutions.
- Children in conflict with law (those who commit crimes).
- Children who are victims of crime.

For the first time in the history of planning for children, India has adopted a clear understanding and definition of the child in the NPAC 2005. The NPAC definition of the child as a person upto the age of 18 years and its clear declaration that 'all rights apply to all age-groups, including before birth' reiterates the 1974 National Policy mandate that the State takes responsibility for children 'both before and after birth,' and the child's interests are to receive paramount attention. This national reaffirmation must set the frame for future planning and intervention to secure the well-being of all children of the country and provide them a caring and protective environment.

Battered baby syndrome

It has been defined as "a clinical condition in young children, usually under 3 years of age who have received non-accidental wholly inexcusable violence or injury, on one or more occasions, including minimal as well as severe fatal trauma, for what is often the most trivial provocation, by the hand of an adult in a position of trust, generally a parent, guardian or foster parent. In addition to physical injury, there may be deprivation of nutrition, care and affection in circumstances which indicate that such deprivation is not accidental".

Battered baby syndrome has been found in all strata of society. Its incidence is not known. So far as sequelae are concerned, the most worrying is the risk of mental and neurological complications. Thus it has been tentatively suggested that 10–15 per cent of cases of cerebral palsy and almost double that proportion of the new mentally retarded children each year may be the result of the battered baby syndrome.

Girl child and gender bias *(66)*

Gender biases pose a specific threat to girl children across the social and economic strata. For a girl child, life is a constant fight for survival, growth and development from the time she is conceived till she attains 18 years. The life chart of a girl child and the many life threatening problems she might face are as follows :

Years	Problems faced
Before birth to 1 year	– Being unwanted, risk of prenatal detection. – Foeticide and infanticide. – Infant mortality. – Discrimination in breast-feeding and infant food. – Neglect of health (immunization).
1 to 5 years	– Discrimination in access to food. – Poorer health attention and poorer access to health care; high risk of nutritional anaemia. – Discrimination in overall treatment, parental care; expression of value and worth. – Vitamin and micro-nutrient deficiencies. – Early definition and imposition of 'suitable' roles; limits on permitted learning and play activities. – Child marriages in some areas of country. – Household/near-home sexual abuse. – If enrolled in school, less time for learning. – Assignment of domestic duties, minor small domestic chores.
6 to 11 years	– Malnutrition and anaemia. – Health problems like diarrhoea. – Iodine and Vitamin A deficiency. – Low school enrolment, school drop outs. – Vulnerable to trafficking, child labour, child marriage. – Abuse, exploitation and violence. – Increasing domestic duties/workload. – Looking after siblings. – Restrictions on mobility, play.
12 to 18 years	– Poor health, poor health attention. – High risk/high levels of anaemia. – Frequent illness due to malnutrition and micro-nutrient deficiency. – Child marriage. – High-risk/incidence of early child-bearing related morbidity/mortality. – Becoming a 'child-mother', health risks and burden of childcare. – Denied information, mobility, access to services. – Low literacy/learning level. – Early and frequent pregnancy coupled with abortions. – Marital and domestic violence. – Dowry harassment, desertion, polygamy, divorce. – Child labour, trafficking. – STDs and HIV/AIDS. – Unpaid and unrecognized work, and drudgery, hard & boring work – No voice either in home or society.

It is evident from the text above that age-specific and setting-specific interventions have to be put in place for appropriate and effective response to the above problems, highlighting the inter-sectoral nature of actions required.

- Children in bondage.
- Children in prostitution.
- Children of sex workers/prostitutes/sexual minorities.
- Children of prisoners.
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It is evident from the text above that age-specific and setting-specific interventions have to be put in place for appropriate and effective response to the above problems, highlighting the inter-sectoral nature of actions required.

Protecting girl children in India will not be easy. The nation cannot any longer afford the cost of hoping that society will change its mindset on its own, in a situation where pervasive negative attitudes towards women are being reflected on girl children, to the extent of denying them life itself.

The well-being of daughters in the community must become the subject of government monitoring (with NGO assistance if appropriate), covering every age and stage of childhood. Such vigilance must apply to all stages of a girl child's childhood. Panchayats, gram sabhas and local self-government bodies should be brought into this benevolent surveillance.

The specific goals for girls in the National Plan of Action for Children 2005

- Assurance of equality of status for girl child as an individual and a citizen in her own right through promotion of special opportunities for her growth and development.
- To ensure survival, development and protection of the girl child and to create an environment wherein she lives a life of dignity with full opportunity for choice and development.
- To stop sex selection, female foeticide and infanticide.
- To eliminate child marriages.
- To ensure the girl child's security and protect her from abuse, exploitation, victimization and all other forms of violence.
- To protect the girl child from deprivation and neglect and to ensure to the girl child an equal share of care and resources in the home and community, and equal access to services.
- To take measures to protect girl children from any treatment which undermines their self-esteem, and causes their exclusion from social mainstream and also to break down persistent gender stereotype.
- To eliminate all obstacles that prevent girls from full enjoyment of human rights and fundamental freedom including equal rights in succesion and inheritance.
- To ensure equal opportunity for free and compulsory elementary education to all girls.
- Health and nutrition.

Child abuse

The WHO defines child abuse and child maltreatment as "all forms of physical and/or emotional ill-treatment, sexual abuse, neglect or negligent treatment or commercial or other exploitation resulting in actual or potential harm to the childs health, survival, development or dignity in the context of a relationship of responsibility, trust or power". The Center for Disease Control and Prevention (CDC) uses the term child maltreatment to refer to both acts – commission (abuse), or acts of omission (neglect) *(132)*. These public health problems include all types of abuse and neglect under the age of 18 years by a parent, caregiver or another person in a custodial role (such as clergy, a coach, a teacher) that result in harm to the child. There are four types of abuse and neglect *(133)* :

a. *Physical abuse* – It is the intentional use of physical force that can result in physical harm. Examples include hitting, kicking, shaking, burning or other show of force against a child;

b. *Sexual abuse* – It involves pressuring or forcing a child to engage in a sexual act. It includes behaviours such as fondling, penetration and exposing a child to other sexual activities;

c. *Emotional abuse* – It refers to behaviours that harm a child's self-worth or emotional well-being. Examples include name calling, shaming, rejection, withholding love and threatening; and

d. *Neglect* – It is failure to meet a child's basic physical and emotional needs. These needs include housing, food, clothing, education and access to medical care.

Child abuse and neglect are common. At least 1 in 7 children have experienced child abuse and/or neglect in the past year. Children living in poverty experience more abuse and neglect. Rates are 5 times higher for children in families with low socio economic status. The consequences of physical battering – death, blindness, mental and emotional retardation, stunting of growth – are only one part of the whole picture of child abuse. Some contributory factors of child abuse are poverty, alcohol and other drug abuse, loneliness, immaturity and a host of other factors. Many causes are embedded in the family and in its function of child rearing.

The adverse effects of child-abuse are summarized in Fig. 19.

FIG. 19
Impact of adverse childhood experiences
Source : *(133)*

The strategies and approaches to prevent child abuse can be summarized as :

a. Strengthen economic support to the family;
b. Change social norms to support parents and positive parenting;
c. Provide quality care and education early in life;
d. Enhance parenting skills to promote healthy child development;
e. Intervene to lessen harms and prevent future risk; and
f. Child protection.

Studies carried out throughout the past two decades have shown that the provision of supportive home visitors, either public health nurse or trained lay people, to families who are at risk of using violence against children can prevent the abuse from happening. However, we have not yet reached a similar level of confidence about our ability to prevent the sexual abuse of children, which is also a worldwide phenomenon.

Street children

The UN defines street children as "boys and girls for whom the street has become their home and/or source of livelihood and who are inadequately protected or supervised by responsible adults".

The issue of street children is considered to be an urban problem. There are three major categories of street children :

1. Children who live on street with their families and often work on street. They may be from migrated families or temporarily migrated and are likely to go back to their home;
2. Children who live on the street by themselves or in groups and have remote access or contacts with their families in the village; and
3. Children who have no ties to their families such as orphans, refugees or runaways.

According to UNICEF street children fall under two categories: "on the street" and "of the street". Children of the street are homeless who live and sleep on the streets in the urban areas. They are on their own and do not have parental supervision or care though some do live with other homeless adults. Children on the street earn a livelihood from street such as street urchins and beggars. They return home at night to have contact with their families. The distinction is important one because children of the street lack emotional and psychological support of a family.

A large number of children without any family support, particularly in the megacities of the developing world are at high-risk of malnutrition, tuberculosis, STDs including HIV, parasite and worm infestation and skin diseases. Both sexes are highly vulnerable to drug abuse, prostitution and criminal exploitation.

Most street children describe major losses in their lives. Many have lost family members through diseases, natural or man-made disasters, or may be by-product of war and riots.

Although poverty and rapid urbanization are major contributing factors to the problem, many claim that physical and sexual abuse were the reason for their leaving home.

During the year 2003, global estimates placed their number at as many as 100 million. There may be 40 million in Latin America, 25 million in Asia and 10 million in Africa, with about 25 million in other areas including the developed world. In 1993 WHO launched an innovative project to study links between street children and substance abuse. The study noted regular use of alcohol and other drugs by a major proportion of street children. Often the lives of street children are intimately entwined with the illicit drug industry. Street children are used in the production and marketing of cocain and the trafficking of cannabis and heroin *(40)*.

There are particular problems in the provision of health and welfare services to street children with regard not only to health care but also to housing, educational opportunities and employment. The rehabilitation of these children should be taken up by the government and non-government voluntary agencies.

The "Integrated Programme for Street Children" without homes and families was launched to prevent destitution of children and provide facilities for their withdrawal from life on the streets. During 2008–09 the scheme was merged to Integrated Child Protection Scheme. Under the scheme NGOs are given financial support to run 24 hour shelters and provide food, clothing, non-formal education, recreation, counselling, guidance and referral services for children. The other components of the scheme include enrolment in schools, vocational training, occupational placement, mobilizing preventive health services and reducing incidence of drug substance abuse, HIV/AIDS etc. *(67)*.

Refugee and displaced children

Worldwide, about 47.2 million children had been displaced due to conflict and violence as at the end of year 2023. This number includes about 19.1 million refugee children and asylum seekers (15.3 million refugees under UNHCR mandate and other children in need of international protection), and around 2 million asylum seeking children; and an estimated 28.1 million displaced within their own country by conflict and violence. In addition, another 3.1 million children were living in internal displacement as a consequence of natural disaster *(134)*. According to UNHCR, over 2 million children were born as refugees from 2018 to 2023 *(134)*.

As large number of refugees and migrants arrive, children among them are routinely left in conditions that would be deemed unacceptable for native-born children. Thy languish in overcrowded shelters, end up in make shift camps or are left exposed to the dangers of life on the streets. Sometimes, compatriots force them to work under exploitative conditions in exchange for shelter and food. Mistrust of authorities and fear of detention and deportation keep children from coming forward to seek protection and support.

In 2023, nearly three quarters of all refugee children and other people in need of international protection came from just five countries : Afghanistan, the Syrian Arab Rep., Ukraine, Venezuela and South Sudan; three of them – Afghanistan, Syrian Arab Rep. and Ukraine – accounted for more than half of all refugee children in the world *(134)*. Two in three refugee children are in Asia and Africa.

Refugee and internally displaced children face many risks, given the violence and uncertainty surrounding both their flight and their lives in the country and/or place of asylum. They may become separated from their families, lose their homes and find themselves living in poor conditions that jeopardize their health and education.

Displacement complicates birth registration and the issuance of travel documents, thereby compromising displaced persons' right to an identity. Both refugees and internally displaced people may have been forced to leave their homes without proper documentation, making it difficult to establish their identities. They may, therefore, be unable to prove their right to receive basic social services, such as education or health care, or to work in a different part of the country.

The loss of family protection, and inadequate resources to address the needs and challenges that refugee and internally displaced children face, can leave them at significant risk of recruitment by armed groups and forces, abuse and sexual exploitation. Girls are especially at risk of abduction, trafficking and sexual violence, including rape used as a weapon of war.

Orphaned children are much more vulnerable to protection violations. The death of a parent, in situations

where no adequate alternative care systems are in place, opens up a protection gap. Children living on their own are at much greater risk of abuse and exploitation. Assessments by the International Labour Organization (ILO) have found that orphaned children are much more likely than non-orphans to be working in commercial agriculture, as street vendors, in domestic service and in the sex trade.

Primary responsibility for both refugee and displaced children lies with national governments. However, the Office of the United Nations High Commissioner for Refugees (UNHCR) has a mandate to assist and protect refugees, while the International Committee of the Red Cross (ICRC) has a mandate to assist internally displaced people if displacement is a result of armed conflict and internal violence.

Child labour and child exploitation

A sizeable number of growing children of poor socio-economic class especially in rural areas are known to be inducted as child labour. Studies have shown that labour at very young ages can have dire consequences on the child's development, both physical and mental. Child labourers always had lower growth and health status compared to their non-working counterparts, besides exposure to occupational hazards at a very young stage in their lives. The Declaration of the Rights of the Child and our own Constitution has laid down that childhood and youth should be protected against exploitation. In 1973, the ILO passed a convention establishing 15 as the minimum work age for most sectors while permitting light work from age 13, provided that such work was unlikely to harm child's health, morals and safety or prejudice his school attendance *(136)*.

The facts and figures of child labour are summarized as *(137)* :

1. Worldwide 218 million children between 5 and 17 years are in employment. Among them, 152 million are victims of child labour, almost half of them, about 73 million work in hazardous conditions;
2. In absolute terms, almost half of child labour (72.1 million) is in Africa; 62.1 million in the Asia and the Pacific; 10.7 million in the Americas; 1.2 million in the Arab States and 5.5 million in Europe and Central Asia;
3. In terms of prevalence, 1 in 5 children in Africa (19.6%) are in child labour, whilst prevalence in other regions is between 3% and 7%; 2.9% in the Arab States (1 in 35 children); 4.1% in Europe and Central Asia (1 in 25); 5.3% in the Americas (1 in 19) and 7.4% in Asia and the Pacific region (1 in 14);
4. Almost half of all 152 million children victims of child labour are aged 5–11 years;
5. Hazardous child labour is most prevalent among the 15–17 years old. Nevertheless up to a fourth of all hazardous child labour (19 million) is done by children less than 12 years old;
6. Among 152 million children in child labour, about 88 million are boys and 64 million are girls;
7. 58% of all children in child labour and 62% of all children in hazardous work are boys. Boys appear to face a greater risk of child labour than girls, but this may also be a reflection of an under-reporting of girls' work, particularly in domestic child labour; and
8. Child labour is concentrated primarily in agriculture (71%) , which includes fishing, forestry, livestock herding and aquaculture, and comprises both subsistence and commercial farming; 17% in service; and 12% in the industrial sector, including mining.

According to ILO, forced child labour is present in all regions and kinds of economy. For the most part, there is neither official data on the incidence of forced labour nor a widespread awareness among society at large that forced labour is a problem. Children in domestic service are the most invisible child labourers. Their work is performed within individual homes, removed from public scrutiny and their conditions of life and labour are entirely dependant on the whims of their employers. The number of children involved in domestic service around the world is unquantifiable because of the hidden nature of the work, but it certainly runs into millions. Many of these children are girls, and in many countries domestic service is seen as the only avenue of employment for a young girl, though in some places, such as Nepal and South Africa, boys are more likely to be domestic workers than girls. Children exploited in domestic service are generally paid little or nothing over and above food and lodging. In addition, children in domestic service are especially susceptible to physical and psychological harm. Many are forced to undertake tasks that are completely inappropriate for their age and physical strength. Another form of forced labour is debt bondage, whatever the origin of the debt, it leaves children under complete control of a money lender in a state little distinguishable from slavery.

India fosters the largest number of child labour in the world. In 2014, about 82.2 lakh child labour population was estimated in India. Child labour contributes about 20 per cent of India's GNP. Child workers work for 12 hours at an average every day *(137)*. Jammu and Kashmir has the highest percentage of child labour, where children are mainly engaged in carpet weaving industry. The other fields where child labour is used is in agriculture, plantations, mining, building construction, beedi-making, garbage picking, cashew descalding and processing, cloth printing, dyeing and weaving etc.

In India, various items of health and social legislation have been enacted to protect the health, safety and welfare of working children below the age of 15 years.

The Child Labour (Prohibition and Regulation) Act, 1986

Except in the process of family-based work or recognized school-based activities, children are not permitted to work in occupations concerned with :

- Passenger, goods mail transport by railways.
- Carpet weaving.
- Cinder picking, cleaning of ash-pits.
- Cement manufacturing.
- Building construction operations.
- Cloth printing.
- Dyeing, weaving.
- Manufacturing of matches, explosives, fire-works.
- Beedi making.

- Mica cutting, splitting.
- Abattoirs.
- Wool cleaning.
- Printing.
- Cashew descalding and processing.
- Soldering process in electronic industries.

Child labour is rooted in poverty, unemployment and lack of education. A great deal of effort is needed to eliminate these basic causes. It is felt that instead of proliferating the laws relating to children, all the statutory provisions of the various Acts relating to children should be grouped in one comprehensive code of children. It is not feasible to abolish child labour entirely in the present context, but it is expedient to protect such children against abuse, exploitation and health hazards, and regulate the conditions of work in occupations where child labour is permitted.

Child trafficking *(135)*

Child trafficking is the recruitment, transportation, transfer, harbouring or receipt of a child for the purpose of exploitation. A child trafficker is anyone who contributes to an element of the trafficking process with the intent to exploit the child. This included those who play only a part in the entire process, such as recruiters, intermediaries, document providers, transporters, corrupt officials, service providers and unscrupulous employers. Girls are trafficked disproportionately for commercial sexual exploitation and child domestic labour. The ILO 2005 Global Report estimates that Asia has the highest number of child trafficking victims followed by industrialized countries, Latin America and Caribbean, the Middle East Countries *(138)*.

"Poverty-plus" at source, transit and destination : Poverty alone does not guarantee that a child will be trafficked, usually it is poverty plus one or many other risk factors that make a child vulnerable to trafficking. These could be at the individual, household, community or institutional level. Some common causes of vulnerability include lack of birth registration, discrimination, orphanhood, illness in the family, family abuse, conflict or natural disaster, travelling alone or through a non-registered agency or smuggler, inability to speak the language, unregulated informal economy, weak legal framework and enforcement, corruption and a large youth population with low labour market absorption. Vulnerability is not static, it changes over time, and different risk factors are present in different contexts *(138)*.

Trafficking of children takes many different forms. Some children are forcibly abducted, others are tricked and still others opt to let themselves be trafficked by promise of earnings, but not suspecting the level of exploitation they will suffer at the other end of the recruiting chain. Trafficking always involves journey, whether within the country or across the international border. The relocation takes children away from their families, communities and support network, leaving them isolated and utterly vulnerable to exploitation. Collecting data about these children is very difficult. It is estimated that trafficking affects about 1.2 million children each year.

Though the trafficking of children is a shadowy practice, some dominant regional patterns are identifiable. In West and Central Africa, children are "placed" in a marginal position within other families. This practice is being used to exploit children both within and outside home. Children are also trafficked into plantations and mines, and in those countries affected by conflict, they are directly abducted by militias. In East Asia and Pacific, most trafficking is into child prostitution, though some children are also recruited for industrial and agricultural work. In South Asia, trafficking forms most of immense child labour problem in the sub-continent, often related to debt bondage. In addition, significant number of children are trafficked for other purposes, including into prostitution, carpet and garment factories, construction projects and begging. In Europe, children are mainly trafficked from east to west, reflecting the demand for cheap labour and child prostitution in richer countries of the continent. Children are also used as unskilled labour and in the entertainment sector.

An estimated 8.4 million children work under terrible circumstances and are forced into bondage or other forms of slavery.

Making children safe requires creating a protective environment for them. The key elements of a protective environment include :

- Strengthening the capacity of families and communities to care for and protect children.
- Government commitment to child protection by providing budgetary support and social welfare policies targeted at the most excluded and invisible children.
- Ratification and implementation of legislation, both national and international, concerning children's rights and protection.
- Prosecution of perpetrators of crimes against children, and avoidance of criminalizing child victims.
- An open discussion by civil society and the media of attitudes, prejudices, beliefs and practices that facilitate or lead to abuses.
- Ensuring that children know their rights, are encouraged to express them and are given vital life skills and information to protect themselves from abuse and exploitation.
- Availability of basic social services to all children without discrimination.
- Monitoring, transparent reporting and oversight of abuses and exploitation.

The key to building the protective environment is the responsibility of members of the society, by ensuring that children are not exploited. While families and the State have the primary responsibility for protecting children, ongoing and sustained efforts by individuals and organizations at all levels, are essential to break patterns of abuse.

UJJAWALA : "Ujjawala", a comprehensive scheme to combat trafficking was launched in India by the Ministry of Women and Child Development on 4th December, 2007 and is being implemented mainly through NGOs. The scheme has five components of prevention, rescue, rehabilitation, reintegration and repatriation of victims trafficked for commercial sexual exploitation. Some of the provisions under the scheme are *(67)* :

(1) Formation of community vigilance groups, adolescents groups, awareness creation and preparation of IEC material, organizing workshops;

(2) Safe withdrawal of victims from the place of exploitation;

(3) Rehabilitation of victims by providing them safe shelter, basic amenities, medical care, legal aid, vocational training and employment;

(4) Re-integration of victims into society; and

(5) Provide support to cross-border victims for their safe repatriation to the country of origin.

Preventing Violence Against Children *(139)*

Globally, it is estimated that one out of two children aged 2–17 years suffer some form of violence each year. Worldwide, close to 300 million children aged 2–4 years regularly experience violent discipline by their caregivers. A third of students aged 11–15 years worldwide have been bullied by their peers in the past month, and 120 million girls are estimated to have suffered some form of forced sexual contact before the age of 20 years. Emotional violence affects one in three children and worldwide one in four children lives with a mother who is the victim of intimate partner violence. An estimated 40,150 children worldwide were victims of homicide in the year 2017. The global homicide rate for 0–17 years old was 1.7 per 100,000 population, and the rate for boys of 2.4 per 100,000 was over twice than in girls (1.1 per 100,000 population). The COVID-19 pandemic and societies response to it has had a dramatic impact on the prevalence of violence against children and is likely to have long-lasting negative consequences.

Over their lifetime, children exposed to violence are at increased risk of mental illness and anxiety disorders; high risk behaviours like alcohol and drug abuse, smoking and unsafe sex; chronic diseases such as cancers, diabetes and heart disease; infectious diseases like HIV; and social problems including educational underattainment, further involvement in violence and crime. The economic costs of these consequences are enormous.

The elimination of violence against children is called for in several targets of the 2030 Agenda for Sustainable Development Goals, specially in Target 16.2 : "end abuse, exploitation, trafficking and all forms of violence and torture of children". It focusses on interpersonal violence which accounts for most acts of violence against children, and includes child maltreatment, bullying and other types of youth violence and intimate person violence. The governments can monitor their progress towards reaching the SDG over course of 2020–2030, through the lens of Seven INSPIRE evidence-based strategies for ending violence against children.

INSPIRE: Seven strategies for ending violence against children *(139)*

INSPIRE is a set of seven evidence-based strategies for countries and communities working to eliminate violence against children. Launched in 2016, INSPIRE serves as a technical package and handbook for selecting, implementing and monitoring effective policies, programmes and services to prevent and respond to violence against children.

INSPIRE is an acronym, with each letter representing a strategy : I for the implementation and enforcement of laws; N for norms and values; S for safe environments; P for parent and caregiver support; I for income and economic strengthening; R for response and support services; and E for education and life skills. There are also two cross-cutting activities (multisectoral action and coordination, and monitoring and evaluation) that connects the seven strategies and monitor the extent of their implementation and impact on the problem.

The strategies and approaches of INSPIRE for preventing and responding to violence against children are as follows :

Strategy	Approach
Implementation and enforcement of laws	– Laws banning violent punishment of children by parents, teachers or other caregivers – Laws criminalizing sexual abuse and exploitation of children – Laws that prevent alcohol misuse – Laws limiting youth access to firearms and other weapons
Norms and values	– Changing adherence to restrictive and harmful gender and social norms – Community mobilization programmes – Bystander interventions
Safe environments	– Reducing violence by addressing "hotspots" – Interrupting the spread of violence – Improving the built environment
Parent and caregiver support	– Delivered through home visits – Delivered in groups in community settings – Delivered through comprehensive programmes
Income and economic strengthening	– Cash transfers – Group saving and loans combined with gender equity training – Micro-finance combined with gender norm training
Response and support services	– Counselling and therapeutic approaches – Screening combined with interventions – Treatment programmes for juvenile offenders in the criminal justice system – Foster care interventions involving social welfare services
Education and life skills	– Increase enrolment in pre-school, primary and secondary schools – Establish a safe and enabling school environment – Improve children's knowledge about sexual abuse and how to protect themselves against it – Life and social skills training – Adolescent intimate partner violence prevention programmes

Child marriage

Early marriage is a long-established custom in India. As early as 1929, the Sharda Act was enacted forbidding the

practice of child marriages. In spite of the spread of literacy and legislations prohibiting early marriages, child marriages are still in vogue in the countryside particularly in Rajasthan, Madhya Pradesh and Uttar Pradesh, where substantial proportion of marriages take place when the girl is around 15 years of age *(140)*. The census data reveal that prior to 1951, the average age at marriage for girls in India was 13 years. There is however a gradual rise in the age at marriage in the country. The Child Marriage Restraint Act of 1978 raises the legal age of marriage from 15 to 18 years for girls; and from 18 to 21 years for boys. Studies indicate that in many states, the mean age at marriage for girls has already moved into 19 years and 24 years for the boys. The Prohibition of Child Marriage Act, 2006 (PCMA) was enacted repealing the Child Marriage Restraint Act of 1929 in order to prohibit child marriage rather than only restraining them. PCMA has been enforced with effect from 1st November, 2007. It makes child marriage an offence and makes provision for punishment for those conducting / abetting /promoting / permitting the marriage *(67)*.

The age at which the girl marries and enters the reproduction period of life has a great impact on her fertility. Girls who marry before the age of 18 give birth to larger number of children than those who married late. It is estimated that if the marriages were postponed from the age of 16 to 20–21, the number of births would decrease by 20–30 per cent.

Child guidance clinic

The first child guidance clinic was started in Chicago in 1909 and ever since, they have grown in number and complexity throughout the world. Originally intended to deal with problems of juvenile delinquency, child guidance clinics deal with all children or adolescents who for one reason or other, are not fully adjusted to their environment. The object of child guidance is to prevent children from the possibility of becoming neurotics and psychotics in later life.

Team work : Child guidance is a team work job – the team comprising of a psychiatrist, clinical psychologist, educational, psychologist, psychiatric social workers, public health nurses, paediatrician, speech therapist, occupational therapist and a neurologist. The psychiatrist is the central figure and is helped by the others in arriving at a correct diagnosis and formulating the line of treatment.

Services : The paediatrician takes care of the physical health of the child. The core of therapy is psychotherapy in order to restore positive feelings of security in the child. To achieve this, many methods are employed, e.g., play therapy, counselling, suggestions, change in the physical environment, easing of parental tensions, reconstruction of parental attitudes, etc. The child guidance clinics operate on the premise that if sound foundations of mental health are laid in childhood and adolescence, the same will continue into adulthood.

Child placement

(1) ORPHANAGES : Children who have no home or who for some reason could not be cared for by their parents are placed in orphanages. Scientific studies of human behaviour have revealed that mass care of infants and children in large institutions is undesirable. In such institutions, there is little opportunity for the child to experience the warmth and intimacy of family life, to develop emotional security and to participate in activities that would help him to become an adequate citizen. (2) FOSTER HOMES : Fostering is an arrangement whereby a child lives, usually on a temporary basis, with an extended or unrelated family member. Such an arrangement ensures that the birth parents do not lose any of their parental rights or responsibilities. This arrangement cater to children who are not legally free for adoption, and whose parents are unable to care for them due to illness, death or desertion by one parent, or any other crisis. The aim is to eventually re-unite the child with his/her own family, when the family circumstances improve *(66)*. (3) ADOPTION : In addition to the more or less temporary placement of children in foster or boarding homes, children are legally adopted. Legal adoption confers upon the child and adoptive parents, rights and responsibilities similar to that of natural parents. The laws of adoption vary from country to country; the relevant law in India is the "Hindu Adoptions and Maintenance Act, 1956". (4) BORSTALS : Boys over 16 years who are too difficult to be handled in a certified school or have misbehaved there, are sent to a Borstal. This institution falls in a category between a certified school and an adult prison. A Borstal sentence which is usually for three years, is regarded as a method of training and reformation. There are about six Borstals for boys in India but none for girls. Borstals do not come under the Children Act but are governed by the State Inspector General of Prisons *(141)*. (5) REMAND HOMES : In the remand home, the child is placed under the care of doctors, psychiatrists and other trained personnel. Every effort is made to improve the mental and physical wellbeing of the child. Elementary schooling is given, various arts and crafts are taught, games are played and other recreational activities are arranged.

THE CHILDREN ACT, 1960

The Children Act, 1960 in India (amended in 1977) provides for the care, maintenance, welfare, training, education and rehabilitation of the delinquent child. It covers the neglected and destitute, socially handicapped, uncontrollable, victimized and delinquent children. In Article 39 (f) the Constitution of India provides that "the state shall in particular direct its policy towards securing that childhood and youth are protected against moral and material abandonment."

JUVENILE JUSTICE ACT 1986

With the implementation of the Juvenile Justice Act, 1986, all Children's Acts applicable in different parts of the country have been repealed. The new Act, apart from rectifying the inadequacies of Children's Act, provides a comprehensive scheme for care, protection, treatment, development and rehabilitation of delinquent juveniles. The new Act has come into force from 2nd Oct 1987. Some of the special features of the Act are :

a. It provides a uniform legal framework for juvenile justice in the country so as to ensure that no child under any circumstances is put in jail or police lock-up;
b. It envisages specialized approach towards prevention and treatment of juvenile delinquency in keeping with the developmental needs of children;

c. It establishes norms and standards for administration of juvenile justice in terms of investigation, care, treatment and rehabilitation; and

d. It lays down appropriate linkages and coordination between the formal system of juvenile justice and voluntary organizations. It specifically defines the roles and responsibilities of both.

Juvenile Justice Act 2000 *(66)*

Juvenile Justice (Care and Protection of Children) Act, 2000 (now Amendment Act 2006) is an Act to consolidate and amend the law relating to juveniles in conflict with law and children in need of care and protection, by providing for proper care, protection and treatment by catering to their development needs, and by adopting a child-friendly approach in the adjudication and disposition of matters in the best interest of children and for their ultimate rehabilitation. The Act defines a juvenile/child as a person who has not completed the age of 18 years. It has two separate chapters – one for juveniles in conflict with law and the other for children in need of care and protection. It also contains an exclusive chapter concerning rehabilitation and social reintegration of children. The Act defines Juvenile in conflict with law as a child who is alleged to have committed an offence and Children in need of care and protection broadly as children who are neglected, abused, abandoned, victim of any armed conflict or natural calamity amongst others. Offences committed against a child as listed in the Act, are cognizable and punishable under the provisions of this Act.

In order to implement its provisions and procedure, the Act provides for :

- Juvenile Justice Boards
- Child Welfare Committees
- Institutional care through children's homes, observation homes, shelter homes, special homes and aftercare organizations
- Non-institutional care through Adoption, Foster Care, Sponsorship Act and After Care
- Special Juvenile Police Units
- Juvenile Justice Fund
- Central/State/District Advisory Boards
- Selection Committee
- Inspection Committee.

Juvenile Justice (Care and Protection of Children) Act 2015

Juvenile Justice (Care and Protection of Children) Act 2015 came into force from January 15, 2016. The Act allows children aged 16 to 18 years and in conflict with law to be tried as adults in cases of heinous offences. When pronounced guilty, such children can be detained in a place of safety until they reach the age of 21 years. If still not found to have reformed by 21, they can be sent to jails housing adults.

SOCIAL WELFARE PROGRAMMES

The various social welfare programmes for women and children in India may be broadly categorized under six heads : (1) programmes for the welfare of women; (2) programmes for the welfare of children; (3) composite programmes (both for women and children); (4)schemes for the maladjusted groups; (5) schemes for the physically handicapped persons; and (6) programmes for the welfare of backward classes.

CHILD WELFARE

Child welfare covers the entire spectrum of needs of children who by reason of handicap – social, economic, physical or mental – are unable to avail of services provided by the community *(142)*. Child welfare programmes thus seek to provide supportive services to the families of these children because one of the important responsibility of the society and state is to assist the family in its natural obligations for the welfare of the children.

Child welfare services in their various facets are preventive, promotive, developmental and rehabilitative in nature. The problem is gigantic, and the resources available are only supplementary in nature and are designed to meet certain needs of the most deprived and vulnerable among country's child population. Attention is generally focussed on 3 categories of children in the poverty groups : children of working mothers; destitute children, and handicapped children *(142)*.

CHILD WELFARE AGENCIES

The important child welfare agencies in India are : (1) Indian Council for Child Welfare (ICCW); (2) Central Social Welfare Board; (3) Kasturba Gandhi Memorial Trust; and (4) the Indian Red Cross Society. These agencies have got branches all over the country. They get financial aid from the government to organize child welfare services in the country. The following are some of their activities. (a) DAY CARE SERVICES : This is for children of working mothers. Nursery schools, BALWADIS and creches are set up to help the children of working mothers. Day care centres are mainly for infants and toddlers. (b) HOLIDAY HOMES : These are organized for children in the age group 12 to 16 years at hill stations and sea-side resorts. The children spend their holidays in a useful manner. (c) RECREATION FACILITIES : These comprise organization of play centres, public parks, children's libraries, BAL BHAVANS, children's films, national museums, hobby classes, etc. Besides the national agencies, the following international agencies are interested in child welfare : UNICEF, WHO, International Union for Child Welfare, CARE and FAO of the United Nations.

INTEGRATED CHILD DEVELOPMENT SERVICES (ICDS)

Currently, the most important scheme in the field of child welfare is the ICDS scheme. The blue print for the scheme was prepared by the Department of Social Welfare in 1975. Considering the magnitude of the task, it was decided to take up on an experimental basis 33 projects in the year 1975–76 in 4 urban, 19 rural and 10 tribal areas spread over 22 states and the Union Territory of Delhi. The projects were sanctioned in October 1975. The Government of India decided to expand the project to cover 100 areas by 1978–79. Two major evaluations were conducted in 1978 and 1982. The positive results of these evaluations formed

the basis for the governments decision to accelerate the expansion of ICDS in 1982.

Prior to 2005–06, providing supplementary nutrition was the responsibility of the states and administrative cost was provided by the central government. Government of India has modified the cost sharing pattern under ICDS by giving aid of 60 per cent of the financial expenditure to the states/UTs. In North-East states and Himalayan states the share is 90:10 and in Union Territories without legislation it is 100% central share.

The population norms for setting up of Angan Wadi Centres (AWC) and Mini-AWC have been revised to cover all habitations by SC/ST/minorities. The revised norms are as follows :

For AWCs in rural/urban projects

1 AWC for 400–800 population

2 AWCs for 800–1600 population

3 AWCs for 1600–2400 population

Thereafter, one AWC for multiples of 800 population. For Mini-AWC, the norm is one mini-AWC for 150 to 400 population.

Anganwadi on demand – where a settlement has atleast 40 children under 6 years but no anganwadi centre.

For tribal/reverine/desert/hilly and other difficult areas

1 AWC for 300–800 population

1 Mini-AWC for 150–300 population.

The ICDS seeks to lay a solid foundation for the development of the nation's human resource by providing an integrated package of early childhood services. These consist of – (1) supplementary nutrition; (2) immunization (3) health check-up; (4) medical referral services; (5) nutrition and health education for women; and (6) non-formal education of children up to the age of 6 years, and pregnant and nursing mothers in rural, urban, slums and tribal areas. ICDS scheme is designed both as a preventive and development effort. The services of immunization, health check-up and referral services are provided through public health infrastructure i.e., sub-centres, PHC and CHC. The services are provided concurrently.

Objectives *(143)*

The objectives of the ICDS scheme are :

(a) to improve the nutritional and health status of children in the age group 0–6 years;

(b) to lay the foundations for proper psychological, physical and social development of the child ;

(c) to reduce mortality and, morbidity, malnutrition and school drop-out;

(d) to achieve an effective coordination of policy and implementation among the various departments working for the promotion of child development; and

(e) to enhance the capability of the mother and nutritional needs of the child through proper nutrition and health education.

To achieve the above objectives the ICDS aims at providing the following package of services.

Beneficiary	Services
Pregnant women	Heath check-up Immunization against tetanus Supplementary nutrition Nutrition and health education
Nursing mothers	Health check-up Supplementary nutrition Nutrition and health education
Other women 15–45 years	Nutrition and Health education
Children less than 3 years	Supplementary nutrition Immunization Health check-up Referral services
Children in age group 3–6 years	Supplementary nutrition Immunization, Health check-up Referral services Non-formal education
Adolescent girls 11–18 years	Supplementary nutrition Nutrition and health education

The strategy adopted in ICDS is one of simultaneous delivery of early childhood services. While the health component forms a major component, ICDS is much more than a mere health programme for delivery of social services input for development.

Delivery of services

1. Supplementary nutrition

Supplementary nutrition is given to children below 6 years, and nursing and expectant mothers from low income group. The type of food depends upon local availability, type of beneficiary, location of the project etc. The aim is to supplement nutritional intake as follows *(144)* :

a. each child 6–72 months of age to get 500 calories and 12–15 grams of protein (financial norm of Rs 8.00 per child per day);

b. Severely malnourished child 6–72 months to get 800 calories and 20–25 grams protein (financial norm of Rs 12.00 per child per day); and

c. Each pregnant and nursing woman to get 600 calories and 18–20 grams of protein (financial norm of Rs 9.50 per beneficiary per day.

Under the revised nutritional and feeding norms for supplementary nutrition, state governments/UTs have been mandated to provide more than one meal to the children who come to AWCs, which include providing a morning snack in the form of milk/banana/egg/seasonal fruit/micro-nutrient fortified food followed by a hot cooked meal. For children below 3 years of age, and pregnant and lactating mothers, "take home ration" is to be provided. All are eligible for availing of the services of ICDS, below poverty line is not a criteria for registration of beneficiaries. The scheme is universal.

Supplementary nutrition is given 300 days in a year *(143)*. Adequate funds for supplementary nutrition is provided in the State Plan under Minimum Needs Programme. Children are weighed every month. Nutrition education and health education is given to mothers of children suffering from 1st

degree of malnutrition. Supplementary nutrition (therapeutic food) is given to children suffering from 2nd and 3rd degree malnutrition. Children suffering from 4th degree malnutrition are recommended hospitalization.

2. Nutrition and health education

Nutrition education and health education is given to all women in the age group 15–45 years, giving priority to nursing and expectant mothers. It is imparted by specially organized courses in village during home visits by anganwadi workers.

3. Immunization

Immunization of children against 9 vaccine preventable diseases is being done, while for expectant mothers, immunization against tetanus is recommended.

4. Health check-up

This includes (a) antenatal care of expectant mothers; (b) postnatal care of nursing mother and care of newborn infants; (c) care of children under 6 years of age. Besides immunization, expectant mothers are given iron and folic acid tablets along with protein supplements. A minimum of 3 physical examinations are done. High risk mothers are referred to appropriate institutions for special care.

The health care of children under 6 years of age consists of :

1. Record of weight and height of children at periodical intervals;
2. Watch over milestones;
3. Immunization;
4. General check-up every 3-6 months to detect disease, malnutrition etc.;
5. Treatment for disease like diarrhoea, dysentery, respiratory tract infections etc. which are widely prevalent;
6. Deworming;
7. Prophylaxis against vitamin A deficiency and anaemia; and
8. Referral of serious cases to hospital has also been provided for.

Health records : Health records of the children, antenatal care and delivery card etc. are maintained. A card containing the health record of the child is given to the mother.

5. Non-formal pre-school education

Children between the ages 3–6 years are imparted non-formal pre-school education in an anganwadi in each village with about 1000 population. The objective is to provide opportunities to develop desirable attitude, values and behaviour pattern among children. Locally produced inexpensive toys and material are used in organizing play and creative activity.

Schemes for adolescent girls (67)

At present, there are two schemes for adolescent girls viz. "Kishori Shakti Yojana" and "Nutrition Programme for Adolescent Girls".

Kishori Shakti Yojana is being implemented using the infrastructure of ICDS. The scheme targets adolescent girls in the age group of 11 to 18 years and addresses their needs of self development, nutrition and health status, literacy and numerical skills, vocational skills etc.

Nutrition Programme for Adolescent Girls was approved in the year 2009–10, on a pilot project basis. The project is being implemented in 51 identified districts from the major states. Undernourished adolescent girls in the age group of 11 to 19 years (with body weight less than 30 kg in the age group of 11 to 15 years and 35 kg in the age group of 15 to 19 years) are covered under the scheme. 6 kg of free food grain is provided to each beneficiary per month. The programme is being implemented through the administrative set-up of ICDS scheme at the state, district, block and Anganwadi Centre level.

Poshan Abhiyan *(143)*

Government of India has launched "Poshan Abhiyan" on 18th December 2017 for a period of three years commencing from 2017–18, in all 36 states/UTs. The goals are to achieve improvement in nutritional status of children from 0–6 years, adolescent girls, pregnant women and lactating mothers with fixed targets. It ensures convergence of various programmes i,e anganwadi services, Pradhan Mantri Matru Vandana Yojana; schemes for adolescent girls of Ministry of Women and Child Development; Janani Suraksha Yojana; National Health Mission of Ministry of Health and Family Welfare; Swachh Bharat Mission of Ministry of Jal Shakti etc.

The objectives and targets are as follows *(140)* :

1.	Prevent and reduce stunting in children (0–6 years)	By 6 per cent (2 per cent/ year)
2.	Prevent and reduce under nutrition and underweight prevalence in children (0–6 years)	By 6 per cent (2 per cent/ year)
3.	Reduce the prevalence of anaemia among children (6–59 months)	By 9 per cent (3 per cent/ year)
4.	Reduce the prevalence of anaemia among girls and women in the age group (15–49 years)	By 9 per cent (3 per cent/ year)
5.	Reduce low birth weight (LBW)	By 6 per cent (2 per cent/ year)

The Abhiyan aims to reduce malnutrition in the country through a life cycle approach.

Two more schemes are being implemented at the ICDS level. They are (a) Rajiv Gandhi Scheme for Empowerment of Adolescent Girls – "SABLA" for the age group 11 to 18 years to improve their nutritional and health status; and (b) Indira Gandhi Matritva Sahyog Yojana (IGMSY) under which conditional cash transfer will be made to pregnant and lactating mothers in order to improve their nutritional and health status *(67)*.

At the end of 2019, about 7,075 ICDS projects and 13.77 lakh Anganwadi Centres/Mini-Anganwadi Centres were functional in the country. About 305.09 lakh children are pre-school education beneficiaries and 836.25 lakh supplementary nutrition beneficiaries are children and pregnant and lactating mothers.

Administration

The administrative unit of an ICDS project is the "community development block" in rural areas, the "tribal development block" in tribal areas and a group of slums in urban areas. In selection of project areas preference was given to areas predominantly inhabited by backward tribes, backward areas, draught prone areas and areas in which nutritional deficiencies are rampant. The rural/urban project has a population of 100,000 and a tribal project about 35,000 population. The number of villages in the rural

project may be 100 while in tribal areas, it may be only about 50, taking into account the difficult terrain in which the tribal projects are located. The focal point for the delivery of integrated early childhood services under the ICDS scheme is the trained local woman known as Anganwadi worker (AWW). Other functionaries in the ICDS are the Child Development Project Officer (CDPO), who is in charge of 4 Supervisors (Mukhya Sevika) and 100 AWWs. Each Supervisor is responsible for 20–25 anganwadis and acts as mentor to AWWs; assists in record keeping, visits of health personnel and organizing community visits; and provides on-the-job training to AWWs. Anganwadi worker is the multipurpose agent, selected from the community. AWW provides direct link to children and mother; assists CDPO in survey of community and beneficiaries; organizes non-formal education sessions; provides health and nutrition education to mothers; assists PHC staff in providing health services; maintains records of immunization, feeding and pre-school attendance; liaises with block administrator, local school, health staff and community, and works for other community based activities, e.g., family planning.

The Government of India is committed to child development as a policy priority and is steadily expanding ICDS programme with the ultimate aim of reaching every child. The impact of the programme on the lives of children is evident in several crucial indicators : increased birth weight, reduced incidence of malnutrition, increased immunization coverage, and a reduced infant and child mortality rate in areas covered by the ICDS *(123)*.

Health of adolescents

The term "adolescence" has been defined as including those aged between 10 and 19, and "youth" as those between 15 and 24; "young people" is a term that covers both age groups, i.e. those between the ages of 10 and 24. True adolescence, however, being the period of physical, psychological and social maturing from childhood to adulthood, may fall within either age range. The development that takes place in adolescence is generally uneven, in that physical maturity may well be achieved in advance of psychological or social maturity; in most societies, in fact, reproductive capability is now established at an earlier age than in the past.

The importance of the health of adolescents has started to receive increasing recognition, particularly in developing countries where four out of five of the world's young people live, and where more than half the population is under the age of 25. These young men and women are, or will become, the parents of the next generation. They must be given every opportunity to develop to their full potential as healthy individuals.

Because adolescents are less vulnerable to disease than the very young and the very old, health problems specific to their age group have been given little prominence until now. Moreover, in societies where girls in particular have traditionally married at an early age, adolescence has been regarded merely as a brief interlude between puberty and marriage. As the average age of menarche has fallen, and with an increasing trend towards late marriage, however, this period has been extended and traditional attitude has begun to change. At the same time, the influence of the family has declined, urbanization and migration have become more common, and young people have been increasingly exposed to the mass media – all factors that contribute to major changes in social and sexual behaviour.

High rate of mortality and morbidity has always been associated with pregnancy and childbirth in pubertal and adolescent girls. This problem is now compounded by the dramatic rise in the number of pregnancies, both wanted and unwanted, among adolescents, who are also having more abortions and contracting sexually transmitted diseases more often. There appears also to be an increase in the number of abandoned and abused children born to adolescent mothers. As long as these problems are allowed to persist, much of the energy, creativity and idealism of youth will be lost to society. However, the problems are preventable, and efforts to eliminate them must involve the young people themselves, contributing in ways appropriate to their particular cultures.

Society today demands more of young people than ever before. With the decline of the extended family greater autonomy is expected of them, especially in the raising of children; increasing urbanization and industrialization means that economic independence is achieved only through more education and training. Early parenthood, particularly for girls, may limit or preclude social and educational development and the ability to achieve full status in society and is associated with greater morbidity and mortality. The World Fertility Survey observed an inverse relationship between fertility and the education of women: women with no education have, on average, twice as many children as those with seven or more years of schooling. Corollaries of this finding are the increased earning power of educated women, their improved status within the family, and the greater control they are able to exercise over their own lives.

A more universal consequence of early and more frequent childbearing is the increase in population size and growth rate. Where girls marry at 15, the age gap between successive generations may be less than 20 years; this gap may widen to as much as 30 years where the age at marriage is 25. The sexual behaviour and reproductive patterns of young people are highly susceptible to social influences and related to their own sense of psychological well-being.

Although an adolescent girl is likely to give birth and rear her children within the context of an extended family, the risks she and her children run of illness, injury and death are far greater than those for a mature woman in her twenties. The chances of anaemia, developing during pregnancy, and of retarded fetal growth; premature birth and complications during labour are all significantly higher for the adolescent mother, as are the risks of her own death during pregnancy or child-birth.

Formal education of girls generally ends with marriage, and from then on their social status may well depend on fecundity. An adolescent girl who proves to be infertile (or whose husband is infertile) runs the risk of being rejected by both husband and family and thus of losing what little status she has. The second major set of problems of reproductive health in adolescence results from the profound socio-economic changes taking place in most developing countries. The average age of menarche has fallen, there is a trend towards later marriage, and young people are often less directly supervised than was the case in the past – all of which have the effect of increasing the opportunities for sexual encounter. Since the subject of adolescent sexuality remains taboo in most societies, there is widespread ignorance among young people of the risks associated with unprotected sexual activity. Sources of information and

contraceptive advice are rarely available or accessible to them. In addition, impulsive sexual behaviour and non-use of contraceptives are sometimes exacerbated by alcohol and drug abuse.

A number of major approaches to reducing problems by modification of the contributing factors will serve to promote good health among the young and thus to improve health and social development of their communities. These approaches include the following :

1. Informing, educating and sensitizing key groups in society to individual health and social development needs.
2. Advocating appropriate policy, legislation and programmes for promoting adolescent reproductive health.
3. Using appropriate and innovative research to improve knowledge of, and disseminate information about, the factors that influence and determine young people's sexual, contraceptive and reproductive decisions and behaviour.
4. Modifying, extending and evaluating services specially designed to meet young people's needs.
5. Mobilizing the energy, creativity and idealism of young people in promoting health and developing appropriate activities in their communities.
6. Facilitating action to extend education opportunities for girls.

PREVENTIVE MEDICINE AND GERIATRICS

Ageing is a natural process. In the words of Seneca; "Old age is an incurable disease", but more recently, Sir James Sterling Ross commented : "You do not heal old age. You protect it; you promote it; you extend it" *(145)*. These are in fact the basic principles of preventive medicine. Old age should be regarded as a normal, inevitable biological phenomenon. The study of the physical and psychological changes which are incident to old age is called gerontology. The care of the aged is called clinical gerontology or geriatrics. Another aspect of gerontology is social gerontology which was born on the one hand out of the instincts of humanitarian and social attitudes and on the other out of the problems set by the increasing number of old people. Experimental gerontology is concerned with research into the basic biological problems of ageing, into its physiology, biochemistry, pathology and psychology. The fields of studies range from studies of populations through individuals, organs, systems, tissues and cells, down to the molecular level. GERIATRIC GYNAECOLOGY : With the lengthening span of life a new chapter in gynaecology – geriatric gynaecology – is fast opening up. More patients are coming for repair of prolapse of varying degrees, non-specific vaginitis, ovarian tumours, psychic aberrations and sexual problems. There is ample scope for research into the degenerative and other diseases of old age; their treatment in hospital and general practice; and finally into preventive geriatrics and the epidemiology of conditions affecting the aged.

Size of the problem

Discoveries in medical science and improved social conditions during past few decades have increased the life span of man. The expectation of life at birth in developed countries is over 80 years. The age structure of the population in the developed countries has so evolved that the numbers of old people is continually on the increase. These trends are appearing in all countries where medical and social services are well developed and the standard of living is high.

In the year 2019, there were an estimated 694 million old persons in the world, of which 540 million were living in developing countries *(5)*. Italy and Japan have the highest proportion of older persons (about 24 per cent and 16 per cent respectively in the year 2019). By 2025, the number of elderly people is expected to rise more than 1.2 billion with about 840 million of these in low-income countries. In India, although the percentage of aged persons to the total population is low in comparison to the developed countries, nevertheless, the absolute size of aged population is considerable. For the year 2019 the estimates are : 9.3 per cent of total population were above the age of 65 years. This profound shift in the share of older Indians, brings with it a variety of social, economic and healthcare policy challenges *(146)*.

Health problems of the aged

(1) PROBLEMS DUE TO THE AGEING PROCESS

No one knows when old age begins. The "biological age" of a person is not identical with his "chronological age". It is said that nobody grows old merely by living a certain number of years. Years wrinkle the skin, but worry, doubt, fear, anxiety and self-distrust wrinkle the soul. While ageing merely stands for growing old, senescence is an expression used for the deterioration in the vitality or the lowering of the biological efficiency that accompanies ageing. With the passage of time, certain changes take place in an organism. These changes are, for the most part deleterious and eventually lead to the death of the organism. Our knowledge about the ageing process is incomplete. We do not know much about the disabilities incident to the ageing process. However the following are some of the disabilities considered as incident to it: (a) senile cataract, (b) glaucoma, (c) nerve deafness, (d) osteoporosis affecting mobility, (e) emphysema, (f) failure of special senses, (g) changes in mental outlook. This list is not exhaustive; we need to know a lot more about the disabilities incident to the ageing process.

(2) PROBLEMS ASSOCIATED WITH LONG-TERM ILLNESS

Certain chronic diseases are more frequent among the older people than in the younger people. These are : (a) DEGENERATIVE DISEASES OF HEART AND BLOOD VESSELS : Of particular importance after the age of 40, are the degenerative diseases of the heart and blood vessels. The inner walls of arteries break down, and a lipoid material is deposited. This in time is replaced by calcium which leads to narrowing of blood vessels or atherosclerosis. This leads to diminished blood supply, thrombus formation, rupture of blood vessels and high blood pressure. No single factor has been identified as the cause of atherosclerosis. Diet, heredity, overweight, nervous and emotional strain have all been implicated. Cardiovascular diseases are the major causes of death in the developed countries. A reduction of body weight and modification of the habits of life are needed to decrease the strain on heart and blood vessels. By these, it is possible to lead a longer and more useful life. (b) CANCER : The danger of cancer looms large past middle life. In the developed countries, cancer is a leading cause of death. The incidence of cancer rises rapidly after the age of 40. Cancer of the prostate is common after the age of 65. (c) ACCIDENTS : Accidents are a health problem in the

elderly. The bones become fragile due to a certain amount of decalcification as a result of which they break easily. Accidents are more common in the home than outside. Fracture neck of femur is a very common geriatric problem. (d) DIABETES : Diabetes is a long-term illness due to faulty carbohydrate metabolism. It is a leading cause of death as the population grows older. About 75 per cent of the diabetics are over 50 years of age. (e) DISEASES OF LOCOMOTOR SYSTEM : A wide range of articular and non-articular disorders affect the aged – fibrositis, myositis, neuritis, gout, rheumatoid arthritis, osteoarthritis, spondylitis of spine, etc. These conditions cause more discomfort and disability than any other chronic disease in the elderly. (f) RESPIRATORY ILLNESSES : In the upper decades of life, respiratory diseases such as chronic bronchitis, asthma, emphysema are of major importance. (g) GENITOURINARY SYSTEM : Enlargement of the prostate, dysuria, nocturia, frequent and urgency of micturition are the common complaints.

(3) PSYCHOLOGICAL PROBLEMS

(1) MENTAL CHANGES : Impaired memory, rigidity of outlook and dislike of change are some of the mental changes in the aged. Reduced income leads to a fall in the living standards of the elderly; it does have mental and social consequences. (2) SEXUAL ADJUSTMENT : Between 40 and 50, there is cessation of reproduction by women and diminution of sexual activity on the part of men. During this phase, physical and emotional disturbances may occur. Irritability, jealousy and despondency are very frequent. (3) EMOTIONAL DISORDERS : Emotional disorders result from social maladjustment. The degree of adaptation to the fact of ageing is crucial to a man's happiness in this phase of life. Failure to adapt can result in bitterness, inner withdrawal, depression, weariness of life, and even suicide.

Lifestyle and healthy ageing

People can do a great deal to influence their individual risk of developing many of the diseases of later life by paying careful attention to lifestyle factors. By adopting a healthier lifestyle, the risk of a whole range of diseases can be reduced. These factors are : (a) DIET AND NUTRITION : A good diet reduces the chances of developing the diseases of old age. As countries rapidly develop economically, diets and lifestyles change considerably and overnutrition replaces undernutrition. One of the problem is excessive fat intake. Saturated fats and trans-fatty acids, have been linked to raised cholesterol levels in the blood, leading to increased risk of cardiovascular disease. People should eat healthy diet since very early age to avoid or delay diseases. The diet should be balanced with less saturated fats and oils; should contain lots of fruits and vegetables; salt and sugar should be less; include plenty of calcium rich food; eat high fibre diet; (b) EXERCISE : Exercise helps maintain good health, as it helps to control weight, improves emotional well-being and relieves stress, improves blood circulation, increases flexibility, lowers blood pressure, increases energy levels, improves balance and thus reduces the dangers of falls, lowers blood sugar levels thus helps in diabetes, improves bone density and thus helps prevent osteoporosis; (c) WEIGHT : Overweight and obesity have become major problem worldwide and it contributes to many diseases of later life. Obesity is an important factor in heart disease, stroke, hypertension, diabetes, arthritis (especially in the knees), and breast cancer; (d) SMOKING : It is estimated that 22 per cent of men and 18 per cent of women aged 65 to 74 years in developed countries are smokers *(144)*. Though this figure is lower than among younger adults, older people have usually smoked for longer, have been and continue to be heavy smokers, and are likely to have chronic diseases, with smoking causing further deterioration. Former smokers live longer than continuing smokers; smoking cessation at the age of 50 years reduces the risk of dying within the next 15 years by 50 per cent. For some, but not for all former smokers, the risk of developing smoking-related diseases reverts to that of lifelong non-smokers *(147)*; (e) ALCOHOL : Drinking beyond a specified amount contributes to a number of later life diseases. Research suggests that sensitivity to the effect of alcohol increases with age. Older people achieve a higher blood alcohol concentration, than younger people after consuming an equal amount of alcohol. This is largely as a result of the age-related decrease in the amount of body water which dilutes alcohol. While younger people are likely to develop tolerance to increasing amount of alcohol, older people have a decreased ability to develop this tolerance *(144)*. Drinking is linked to liver diseases, stomach ulcers, gout, depression, osteoporosis, heart disease, breast cancer, diabetes and hypertension *(146)*; and (f) SOCIAL ACTIVITIES : People who become socially isolated – who rarely go out, do not join in the community activities, have few friends or do not see much of their family – are less healthy. Getting out and keeping involved with others creates a sense of belonging. Mixing with other people of similar age, at similar stage of life or perhaps with similar health concerns, can help people realize that they are not alone. The support gained from others can be important in recovering from illness. Simply knowing that others care, helps *(146)*.

Health status of the aged in India

A few hospital based studies have been made in India on the health status of the aged persons, but such studies provide only a partial view of the spectrum of illness in the aged. The overall data on aged are scarce. The main causes of illness are arthritis, cataract, bronchitis, avitaminosis, ear diseases, hypertension, diabetes, rheumatism, helminthic infestations, accidents, etc.

The government of India announced a *National Policy on older persons* in January 1999. This policy identifies principal areas of intervention as financial security, health care, nutrition, shelter, education, welfare, protection of life and property of older citizens. The policy provides for a broad framework for collaboration and cooperation, both within as well as between governmental and non-governmental agencies. An important thrust in the policy is on active and productive involvement of older persons, and not just their care. A national council for older persons (NCOP) was constituted to operationalize the policy. An integrated programme for older persons has been formulated by revising the earlier scheme of assistance to voluntary organizations for programmes relating to the welfare of the aged. The objective is to promote a society for all ages, to empower and improve the quality of life of older persons.

The programme for the first time recognizes formation of self-help groups, association of older persons for advancement of their rights and utilization of their experience and services. 234 Old age homes, 398 day care

centres and 40 mobile medical units are operational. Scheme of assistance to Panchayat Raj Institutions / Voluntary Organizations / Self Help Groups, for construction of old age homes has also been revised to encourage Multi Service Centres for older persons.

As a part of National Social Assistance Programme, old age pension is being provided to more than 4 million destitute elderly all over the country. The amount of pension varies from state to state – from Rs 75 per month in Assam to Rs 300 per month in West Bengal and Rajasthan *(144)*. An Old Age Social and Income Security (OASIS) project was launched to comprehensively examine policy questions, connected with Old Age Income Security. Travel related concessions / facilities are provided to the older people by Indian Railways, Indian Airlines and State Transport Corporations. Health care is being provided to the older persons through Bhavishya Arogya Mediclaim, and Rural Group Life Insurance Schemes. Income Tax Concessions are also available to the elderly citizens.

On 19th Nov. 2007, the Indira Gandhi National Old Age Pension Scheme was launched to provide monthly pension to people over 65 years and living below poverty line. The scheme is to cover about 1.57 crore people, the central government is to provide a monthly pension of Rs. 200 to each beneficiary and the state governments are expected to contribute an equal amount.

In India, *HelpAge India* is the largest voluntary organization working for the cause and care of the disadvantaged older people. In the 26 years since its inception, it has made an impact on the lives of nearly 6 million senior citizens, through 3,084 projects. HelpAge India supports the following programmes to make life easier for older people : (a) Free cataract operations; (b) Mobile medicare units; (c) Income generation and micro-credit; (d) Old-age homes and day-care centres; (e) Adopt-a-Gran (grand parent); and (f) Disaster mitigation.

Implication of the ageing population in terms of preventive and social medicine

The ageing population is both a medical and sociological problem. It makes a greater demand on the health services of a community. In rapidly greying world, healthy ageing is vital for countries. It is a prerequisite for economic growth. The predicted explosion of non-communicable diseases like cardiovascular diseases, cancer, and depression in the ever increasing number of older persons globally, will result in enormous human and social costs unless preventive action is taken.

The alteration of the age pyramid, however, poses significant new challenges for governments, societies, and families in the 21st century. Ageing developing countries are slated to face a heavy double burden of infectious and non-communicable diseases, yet they often lack significant resources, including comprehensive ageing policies, to cope. Industrialized countries, on the otherhand, were fortunate enough to become affluent before they became old *(147)*.

The modern philosophy is that the old must continue to take their share in the responsibilities and in the enjoyment of the privileges, which are an essential feature of remaining an active member of the community. The community must assist the aged to fight the triple evils of poverty, loneliness and ill-health.

Potential for disease prevention in the elderly

For older individuals, a great proportion of the disease burden derives from existing conditions, whether this burden is measured by prevalence rates, indicators of morbidity, disability, mortality, or by health and long term care utilization. In addition, older people with disability, resulting from chronic diseases, appear at high risk of acute illness and injuries. The evidence arrayed of the role of existing and often immutable disease argues for the importance of secondary and tertiary prevention, in combination with primary screening or prevention for this population *(148)*.

Among older individuals, categories of conditions, occurrences, and illnesses exist in a variety of combinations, and risk factors as well as disease sequelae often overlap. Examples of conditions potentially amenable to prevention in older persons are outlined in Table 31.

Many factors that contribute to decrements of ageing and the burden of illness are potentially responsive to preventive interventions. In view of this evidence, the design of preventive strategies appropriate to this population becomes crucial for the utility of preventive care, both in reducing risk and maintaining functional independence.

Much care is bestowed upon the old people in Western societies by providing Social Welfare measures such as national assistance, supplementary pensions, home services, home care services, meals on wheels services, old folk's homes, sitters-up service and provision of services of health visitors. By providing these services, the State ensures that the years of retirement of those who have worked hard in its service shall be free from anxiety, want and boredom.

TABLE 31

Areas potentially amenable to preventive health care in the elderly

Primary	Secondary	Tertiary
Health habits – smoking – alcohol abuse – obesity – nutrition – physical activity – sleep	Screening for – hypertension – diabetes – periodontal disease – dental caries – sensory impairment – medication side-effects	Rehabilitation – physical deficits – cognitive deficits – functional deficits Caretaker support
Coronary heart disease risk factors	– colo-rectal cancer breast cancer, cervical cancer prostatic cancer	Introduction of support necessary to prevent loss of autonomy
Immunization – influenza – pneumovax – tetanus	– nutritionally-induced anaemias – depression, stress – urinary incontinence – podiatric problems	
Injury prevention Iatrogenesis prevention	– fall risk – tuberculosis (high-risk)	
Osteoporosis prevention	– syphilis (high-risk) – stroke prevention – myocardial infarction	

Source : *(148)*

ANNEXURE A *(149)*

PRINCIPLES OF THE INTEGRATED CLINICAL CASE MANAGEMENT

IMCI clinical guidelines are based on the following principles :

1. **Examining all sick children aged up to five years** of age for general danger signs and all young infants for signs of **very severe disease**. These signs **indicate** severe illness and the need for immediate referral or admission to hospital.
2. The children and infants are then **assessed for main symptoms :**
   - In older children the main symptoms include :
     - Cough or difficulty in breathing
     - Diarrhoea,
     - Fever, and
     - Ear infection.
   - In young infants, the main symptoms include :
     - Local bacterial infection,
     - Diarrhoea, and
     - Jaundice.
3. Then in addition, all sick children are **routinely checked** for :
   - Nutritional and immunization status,
   - HIV status in high HIV settings, and
   - Other potential problems.
4. Only a **limited number of clinical signs** are used, selected on the basis of their sensitivity and specificity to detect disease through classification.

A combination of individual signs leads to a **child's classification** within one or more symptom groups rather than a diagnosis. The classification of illness is based on a colour-coded triage system :

- **"PINK"** indicates urgent hospital referral or admission.
- **"YELLOW"** indicates initiation of specific outpatient treatment.
- **"GREEN"** indicates supportive home care.

5. IMCI management procedures use a **limited number of essential drugs** and encourage active participation of caregivers in the treatment of their children.
6. An essential component of IMCI is the **counselling of caregivers** regarding home care :
   - Appropriate feeding and fluids,
   - When to return to the clinic immediately, and
   - When to return for follow-up.

SICK YOUNG INFANT AGE UPTO 2 MONTHS
ASSESS AND CLASSIFY THE SICK YOUNG INFANT

ASSESS

DO A RAPID APPRAISAL OF ALL WAITING INFANTS
ASK THE MOTHER WHAT THE YOUNG INFANT'S PROBLEMS ARE

- Determine if this is an initial or follow-up visit for this problem.
  - If follow-up visit, use the follow-up instructions.
  - If initial visit, assess the child as follows:

CLASSIFY

USE ALL BOXES THAT MATCH THE INFANT'S SYMPTOMS AND PROBLEMS TO CLASSIFY THE ILLNESS

IDENTIFY TREATMENT

CHECK FOR VERY SEVERE DISEASE AND LOCAL BACTERIAL INFECTION

ASK :

- Is the infant having difficulty in feeding ?
- Has the infant had convulsions (fits) ?

LOOK, LISTEN, FEEL :

- Count the breaths in one minute. Repeat the count if more than 60 breaths per minute.
- Look for severe chest indrawing.

YOUNG INFANT MUST BE CALM

- Measure axillary temperature.
- Look at the umbilicus. Is it red or draining pus ?
- Look for skin pustules.
- Look at the young infant's movements.

If infant is sleeping, ask the mother to wake him/her.

- Does the infant move on his/her own ?

If the young infant is not moving, gently stimulate him/her.

- Does the infant not move at all ?

Classify ALL YOUNG INFANTS

Any one of the following signs: • Not feeding well, or • Convulsions, or • Fast breathing (60 breaths per minute or more), or • Severe chest indrawing, or • Fever (37.5°C* or above), or • Low body temperature (less than 35.5°C*) or • Movement only when stimulated or no movement at all.	***Pink :*** VERY SEVERE DISEASE	➢ **Give first dose of intramuscular antibiotics.** ➢ **Treat to prevent low blood sugar.** ➢ **Refer *URGENTLY* to hospital**** ➢ **Advise the mother how to keep the infant warm on the way to the hospital.**
• Umbilicus red or draining pus. • Skin pustules.	***Yellow :*** LOCAL BACTERIAL INFECTION	➢ **Give an appropriate oral antibiotic.** ➢ Teach the mother to treat local infections at home. ➢ Advise mother to give home care for the young infant. ➢ Follow-up in 2 days.
• None of the signs of very severe disease or local bacterial infection.	***Green :*** SEVERE DISEASE OR LOCAL INFECTION UNLIKELY	➢ Advise mother to give home care.

* These thresholds are based on axillary temperature. The thresholds for rectal temperature readings are approximately 0.5° C higher.
** If referral is not possible, manage the sick young as described in the national referral care guidelines or WHO Pocket Book for hospital care for children.

CHECK FOR JAUNDICE

If jaundice present, ASK :

- When did the jaundice appear first ?

LOOK, AND FEEL :

- Look for jaundice (yellow eyes or skin)
- Look at the young infant's palms and soles. Are they yellow ?

Classify JAUNDICE

• Any jaundice if age less than 24 hours or • Yellow palms and soles at any age.	***Pink :*** SEVERE JAUNDICE	➢ **Treat to prevent low blood sugar.** ➢ **Refer *URGENTLY* to hospital.** ➢ **Advise the mother how to keep the infant warm on the way to the hospital.**
• Jaundice appearing after 24 hours of age and • Palms and soles not yellow.	***Yellow :*** JAUNDICE	➢ Advise the mother to give home care for the young infant. ➢ Advise the mother to return immediately if palms and soles appear yellow. ➢ If the young infant is older than 14 days, refer to a hospital for assessment. ➢ Follow-up in 1 day.
• No jaundice	***Green :*** NO JAUNDICE	➢ Advise the mother to give home care for the young infant.

THEN ASK: Does the young infant have diarrhoea* ?

IF YES, LOOK AND FEEL:

- Look at the young infant's general condition : Infant's movements
  - Does the infant move on his/her own ?
  - Does the infant move when stimulated but then stops ?
  - Does the infant not move at all ?
  - Is the infant restless and irritable ?
- Look for sunken eyes.
- Pinch the skin of the abdomen. Does it go back:
  - Very slowly (longer than 2 seconds) ?
  - or slowly ?

Classify DIARRHOEA For DEHYDRATION

Two of the following signs: • Movement only when stimulated or no movement at all. • Sunken eyes. • Skin pinch goes back very slowly.	***Pink :*** SEVERE DEHYDRATION	➢ **If infant has no other severe classification :** – Give fluid for severe dehydration (Plan C) OR ***If infant also has another severe classification :*** – **Refer *URGENTLY* to hospital with mother giving frequent sips of ORS on the way.** – **Advise the mother to continue breast-feeding.**
Two of the following signs: • Restless and irritable. • Sunken eyes. • Skin pinch goes back slowly.	***Yellow :*** SOME DEHYDRATION	➢ Give fluid and breast milk for some dehydration (Plan B) ➢ ***If infant has any severe classification :*** – ***Refer urgently to hospital with mother giving frequent sips of ORS on the way.*** – ***Advise the mother to continue breast-feeding.*** ➢ Advice the mother when to return immediately. ➢ Follow-up in 2 days if not improving.
Not enough signs to classify as some or severe dehydration.	***Green :*** NO DEHYDRATION	➢ Give fluids to treat diarrhoea at home and continue breast feeding (Plan A). ➢ Advise the mother when to return immediately. ➢ Follow-up in 2 days if not improving.

Details of Plan A, B, C on page 702, 703

• **What is diarrhoea in a young infant ?**
A young infant has diarrhoea if the stools have changed from usual pattern and are many and watery (more water than faecal matter). The normally frequent or semi-solid stools of a breastfed baby are not diarrhoea.

THEN CHECK FOR FEEDING PROBLEM OR LOW WEIGHT FOR AGE

If an infant has no indications to refer urgently to hospital :

ASK :

- Is the infant breastfed ? If yes, how many times in 24 hours ?
- Does the infant usually receive any other drinks ? If yes, how often ?
- If yes, what do you use to feed the infant ?

LOOK, LISTEN, FEEL :

- Determine weight for age.
- Look for ulcers or white patches in the mouth (thrush).

Classify FEEDING

• Not well attached to breast, or • Not suckling effectively, or • Less than 8 breastfeeds in 24 hours, or • Receives other foods or drinks, or • Low weight for age, or • Thrush (ulcers or white patches in mouth).	***Yellow :*** FEEDING PROBLEM OR LOW WEIGHT	➢ If not well attached or not suckling effectively, teach correct positioning and attachment. – If not able to attach well immediately, teach the mother to express breast milk and feed by a cup. ➢ If breastfeeding less than 8 times in 24 hours, advise to increase frequency of feeding. Advice the mother to breastfeed as often and as long as the infant wants, day and night. ➢ If receiving other foods or drinks, counsel the mother about breastfeeding more, reducing other drinks, and using a cup. ➢ If not breastfeeding at all*: – Refer for breastfeeding counselling and possible relactation*. – Advice about correctly preparing breast-milk substitutes and using a cup. ➢ Advice the mother how to feed and keep the low weight infant warm at home. ➢ If thrush, teach the mother to treat thrush at home. ➢ Advise the mother to give home care for the young infant. ➢ Follow-up any feeding problem or thrush in 2 days. ➢ Follow-up low weight for age in 14 days.
• Not low weight for age and no other signs of inadequate feeding.	***Green :*** NO FEEDING PROBLEM	➢ Advise mother to give home care for the young infant. ➢ Praise the mother for feeding the infant well.

ASSESS BREAST-FEEDING :

- **Has the infant breastfed in the previous hour ?**
  If the infant has not fed in the previous hour, ask the mother to put her infant to the breast. Observe the breastfeed for 4 minutes.
  (If the infant was fed during the last hour, ask the mother if she can wait and tell you when the infant is willing to feed again.)
  - Is the infant well attached ?
    not well attached good attachment
- **TO CHECK ATTACHMENT, LOOK FOR :**
  - Chin touching breast
  - Mouth wide open
  - Lower lip turned outwards
  - More areola visible above than below the mouth.

  (All of these signs should be present if the attachment is good)
- Is the infant suckling effectively (that is, slow deep sucks, sometimes pausing) ?
  not suckling effectively suckling effectively
  Clear a blocked nose if it interferes with breastfeeding.

* Unless not breastfeeding because the mother is HIV positive.

SICK CHILD AGE 2 MONTHS UPTO 5 YEARS
ASSESS AND CLASSIFY THE SICK CHILD

ASSESS

ASK THE MOTHER WHAT THE CHILD'S PROBLEMS ARE

- Determine if this is an initial or follow-up visit for this problem.
  - If follow-up visit, use the follow-up instructions on *TREAT THE CHILD* chart.
  - If initial visit, assess the child as follows :

CLASSIFY

USE ALL BOXES THAT MATCH THE CHILD'S SYMPTOMS AND PROBLEMS TO CLASSIFY THE ILLNESS

IDENTIFY TREATMENT

CHECK FOR GENERAL DANGER SIGNS

ASK :	LOOK :	
• Is the child able to drink or breastfeed ? • Does the child vomit everything ? • Has the child had convulsions ?	• See if the child is lethargic or unconscious. • Is the child convulsing now ?	*URGENT Attention*

CLASSIFY		IDENTIFY TREATMENT
• Any general danger sign.	***Pink :*** VERY SEVERE DESEASE	➢ **Give diazepam if convulsing now.** ➢ **Quickly complete the assessment.** ➢ **Give any pre-referral treatment immediately.** ➢ **Treat to prevent low blood sugar.** ➢ **Keep the child warm.** ➢ **Refer URGENTLY.**

A child with any general danger sign needs *URGENT* attention; complete the assessment and any pre-referral treatment immediately so referral is not delayed.

THEN ASK ABOUT MAIN SYMPTOMS :

Does the child have cough or difficult breathing ?

IF YES, ASK :	LOOK, LISTEN, FEEL* :	
• For how long ?	• Count the breaths in one minute. • Look for chest indrawing. • Look and listen for stridor. • Look and listen for wheezing. CHILD MUST BE CALM **If wheezing with either fast breathing or chest indrawing :** Give a trial of rapid acting inhaled bronchodilator for up to three times 15–20 minutes apart. Count the breaths and look for chest indrawing again, and then classify.	Classify COUGH or DIFFICULT BREATHING

If the child is :	***Fast breathing is :***
2 months up to 12 months	50 breaths per minute or more.
12 months up to 5 years	40 breaths per minute or more.

CLASSIFY		IDENTIFY TREATMENT
• Any general danger sign or • Stridor in calm child.	***Pink :*** SEVERE PNEUMONIA OR VERY SEVERE DISEASE	➢ **Give first dose of an appropriate antibiotic.** ➢ **Refer URGENTLY to hospital.****
• Chest indrawing. • Fast breathing.	***Yellow :*** PNEUMONIA	➢ **Give oral Amoxicillin for 5 days***.** ➢ If wheezing (or disappeared after rapidly acting bronchodilator) give an inhaled bronchodilator for 5 days****. ➢ If chest indrawing in HIV exposed/ infected child, give first dose of amoxicillin and refer. ➢ Soothe the throat and relieve the cough with a safe remedy. ➢ If coughing for more than 14 days or recurrent wheeze, refer for possible TB or asthma assessment. ➢ Advise mother when to return immediately. ➢ Follow-up in 3 days.
• No signs of pneumonia or very severe disesase.	***Green :*** COUGH OR COLD	➢ If wheezing (or disappeared after rapidly acting bronchodilator) give an inhaled bronchodilator for 5 days****. ➢ Soothe the throat and relieve the cough with a safe remedy. ➢ If coughing for more than 14 days or recurrent wheezing, refer for possible TB or asthma assessment. ➢ Advise mother when to return immediately. ➢ Follow-up in 5 days if not improving.

* If pulse oximeter is available, determine oxygen saturation and refer if < 90%.

** If referral is not possible, manage the child as described in the pneumonia section of the national referral guidelines or as in WHO Pocket Book for hospital care for children.

*** Oral Amoxicillin for 3 days could be used in patients with fast breathing but no chest indrawing in low HIV settings.

**** In settings where inhaled bronchodilator is not available, oral salbutamol may be tried but not recommended for treatment of severe acute wheeze.

DOES THE CHILD HAVE DIARRHOEA ?

IF YES ASK :
- For how long ?
- Is there blood in the stool ?

LOOK AND FEEL:
- Look at the child's general condition.
  Is the child :
  - Lethargic or unconscious ?
  - Restless and irritable ?
- Look for sunken eyes.
- Offer the child fluid.
  Is the child :
  - Not able to drink or drinking poorly ?
  - Drinking eagerly, thirsty ?
- Pinch the skin of the abdomen. Does it go back:
  - Very slowly (longer than 2 seconds) ?
  - Slowly ?

Classify DIARRHOEA

For DEHYDRATION

Two of the following signs : • Lethargic or unconscious. • Sunken eyes. • Not able to drink or drinking poorly. • Skin pinch goes back very slowly.	***Pink :*** SEVERE DEHYDRATION	➢ If child has no other severe classification : – Give fluid for severe dehydration (Plan C). **If child also has another severe classification :** – **Refer URGENTLY to hospital with mother giving frequent sips of ORS on the way.** – **Advise the mother to continue breastfeeding.** ➢ **If child is 2 years or older and there is cholera in your area, give antibiotic for cholera.**
Two of the following signs : • Restless, irritable. • Sunken eyes. • Drinks eagerly, thirsty. • Skin pinch goes back slowly.	***Yellow :*** SOME DEHYDRATION	➢ Give fluid, zinc supplements, and food for some dehydration (Plan B). ➢ **If child also has a severe classification :** – **Refer URGENTLY to hospital with mother giving frequent sips of ORS on the way.** – **Advise the mother to continue breastfeeding.** ➢ Advise mother when to return immediately. ➢ Follow-up in 5 days if not improving.
Not enough signs to classify as some or severe dehydration.	***Green:*** NO DEHYDRATION	➢ Give fluid, zinc supplements, and food to treat diarrhoea at home (Plan A). ➢ Advise mother when to return immediately. ➢ Follow-up in 5 days if not improving.

and if diarrhoea 14 days or more

• Dehydration present.	***Pink :*** SEVERE PERSISTENT DIARRHOEA	➢ Treat dehydration before referral unless the child has another severe classification. ➢ Refer to hospital.
• No Dehydration.	***Yellow :*** PERSISTENT DIARRHOEA	➢ Advise the mother on feeding a child who has PERSISTENT DIARRHOEA. ➢ Give multivitamins and minerals (including zinc) for 14 days. ➢ Follow-up in 5 days.

and if blood in stool

• Blood in the stool.	***Yellow :*** DYSENTERY	➢ **Give ciprofloxacin for 3 days.** ➢ Follow-up in 3 days.

DOES THE CHILD HAVE FEVER ?
(by history or feels hot or temperature 37.5°C* or above)

IF YES:
- Decide Malaria Risk : High or Low

THEN ASK:
- For how long ?
- If more than 7 days, has fever been present every day ?
- Has the child had measles within the last 3 months ?

LOOK AND FEEL :
- Look or feel for stiff neck.
- Look for runny nose.
- Look for any bacterial cause of fever**.
- Look for signs of MEASLES.
  - Generalized rash and
  - One of these : cough, runny nose, or red eyes.

Do a malaria test :***
If NO severe classification
- In all fever cases if High malaria risk.
- In Low malaria risk if no obvious cause of fever present.

If the child has measles now or within the last 3 months :
- Look for mouth ulcers. Are they deep and extensive ?
- Look for pus draining from the eye.
- Look for clouding of the cornea.

High or Low Malaria Risk	• Any general danger sign or • Stiff neck.	***Pink :*** VERY SEVERE FEBRILE DISEASE	➢ **Give first dose of artesunate or quinine for severe malaria.** ➢ **Give first dose of an appropriate antibiotic.** ➢ **Treat the child to prevent low blood sugar.** ➢ **Give one dose of paracetamol in clinic for high fever (temp. 38.5°C or above).** ➢ **Refer URGENTLY to hospital.**
Classify FEVER	• Malaria test POSITIVE	***Yellow:*** MALARIA	➢ **Give recommended first line oral antimalarial.** ➢ **Give one dose of paracetamol in clinic for high fever (temp. 38.5°C or above).** ➢ Give appropriate antibiotic treatment for an identified bacterial cause of fever. ➢ Advise mother when to return immediately. ➢ Follow-up in 3 days if fever persists. ➢ If fever is present every day for more than 7 days, refer for assessment.
	• Malaria test NEGATIVE • Other cause of fever PRESENT	***Green:*** FEVER NO MALARIA	➢ **Give one dose of paracetamol in clinic for high fever (temp. 38.5°C or above).** ➢ Give appropriate antibiotic treatment for an identified bacterial cause of fever. ➢ Advise mother when to return immediately. ➢ Follow-up in 3 days if fever persists. ➢ If fever is present every day for more than 7 days, refer for assessment.
No Malaria Risk and No Travel to Malaria Risk Area	• Any general danger sign or • Stiff neck.	***Pink:*** VERY SEVERE FEBRILE DISEASE	➢ **Give first dose of an appropriate antibiotic.** ➢ **Treat the child to prevent low blood sugar.** ➢ **Give one dose of paracetamol in clinic for high fever (temp. 38.5°C or above).** ➢ **Refer URGENTLY to hospital.**
	• No general danger signs. • No stiff neck.	***Green:*** FEVER	➢ **Give one dose of paracetamol in clinic for high fever (temp. 38.5°C or above).** ➢ Give appropriate antibiotic treatment for any identified bacterial cause of fever. ➢ Advise mother when to return immediately. ➢ Follow-up in 2 days if fever persists. ➢ If fever is present every day for more than 7 days, refer for assessment.
If MEASLES Now or within last 3 months, Classify	• Any general danger sign or • Clouding of cornea or • Deep or extensive mouth ulcers.	***Pink:*** SEVERE COMPLICATED MEASLES****	➢ **Give Vitamin A treatment.** ➢ **Give first dose of an appropriate antibiotic.** ➢ **If clouding of the cornea or pus draining from the eye, apply tetracycline eye ointment.** ➢ **Refer URGENTLY to hospital.**
	• Pus draining from the eye or • Mouth ulcers.	***Yellow:*** MEASLES WITH EYE OR MOUTH COMPLI-CATIONS****	➢ **Give Vitamin A treatment.** ➢ **If pus draining from the eye, treat eye infection with tetracycline eye ointment.** ➢ If mouth ulcers, treat with gentian violet. ➢ Follow-up in 3 days.
	• Measles now or within the last 3 months.	***Green:*** MEASLES	➢ **Give Vitamin A treatment.**

* These temperatures are based on axillary temperature. Rectal temperature readings are approximately 0.5°C higher.

** Look for local tenderness; oral sores; refusal to use a limb; hot tender swelling; red tender skin or boils; lower abdominal pain or pain on passing urine in older children.

*** If no malaria test available : High malaria risk - classify as MALARIA; Low malaria risk AND NO obvious cause of fever - classify as MALARIA.

**** Other important complications of measles - pneumonia, stridor, diarrhoea, ear infection, and acute malnutrition - are classified in other tables.

DOES THE CHILD HAVE AN EAR PROBLEM ?

IF YES, ASK :
- Is there ear pain ?
- Is there ear discharge ? If yes, for how long ?

LOOK AND FEEL :
- Look for pus draining from the ear.
- Feel for tender swelling behind the ear.

Classify EAR PROBLEM

• Tender swelling behind the ear.	***Pink :*** MASTOIDITIS	➢ **Give first dose of an appropriate antibiotic.** ➢ **Give first dose of paracetamol for pain relief.** ➢ **Refer URGENTLY to hospital.**
• Pus is seen draining from the ear and discharge is reported for less than 14 days, or • Ear pain.	***Yellow :*** ACUTE EAR INFECTION	➢ **Give an antibiotic for 5 days.** ➢ **Give paracetamol for pain relief.** ➢ Dry the ear by wicking. ➢ Follow-up in 5 days.
• Pus is seen draining from the ear and discharge is reported for 14 days or more.	***Yellow :*** CHRONIC EAR INFECTION	➢ Dry the ear by wicking. ➢ Treat with topical quinolone eardrops for 14 days. ➢ Follow-up in 5 days.
• No ear pain, and No pus seen draining from the ear.	***Green :*** NO EAR INFECTION	No treatment.

THEN CHECK FOR ACUTE MALNUTRITION

CHECK FOR ACUTE MALNUTRITION
LOOK AND FEEL :

Look for signs of acute malnutrition
- Look for oedema of both feet.
- Determine WFH/L* — z-score.
- Measure MUAC** — mm in a child 6 months or older.

If WFH/L less than –3 z-scores or MUAC less than 115 mm, then :

- Check for any medical complication present :
  - Any general danger signs
  - Any severe classification
  - Pneumonia with chest indrawing
- If no medical complications present :
  - Child is 6 months or older, offer RUTF*** to eat. Is the child :
    Not able to finish RUTF portion ?
    Able to finish RUTF portion ?
  - Child is less than 6 months, assess breastfeeding :
    Does the child have a breastfeeding problem ?

Classify NUTRITIONAL STATUS

• Oedema of both feet or • WFH/L less than –3 z-scores, or MUAC less than 115 mm AND any one of the following: – Medical complication present, or – Not able to finish RUTF, or – Breast-feeding problem	***Pink :*** COMPLICATED SEVERE ACUTE MALNUTRITION	➢ **Give first dose appropriate antibiotic.** ➢ **Treat the child to prevent low blood sugar.** ➢ **Keep the child warm.** ➢ **Refer URGENTLY to hospital.**
• WFH/L less than –3 z-scores, or • MUAC less than 115 mm AND • Able to finish RUTF.	***Yellow :*** UNCOMPLICATED SEVERE ACUTE MALNUTRITION	➢ **Give oral antibiotics for 5 days.** ➢ Give ready-to-use therapeutic food for a child aged 6 months or more. ➢ Counsel the mother on how to feed the child. ➢ Assess for possible TB infection. ➢ Advise mother when to return immediately. ➢ Follow-up in 7 days.
• WFH/L between –3 and –2 z-scores or • MUAC 115 up to 125 mm.	***Yellow :*** MODERATE ACUTE MALNUTRITION	➢ Assess the child's feeding and counsel the mother on the feeding recommendations. ➢ If feeding problem, follow up in 7 days. ➢ Assess for possible TB infection ➢ Advise mother when to return immediately. ➢ Follow-up in 30 days.
• WFH/L-2 z-scores or more or • MUAC 125 mm or more.	***Green :*** NO ACUTE MALNUTRITION	➢ If child is less than 2 years old, assess the child's feeding and counsel the mother on feeding according to the feeding recommendations. ➢ If feeding problem, follow-up 7 days.

* WFH/L is Weight-for-Height or Weight-for-Length determined by using the WHO growth standards charts.

** MUAC is Mid-Upper Arm Circumference measured using MUAC tape in all children 6 months or older.

*** RUTF is Ready-to-Use Therapeutic Food for conducting the appetite test and feeding children with severe acute malnutrition.

THEN CHECK FOR ANAEMIA

Check for anaemia
- Look for palmar pallor. Is it :
  - Severe palmar pallor* ?
  - Some palmar pallor ?

Classify ANAEMIA

• Severe palmar pallor	***Pink :*** SEVERE ANAEMIA	➢ **Refer URGENTLY to hospital.**
• Some palmar pallor	***Yellow :*** ANAEMIA	➢ **Give iron.**** ➢ Give mebendazole if child is 1 year or older and has not had a dose in the previous 6 months. ➢ Advise mother when to return immediately. ➢ Follow-up in 14 days.
• No palmar pallor	***Green :*** NO ANAEMIA	➢ – If child is less than 2 years old, assess the child's feeding and counsel the mother according to the feeding recommendations. – If feeding problem, follow-up in 5 days.

* Assess for sickle cell anaemia if common in your area.
** If child has severe acute malnutrition and is receiving RUTF, DO NOT give iron because there is already adequate amount of iron in RUTF.

THEN CHECK THE CHILD'S IMMUNIZATION*, PROPHYLACTIC VITAMIN A & IRON-FOLIC ACID SUPPLEMENTATION STATUS

IMMUNIZATION SCHEDULE :
Please refer to page 136 for national immunization schedule.

PROPHYLACTIC VITAMIN A
Give a single dose of vitamin A :
- 100,000 IU at 9 months with measles immunization.
- 200,000 IU at 16-18 months with DPT Booster.
- 200,000 IU at 24 months.
- 200,000 IU at 30 months.
- 200,000 IU at 36 months.

PROPHYLACTIC IFA
Give 20 mg elemental iron + 100 mcg folic acid (one tablet of Paediatric IFA or 5 ml of IFA syrup or 1 ml of IFA drops) for a total of 100 days in a year after the child has recovered from acute illness if :
- ➢ The child 6 months of age or older, and
- ➢ Has not received Paediatric IFA tablet syrup/drops for 100 days in last one year.

* A child who needs to be immunized should be advised to go for immunization the day vaccines are available at AW/SC/PHC.

ASSESS OTHER PROBLEMS

MAKE SURE CHILD WITH ANY GENERAL DANGER SIGN IS REFERRED after first dose of an appropriate antibiotic and other urgent treatments.
Exception : Rehydration of the child according to Plan C may resolve danger signs so that referral is no longer needed.

GIVE EXTRA FLUID FOR DIARRHOEA AND CONTINUE FEEDING

PLAN A: TREAT DIARRHOEA AT HOME

Counsel the mother on the 4 rules of home treatment:

1. Give extra fluid;
2. Give zinc supplements (age 2 months up to 5 years);
3. Continue feeding; and
4. When to return.

1. ***GIVE EXTRA FLUID* (as much as the child will take)**
   - **Tell the mother :**
     - Breastfeed frequently and for longer at each feed.
     - If the child is exclusively breastfed, give ORS or clean water in addition to breast milk.
     - If the child is not exclusively breastfed, give one or more of the following: ORS solution, food-based fluids (such as soup, rice water, and yoghurt drinks), or clean water.
   - **It is especially important to give ORS at home when :**
     - the child has been treated with Plan B or Plan C during this visit.
     - the child cannot return to a clinic if the diarrhoea gets worse.
   - **Teach the mother how to mix and give ORS. Give the mother 2 packets of ORS to use at home.**
   - **Show the mother how much fluid to give in addition to the usual fluid intake :**

Up to 2 years	50 to 100 ml after each loose stool
2 years or more	100 to 200 ml after each loose stool

   Tell the mother to:
   - Give frequent small sips from a cup.
   - If the child vomits, wait 10 minutes. Then continue, but more slowly.
   - Continue giving extra fluid until the diarrhoea stops.
2. ***GIVE ZINC* (age 2 months up to 5 years)**
   - **Tell the mother how much zinc to give (20 mg tab) :**

2 months up to 6 months	½ tablet daily for 14 days
6 months or more	1 tablet daily for 14 days

   - **Show the mother how to give zinc supplements :**
     - Infants - dissolve tablet in a small amount of expressed breast milk, ORS or clean water in a cup.
     - Older children - tablets can be chewed or dissolved in a small amount of water.
3. ***CONTINUE FEEDING*** (exclusive breastfeeding if age less than 6 months).
4. ***WHEN TO RETURN***

PLAN B: TREAT SOME DEHYDRATION WITH ORS

In the clinic, give recommended amount of ORS over 4-hours period

- **Determine amount of ORS to give during first 4 hours**

WEIGHT	<6 kg	6 -<10 kg	10-<12 kg	12-19 kg
AGE*	Up to 4 months	4 months up to 12 months	12 months up to 2 years	2 years up to 5 years
In ml	200–450	450–800	800–960	960–1600

  - *Use the child's age only when you do not know the weight. The approximate amount of ORS required (in ml) can also be calculated by multiplying the child's weight (in kg) times 75.*
  - If the child wants more ORS than shown, give more.
  - For infants under 6 months who are not breastfed, also give 100-200 ml clean water during this period if you use standard ORS. This is not needed if you use new low osmolarity ORS.
- **Show the mother how to give ORS solution :**
  - Give frequent small sips from a cup.
  - If the child vomits, wait 10 minutes. Then continue, but more slowly.
  - Continue breastfeeding whenever the child wants.
- **After 4 hours :**
  - Reassess the child and classify the child for dehydration.
  - Select the appropriate plan to continue treatment.
  - Begin feeding the child in clinic.
- **If the mother must leave before completing treatment :**
  - Show her how to prepare ORS solution at home.
  - Show her how much ORS to give to finish 4-hours treatment at home.
  - Give her enough ORS packets to complete rehydration. Also give her 2 packets as recommended in **Plan A**.
  - Explain the 4 Rules of Home Treatment:
    1. GIVE EXTRA FLUID;
    2. GIVE ZINC (age 2 months up to 5 years);
    3. CONTINUE FEEDING (exclusive breastfeeding if age less than 6 months); and
    4. WHEN TO RETURN.

GIVE EXTRA FLUID FOR DIARRHOEA AND CONTINUE FEEDING

PLAN C: TREAT SEVERE DEHYDRATION QUICKLY

Follow the arrows. If answer is "YES", go across. If "NO", go down.

START HERE

Can you give intravenous (IV) fluid immediately ?

YES →

- **Start IV fluid immediately.** If the child can drink, give ORS by mouth while the drip is set up. Give 100 ml/kg Ringer's Lactate Solution (or, if not available, normal saline), divided as follows :

Age	First give 30 ml/kg in :	Then give 70 ml/kg in :
Infants (under 12 months)	1 hour *	5 hours
Children (12 months upto 5 years)	30 minutes *	2½ hours

* *Repeat once if radial pulse is still very weak or not detectable.*

- Re-assess the child every 1–2 hours. If hydration status is not improving, give the IV drip more rapidly.
- Also give ORS (about 5 ml/kg/hour) as soon as the child can drink : usually after 3–4 hours (infants) or 1–2 hours (children).
- Re-assess an infant after 6 hours and a child after 3 hours. Classify dehydration. Then choose the appropriate plan (A, B or C) to continue treatment.

NO ↓

If IV treatment available nereby (within 30 minutes) ?

YES →

- Refer UNGENTLY to the hospital for IV treatment.
- If the child can drink, provide the mother with ORS solution and show her how to give frequent sips during the trip or give ORS by naso-gastric tube.

NO ↓

Are you trained to use a naso-gastric (NG) tube for rehydration ?

YES →

- Start rehydration by tube (or mouth) with ORS solution : give 20 ml/kg/hour for 6 hours (total of 120 ml/kg)
- Re-assess the child every 1–2 hours while waiting for transfer :
  - If there is repeated vomiting or increasing abdominal distension, give the fluid more slowly.
  - If hydration status is not improving after 3 hours, send the child for IV therapy.
- After 6 hours, reassess the child. Classify dehydration. Then choose the appropriate plan (A, B or C) to continue treatment.

NO ↓

Can the child drink ?

YES →

NO ↓

Refer URGENTLY to the hospital for IV or NG treatment

NOTE :

- If the child is not referred to hospital, observe the child at least 6 hours after rehydration to be sure the mother can maintain hydration giving the child ORS solution by mouth.

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