Chapter 10

Public Health

Introduction

Public health refers to health interventions addressing more than one individual, such as community hygiene, sanitation, water supply, health education, maternal and child health care, immunization and nutrition promotion and disease control activities. Historically, public health efforts meant health development to be undertaken by the government as a public sector activity. This chapter covers public health, its principles, factors affecting health and disease, natural history of disease, levels of prevention, immunization, and important national health programmes. It also includes data collection, presentation of data, sampling and basics of medical statistics.

Objectives

After reading this chapter you will be able to:

- Define public health
- List the principles of public health
- Identify the major public health problems of our country
- Understand natural history of disease
- Explain four levels of prevention of diseases
- Know the basic concepts of epidemiology
- Learn about immunization, vaccines and the Expanded Programme of Immunization
- Know about the National Health Programmes
- Define the Millenneum Development Goals
- Understand data collection methods, presentation of data and sampling
- Calculate the basic statistical averages

10.1 Public Health

Public health is defined as the science and art of preventing disease, prolonging life and efficiency through **organized community efforts**. It is the process of mobilizing local, state, national and international resources to ensure the conditions in which people can be healthy. It covers **promotive, preventive, curative and rehabilitative** health measures.

10.2 Principles of Public Health

These include:

- Prevention of diseases
- Maintenance of health
- Promotion of health and efficiency through community effort
- Prolonging life in the community.

10.3 Heavy Disease Burden on Indian Society

Public health problems refer to diseases or conditions that affect large number of people leading to death or disability. Diseases like malaria, tuberculosis, HIV/AIDS, respiratory infections, injuries and problems such as maternal and infant deaths have been **the major public health problems of our country**. Factors which contribute to the **persistence of infectious diseases** are poverty, illiteracy, ignorance, poor sanitation, inadequate housing, social inequity, low status of women, limited access to health care, rapid urbanization etc. While infectious diseases continue to be a major public health problem, the prevalence of **non- communicable diseases** that include heart disease, diabetes, cancers and obesity is on the rise. This is due to change in life styles and diet, increased use of tobacco and alcohol and increased longevity of life.

10.4 Factors affecting Health and Disease

Public health practice is based on scientific information on factors affecting health and disease. **Factors affecting health and disease** are:

(a) **Nutrition:** The health of a community is linked to the diet of the community. We are aware of the relation between undernutrition and infectious diseases. The inverse relation between under nutrition and infection is the major cause of death and morbidity in young children. On the other hand consumption of a diet rich in fats and low in whole cereals, fruits and vegetables leads to non communicable diseases like heart disease, diabetes, obesity and cancers.

(b) **Environment**: Environment refers to the physical, chemical, and biological factors external to a person. The environment influences our health in many ways — through exposures to physical, chemical and biological risk factors. Exposure to

outdoor and indoor air pollution has been linked to many diseases, in particular pneumonia among children and chronic respiratory diseases among adults. Unsafe water and inadequate disposal of waste are important causes of diseases like diarrhoea, typhoid and other gastrointestinal diseases. Exposure to noise pollution, radiation and chemicals affect the health of communities. Control of environmental factors is an important part of public health practice.

(c) **Occupation**: Occupational health is closely linked to public health. Workers are exposed to high concentration of pollutants in the work place. They are also at increased risk of injuries. Major work-related illnesses are chronic obstructive pulmonary diseases, asthma, injuries, lung cancer, leukemia, hearing loss and back pain. Protecting and promoting the health of workers is the primary aim of occupational health.

(d) **Socio-economic conditions:**

i) *Income*: The economic status determines the purchasing power, living conditions, family size and thus pattern of disease. The poor are more prone to infectious disease because of their low income, they have poor nutrition and they are exposed to unsanitary conditions. Also their ability to seek health services is low. However, diseases such as heart disease, diabetes and obesity are more likely in the affluent.

ii) *Education*: The health status of more educated is usually better than those who are illiterate or less educated. The more educated are also more likely to utilize health care services in case of illness.

(e) **Lifestyle:** The way people live is an important determinant of health. Their decision about diet, exercise, smoking, alcohol intake etc. plays an important role in occurrence of disease. Lifestyle is learnt through social interaction with parents, peer groups, friends and family. It can also be modified by the mass media. The achievement of health requires the adoption of healthy lifestyles.

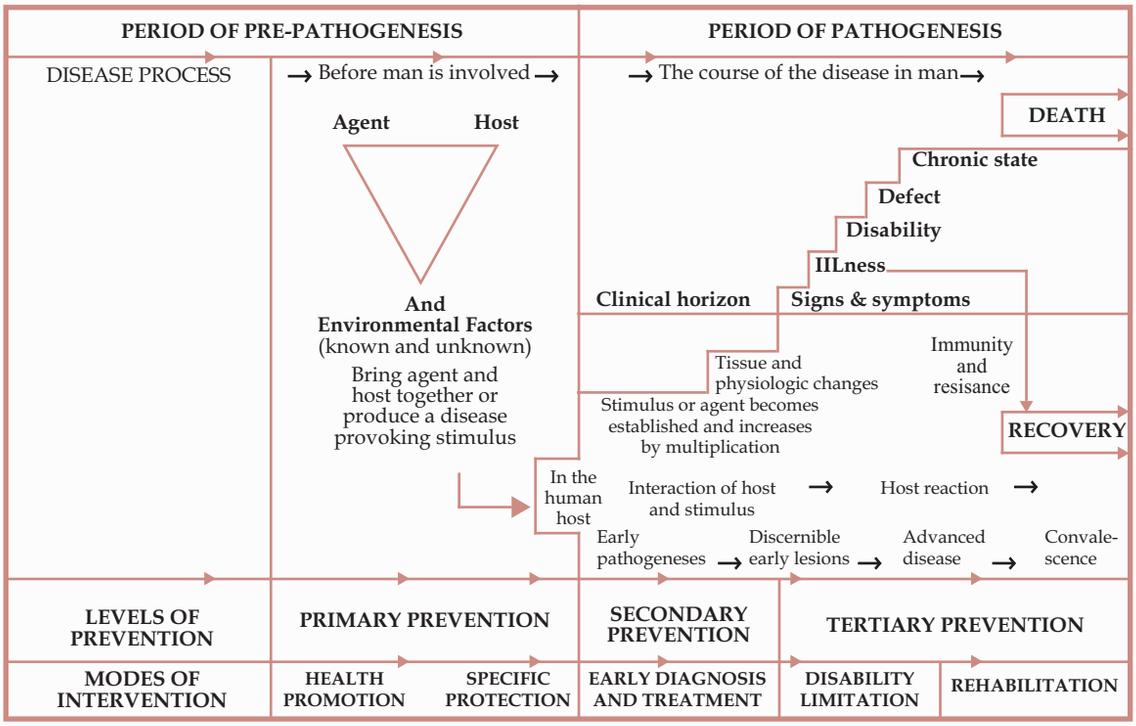
10.5 Natural History of Disease

Disease results from a complex interaction between man, agent or cause and the environment. The natural history of disease is the way in which a disease evolves over time from the earliest stage to its termination as recovery, disability or death.

Pre-pathogenesis phase: This is the phase before the onset of disease. Factors that favour interaction of agent with the human host are present. The causative factors of diseases have been classified as **agent, host and environmental factors**. The interaction of the three determines the onset of disease process.

Pathogenesis phase: This phase begins with the **entry of the disease agent** in the susceptible human host. In this phase, the agent (if an infectious agent) multiplies in the host and induces changes. In the early stage there may be no symptoms which develop later and the disease is manifest. This phase ends with one of the **three outcomes**: recovery, disability or death. The pathogenesis phase may be modified by **interventions** (e.g. chemotherapy, immunization, surgery etc.).

In some diseases the agent may not be identified or established. There may be many factors in the causation of the disease, and then the term **'risk factor'** is used. Risk factor is defined as **an attribute or exposure, significantly associated with development of a disease**. It can be modified by interventions, so as to reduce the possibility of disease (E.g. High blood pressure, diet rich in saturated fats, lack of exercise are risk factors for heart disease).



10.6 The Four Levels of Prevention

The concept of prevention has become broad based. Based on natural history of disease **four levels of prevention** are defined. These are:

(a) **Primordial prevention**: It refers to the prevention of risk factors in population groups in which they have not yet appeared. It is purest form of prevention and this concept is applied in the prevention of chronic diseases. E.g. Adoption of healthy lifestyles during childhood to prevent the development of risk factors

like overweight which can lead to chronic diseases such as heart disease, diabetes, stroke etc. in adulthood.

(b) **Primary prevention**: It is action taken before the onset of disease. It calls for action at the pre pathogenesis phase of the disease. This is further classified as:

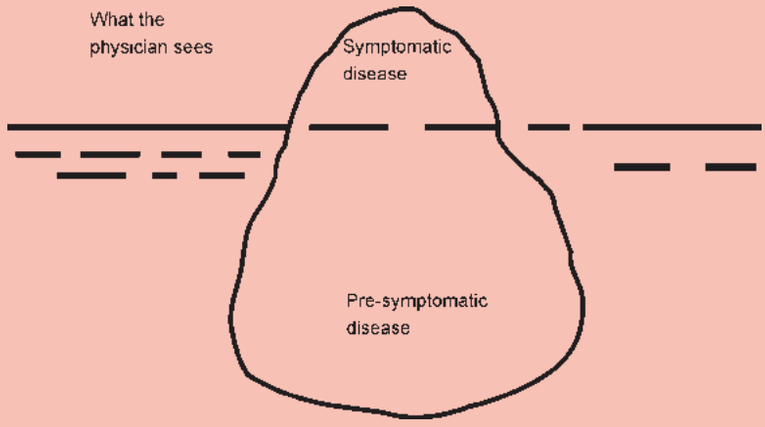
i) **Health promotion**: This includes general measures that promote health e.g. health education and improvement in environmental conditions. Thus it is not disease specific; it is based on non- specific measures.

ii) **Specific protection**: This includes specific measures to prevent a particular disease or group of diseases e.g. administration of DPT vaccine to prevent diphtheria, pertusis (whooping cough) and tetanus.

(c) **Secondary prevention**: It is the action taken in the early stage of pathogenesis phase to arrest the progress of disease and prevent complications. This is done by early diagnosis of the disease and treatment. It also helps in prevention of transmission of the infectious agent to others in the community. It is the main intervention in disease control. E.g. a person with cough is subjected for sputum examination for tuberculosis and if positive, is treated with anti tuberculosis drugs.

(d) **Tertiary prevention**: It is the action taken to reduce or limit disability and minimize suffering caused by the disease. This is done when the disease has crossed the early stage that is in the late pathogenesis phase. E.g. a child whose limb has been paralyzed by poliomyelitis can be rehabilitated by surgery and appropriate aids so that he can walk.

Disease control refers to activities aimed at deducing the incidence of disease, duration of disease, complications of disease and the financial burden caused.



10.7 The Basic Sciences behind Public Health

The basic sciences behind public health are **epidemiology** and **biostatistics**.

Epidemiology

Epidemiology is a science used to describe the distribution, dynamics and determinants of health and disease in human populations. It is defined as study of distribution and determinants of health related states or events in specified populations and application of this study to control health problems. Epidemiology has a wide scope. It not only includes communicable and non-communicable diseases but also covers other **health related issues and events** like injuries, drug abuse, alcoholism, urbanization etc. It measures:

a) Disease frequency

Disease frequency refers to measurement of frequency of disease, disability or death and health related events in populations or sub groups of population in relation to possible causal factors. This tells us about the likely causes related to disease. E.g. prevalence of undernutrition is more in children less than 5 years, therefore supplementary nutrition programmes like the Mid Day Meal programme are targeted for this age group.

b) Distribution of disease

Distribution of disease and health are not uniformly distributed in populations. The distribution of these in relation to time, place and person is studied. This refers to knowing if there has been an increase or decrease in the disease occurrence over time; if it is more common in certain areas or more in a particular age group or gender. This leads to undertaking measures for control of disease. E.g. malaria transmission is more in the rainy season due to collection of water in which larva of mosquitoes breed; so cleaning of drains is done before the rains to prevent collection of water.

c) Determinants of disease and health related events

These are identified by observing the pattern of distribution and verifying the cause-effect relationship. This knowledge is used in the prevention and control of health problems and promotion of health. E.g. smoking is a risk factor for the occurrence for lung cancer. This has been inferred from epidemiological studies.

10.8 Immunization

Immunization is the process by which a person is made immune or resistant to an infectious disease by artificial means. This may be by administration of a vaccine, immunoglobulin or antitoxin. Immunization may be active or passive.

Active immunization is when the body's immune system is stimulated to produce the immune response. The immunity usually appears after an interval of 2-3 weeks (at the first time of immunization). The immunity lasts for a long time.

Passive immunization is the process of conferring immunity by administering pre-formed antibodies of human or animal origin. There is no time lag between the administration and the appearance of immunity. It lasts for a short period of time. It may cause hyper sensitivity reactions in some cases. E.g. **rabies anti serum** is given in cases of dog bite.

Vaccines

Vaccines are substances designed to produce specific protection against a given disease. They stimulate the body's own immune system to protect the person against subsequent infection or disease. Vaccines are classified as:-

(a) **Live vaccines:** These are prepared from live organisms that have been attenuated (by repeated passage in laboratory tissue cultures). They lose their ability to cause full blown disease. But they retain their ability to produce an immune response. Live vaccines are more potent than killed vaccines. Examples of live vaccines are BCG vaccine, measles vaccine, oral polio vaccine etc.

(b) **Killed vaccines (inactivated vaccines)**: These are prepared from organisms that have been killed by heat or chemicals. These are usually less efficacious than live vaccines. So, they require 2-3 doses to produce a primary response. Duration of immunity varies from months to years. So, booster doses need be given. However, they are safer than live vaccines. Examples are Pertusis vaccine, Inactivated Polio Vaccine.

(c) **Toxoids:** These are toxins produced by organisms that have been modified. The capacity to stimulate production of anti-toxin is retained, while the toxic effect is lost. Toxoids are efficacious and safe. E.g. Tetanus toxoid vaccine, Diphtheria vaccine.

(d) **Sub-unit vaccines**: These vaccines are prepared from the cellular fraction of the organisms. E.g. Meningococcal vaccine is produced from the polysaccharide fraction of the cell wall.

(e) **Combined Vaccines**: More than one immunizing agent is constituted in one vaccine. This reduces the number of shots given to the child. This reduces the cost and the number of times the beneficiary has to go to the health system. E.g. DPT vaccine (a combination of Diphtheria, Pertusis and Tetanus vaccines).

(f) **Immunoglobulins:** Immunoglobulins are antibodies produced by the body in response to antigen. Immunoglobulin preparations are used as means for passive immunization. These include:

- **Normal Immunoglobulin**, which are derived from normal healthy individuals (obtained from a pool of at least 1000 donors); and
- **Specific Immunoglobulins**, which have high antibody content against a specific infectious agent. These are made from plasma of patients who have recently recovered from the specific infection or who have been immunized against the specific disease. E.g. **Hepatitis B specific Immunoglobulin** (given to babies born to mothers with Hepatitis B infection).

(g) **Antitoxins** : It is an antibody derived from the serum of animals after stimulation with specific antigens and used to provide passive immunity.

The Cold Chain

The **Cold chain** is a system of storing and transporting vaccines at the recommended temperature from the point of manufacture to the point of use. It is important to maintain the cold chain as vaccines lose their potency if not transported or stored at the required temperature. Oral Polio Vaccine is the most heat sensitive vaccine while BCG and Measles vaccine are to be used within hours of being reconstituted. The DPT, DT, TT and Hepatitis B vaccines are damaged on freezing.

Cold Chain equipment

There are equipments of different capacity that are used for **storage** of vaccines at different levels. These are:

(a) **Walk-In- Coolers**: These are used for bulk storage of vaccines at state and regional stores. They maintain a temperature of 2-8 degrees centigrade.

(b) **Deep freezers: –** These are used for storing OPV and Measles vaccines. They are also used to make freezing ice packs. In case of power failure, it can maintain temperature for 18-26 hours (if not opened).

(c) **Ice Lined Refrigerator (ILR)**: These refrigerators are top opening. They can maintain temperature for 24 hour period even with as little as 8 hours continuous electric supply in one day. This is due to a **lining of water containers** fitted all around the walls. While the refrigerator is operating, the water in the container freezes. If the electric supply fails, the ice lining keeps the inside temperature at a

safe level for the vaccines. The **bottom of ILR** is the coldest place. Measles vaccine and OPV are kept here. The DPT, DT, TT and BCG vaccines should not be kept directly on the floor of ILR (they can get frozen and get damaged). These are kept in baskets, in the **top section of the ILR**. In the top section a temperature of 2-8 degrees is maintained.

The equipment used for vaccine **transport** are:

(a) **Cold boxes**- These are big insulated boxes, used for transport of vaccines. They are available in two sizes. Before the vaccines are placed in the cold boxes, **fully frozen ice packs** should be placed at the bottom and sides of the cold box. The vaccines should be placed in **cartons or polythene bags** and then placed in the cold box. The vaccines should be covered with a layer of fully frozen ice packs. The cold box is then closed.

(b) **Vaccine carriers**- These are used for carrying small quantities of vaccines to the **sub centers** or villages by health workers. These are made of insulated material. **Four ice packs** are laid in the vaccine carrier, the vaccine vials are placed and the lid is tightly closed.

The Expanded Programme on Immunization

EPI was launched in India in 1978 to control **Vaccine Preventable Diseases (VPDs)**. Initially, six diseases were selected: diphtheria, pertussis (whooping cough), tetanus, poliomyelitis, typhoid and childhood tuberculosis. Measles vaccine was included later in the programme and typhoid vaccine was discontinued. The aim of EPI was to cover 80% of all infants. Subsequently, the programme was universalized and renamed as **Universal Immunization Programme (UIP)** in 1985. The UIP envisages achieving and sustaining universal immunization coverage in **infants** (with three doses of DPT and OPV and one dose each of measles vaccine and BCG); and in pregnant women, (with two primary doses or one booster dose of TT). The UIP requires a reliable cold chain system for storing and transporting vaccines. Also India has to attain self-sufficiency in the production of all required vaccines.

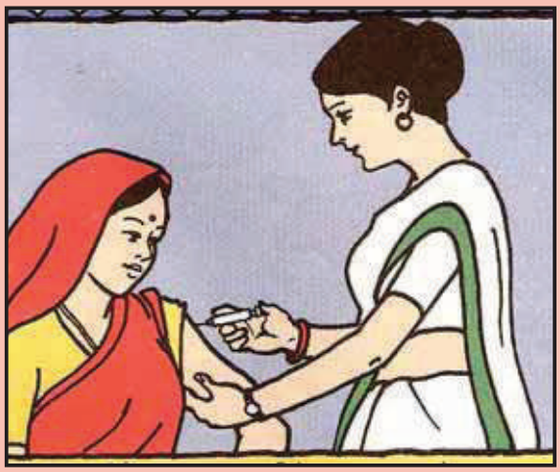


Fig: *Keep in mind the life situation of your client and advise appropriate immunization.*

National Immunization Schedule (NIS) for Infants, Children and Pregnant Women

Vaccine	When to give	Dose	Route	Site
For Pregnant Women				
TT-1	Early in pregnancy.	0.5 ml	Intra-muscular.	Upper Arm.
TT-2	4 weeks after TT-1.	0.5 ml	Intra-muscular.	Upper Arm.
TT- Booster	If received 2 TT doses in a pregnancy, within the previous 3 years.	0.5 ml	Intra-muscular.	Upper Arm.
For Infants				
BCG	At birth; or as early as possible till one year of age.	0.1ml (0.05ml until 1 month age)	Intra-dermal.	Left Upper Arm.
OPV-0	At birth; or as early as possible within the first 15 days.	2 drops	Oral	Oral
OPV 1,2 & 3	At 6 weeks, 10 weeks & 14 weeks.	2 drops	Oral	Oral
DPT1,2 & 3	At 6 weeks, 10 weeks & 14 weeks.	0.5 ml	Intra-muscular.	Antero-lateral side of mid thigh.
Measles	9 months to 12 months (give up to 5 years, if not received at 9-12 months age).	0.5 ml	Sub-cutaneous.	Right upper Arm.
Vitamin A (1stdose)	At 9 months with measles.	1 ml (1 lakh IU)	Oral	Oral.
For Children				
DPT booster	16-24 months.	0.5 ml	Intra-muscular.	Antero-lateral side of mid-thigh.
OPV Booster	16-24 months.	2 drops	Oral	Oral
Vitamin A* (2nd to 9th dose)**	16 months with DPT/ OPV booster. Then, one dose every 6 months, up to the age of 5 years.	2 ml (2 lakh IU)	Oral	Oral
DT Booster	5-6 years.	0.5 ml.	Intra-muscular.	Upper Arm.
TT	10 years & 16 years.	0.5 ml	Intra-muscular.	Upper Arm.

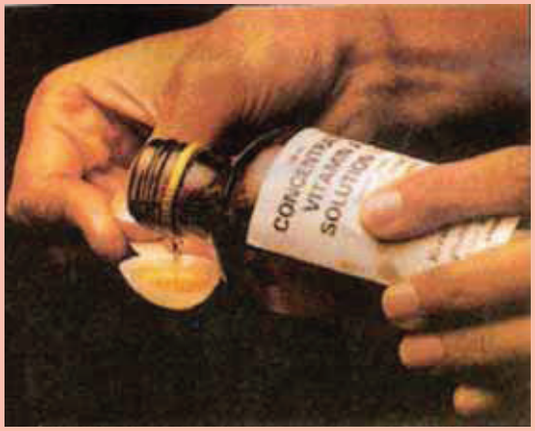


Fig: Vitamin-A Concentrate: *The sealed bottle has a shelf life of one year at room temperature. However, once opened, the bottle should be utilized with in 6 to 8 weeks. Keep vitamin-A solution away from sunlight. Give one dose of one lakh IU to infants of 6 to 11 months of age. Give six monthly doses of two lakh IU to children of 1 to 5 years of age.*

Fig: Prevention of Vitamin-A deficiency*: advise people to consume foods that are rich in Vitamin-A (Papaya, carrot, green leafy vegetables, mango etc.).*

Eradication of Poliomyelitis

Poliomyelitis (polio) is a highly infectious viral disease. It mainly affects young children. The virus is transmitted through contaminated food and water. It **multiplies in intestine**, from where it can invade the nervous system. Many infected people have no symptoms. But they excrete the virus in their faeces, transmitting the infection to others. **Symptoms of polio** include fever, fatigue, headache, vomiting, stiffness in the neck, and pain in the limbs. In a small proportion of cases, the disease causes paralysis, which is often permanent. There is **no cure for polio**. The disease can be prevented by immunization with polio vaccine. Oral polio vaccine (OPV) was developed in 1961 by **Dr Albert Sabin**. OPV is highly effective, safe and inexpensive vaccine.

Global Polio Eradication Initiative

In 1988, World Health Assembly adopted a resolution for worldwide eradication of polio. The number of cases has fallen by over 99%. In 2008, only four countries in the world remain polio-endemic, down from more than 125 in 1988. The remaining countries are

Afghanistan, India, Nigeria and Pakistan. Persistent pockets of polio transmission are in northern India, northern Nigeria and the border between Afghanistan and Pakistan. They are now the current focus of polio eradication initiative.

The **strategies** for eradication of poliomyelitis are:

Routine immunization: Immunization coverage with four doses of OPV in the **first year of life**.

Mass campaign: Supplementary doses of OPV to all **children under five years** of age during **Pulse Polio Immunisation** through National or Sub-National Immunisation Days.

Surveillance for wild poliovirus: All cases of **acute flaccid paralysis** (AFP) are reported and laboratory investigation done for poliomyelitis virus.

Mopping up: OPV given to all children less than five years in **two rounds** (at an interval of 4-6 weeks) in a **target area**. It is conducted when the polio transmission is limited to a small area or when a case of polio is detected.

Polio eradication in India: National Pulse Polio Immunisation campaign was launched in 1995-1996. The number of polio cases declined from 3,263 in 1995 to 66 in 2005. However, in 2006, 676 cases were reported. In 2008, the country reported 559 cases, of which 75 were of (most dangerous) type-1 Polio and 484 type-3 Polio. In 2009, 733 cases were reported, 80 of type 1 and 653 type 3. Majority were reported from **endemic states of Uttar Pradesh and Bihar**. A further decline was seen in the year 2010 - 42 cases were recorded.

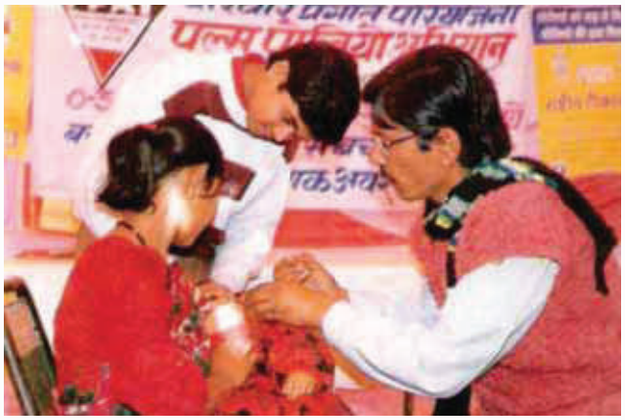


Fig: *Pulse Polio vaccination for eradication of poliomyelitis. This is a national priority, in which all health care workers should participate.*

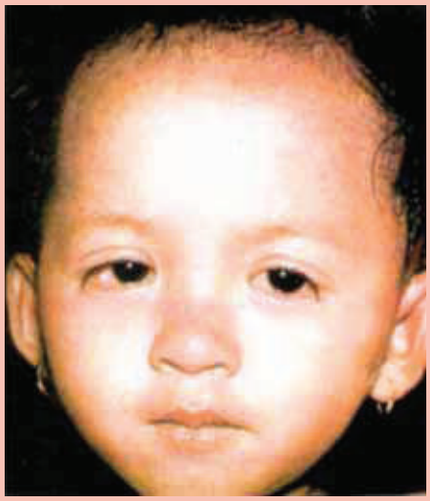


Fig: Child suffering from measles: *red eyes with watering, rash on the spin of the face and fever are some of the symptoms. Measles drags the child into other health & nutritional problems. So, preventing measles is important, by giving immunization at appropriate age.*

10.9 National Health Programmes

A **programme** is an organized set of activities directed towards the achievement of defined objectives. The National Health Programmes were started to address major health problems in the country, as a part of national planned development after independence.

10.9.1 Revised National Tuberculosis Control Programme

Tuberculosis (TB) is an infectious disease caused by **Mycobacterium tuberculosis**. It is spread through the air by a person suffering from TB. It is primarily a disease of lungs. But it can also affect intestines, meninges, bones, joints, lymph nodes etc.

Developing countries account for 95% of the world's TB cases. **India accounts for one third of global burden of TB**. Around 2 million diagnosed every year, 0.5 million die. Thus, tuberculosis is a major public health problem in India. Malnutrition, overcrowding, poor sanitation, poverty, tobacco smoking, alcoholism are factors associated with TB. Now-a-days, HIV infection is the strongest risk factor for tuberculosis.

Relation between TB and HIV

Tuberculosis is one of the earliest **opportunistic diseases** that develop in persons infected with HIV. HIV debilitates the immune system, increasing the person's vulnerability to TB. An HIV positive person is six times more likely to develop TB disease. Tuberculosis can be cured, even among HIV-infected persons.

Cough, fever, weakness, loss of weight, presence of blood in sputum, chest pain, etc are the **symptoms of TB**. Tuberculosis can be diagnosed by microscopic examination of sputum and X-ray of chest. Modern anti-TB treatment can cure virtually all patients. However, it is very important that treatment has to be started early. Also, **treatment should be taken for a minimum of 6 months**. Because treatment is of a long duration and because patients feel better after about 1-2 months of the treatment; many TB patients discontinue the treatment.

The **National Tuberculosis Control Programme** was started in 1962. A review in 1992 revealed poor performance of the programme. Only 30% of cases were being diagnosed and only 30% were completing their treatment. So, **Revised National Tuberculosis Control Programme (RNTCP)**, based on the **Directly Observed Treatment- Short Course (DOTS)** strategy. **Objectives of RNTCP** are:

i) to cure at least 85% of all newly detected infectious cases of pulmonary tuberculosis, and

ii) to detect at least 70% of estimated new sputum smear positive tuberculosis cases.

DOTS strategy

DOTS strategy includes the following:

→ **Case detection by sputum microscopy**: Any person having cough for more than two weeks should have **2 sputum samples** examined for **acid fast bacilli**.

→ **Categorization of cases**: done on the basis of sputum examination. If even one sputum examination result is positive, the patient is labeled as **'smear positive pulmonary tuberculosis'**. If the sputum is negative, **X ray of chest** is done. If X-ray is suggestive of tuberculosis, treatment with anti tubercular drugs is started. The drugs are given thrice weekly in two phases - **intensive phase** and **continuation** phase.

→ **Regular and uninterrupted supply** of drugs: drugs are supplied in prefixed doses in blister packs. Drugs for each patient's full course of treatment are supplied in a box.

→ **Direct observation:** every dose of treatment in intensive phase and at least the first dose in continuation phase of treatment is directly observed. That means, the patient has to swallow the medicine in presence of health worker.

→ **Systematic evaluation and monitoring:** treatment results of each and every patient is assessed.

By March 2006, the entire country has been covered under Revised National TB Control Programme It has consistently achieved treatment success rate of more than 85%.

The World Health Organization has developed a strategy for control of TB. This is called Directly Observed Treatment, Short-course or DOTS. In areas covered by the DOTS programme, a health worker or a volunteer watches a TB patient swallow the tablets in his/her presence. There are certain other benefits of DOTS as well. A health worker ensures that the patient receives a regular supply of medicines. These medicines need to be taken only thrice or twice in a week. The worker also keeps close watch on the patient's progress and looks for any side effects of anti-TB medicines.

If a patient is not living in an area served by DOTS, the following tips may be helpful:

Take medicines at an appointed time everyday.

Ask a family member or a friend to remind you everyday (people have tried reminding through telephone and even used SMS services of cell phones).

Put a mark through the day on your calendar each day after taking your medicines.

10.9.2 National Vector Borne Diseases Control Programme

National Vector Borne Diseases Control programme (NVBDCP) is the common programme for the prevention and control of **vector borne diseases** (i.e. Malaria, Dengue, Lymphatic Filariasis, Kala-azar, Japanese Encephalitis and Chikungunya) in India.

Malaria Control

The National Malaria Control Programme was launched in 1953 and converted to **National Malaria Eradication Programme** in 1958. It achieved success initially but due to some constraints there was resurgence of malaria. In 1977 a **Modified Plan of Operation** was started. Since 2003-04 the ongoing programmes on malaria, filaria and kala-azar have been converged and Japanese encephalitis and dengue have been included under the **National Vector Borne Diseases Control Programme.** Chikungunya fever has also been added under this programme. These are diseases transmitted by **insect vectors**. Kala azar is transmitted through sand fly. In others, different kinds of mosquitoes are the vectors.

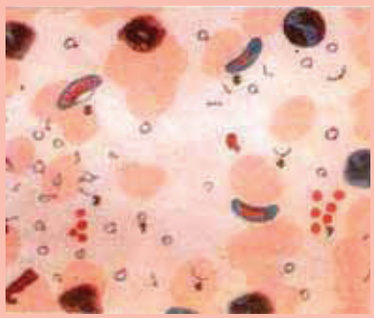


Fig: *Malaria Parasite: Patient's blood smear.*

Malaria is a serious disease caused by parasites known as **Plasmodium** vivax, Plasmodium falciparum, Plasmodium malariae and Plasmodium ovale. It is transmitted by the infective bite of **Anopheles mosquito**. Man develops disease after 10 to 14 days of being bitten by an infective mosquito. Plasmodium vivax and Plasmodium falciparum, are the most commonly reported parasites from India. Infection with P.falciparum is the most deadly form of malaria.

Inside the human host, the parasite undergoes a series of changes as part of its complex life cycle. The parasite completes its life cycle in liver cells and red blood cells. Around 1.8 million cases of malaria (including 0.86 million P. falciparum cases) are being reported in India every year.

Malaria produces fever, headache, vomiting and other flu-like symptoms. As the parasite infects and destroys red blood cells, the patient becomes anemic. Symptoms of severe malaria are high fever with **prostration (inability to sit)**, altered consciousness or coma. Breathing difficulties, generalized convulsions or fits or severe anemia can also occur.

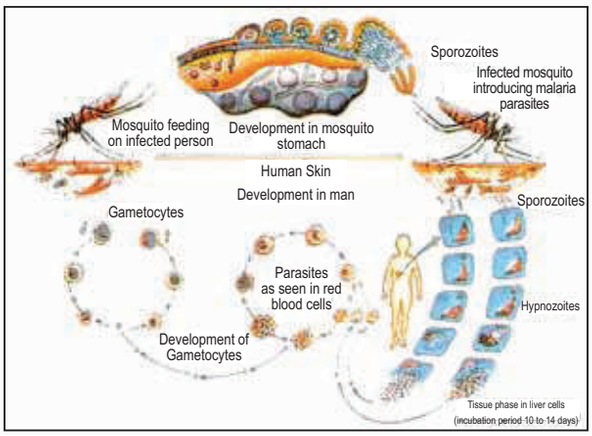


Fig: *Life cycle of malaria parasite (Plasmodium vivax).*

The Malaria control strategies are:

1. Early Case Detection and Prompt Treatment (EDPT)

EDPT is the **main strategy** of malaria control. **Radical treatment** is necessary for all the cases of malaria to prevent transmission of malaria. In cases positive for P falciparum, **Chloroquin** is given for 3 days and **Primaquine** is given as single dose on the first day. Cases positive for P vivax are given Chloroquin for 3 days and Primaquine for 14 days to prevent relapse. **Drug Distribution Centres** (DDCs) and **Fever Treatment Depots** (FTDs) have been established in the rural areas. Alternative drugs are given for **chloroquine resistant malaria**.

2. Vector Control Methods

- Use of **Indoor Residual Spray** (IRS) with insecticides recommended under the programme.
- Use of **chemical larvicides** (like abate) in water.
- **Aerosol space spray** during day time.
- **Malathion fogging** during outbreaks of malaria.
- Use of **larvivorous fish** in ponds, ornamental tanks, fountains etc.

3. Personal Prophylatic Methods

- Use of **mosquito repellent creams**, liquids, coils, mats etc.
- **Screening** of the houses with wire mesh to prevent entry of mosquitoes.
- Use of **bed nets treated with insecticides**, to improve their efficiency.
- Wearing **clothes** that cover maximum surface area of the body

4. Environmental Management and Source Reduction Methods

- Source reduction i.e. filling of the breeding places.
- Proper covering of stored water.
- Sensitizing and involving the community for detection of Anopheles **breeding places** and their elimination.
- Involving NGOs in programme strategy and implementation.

If the intricacies of malaria control are to be understood, we should know the different **stages of mosquito's life cycle**. The stages are depicted in the figure below.

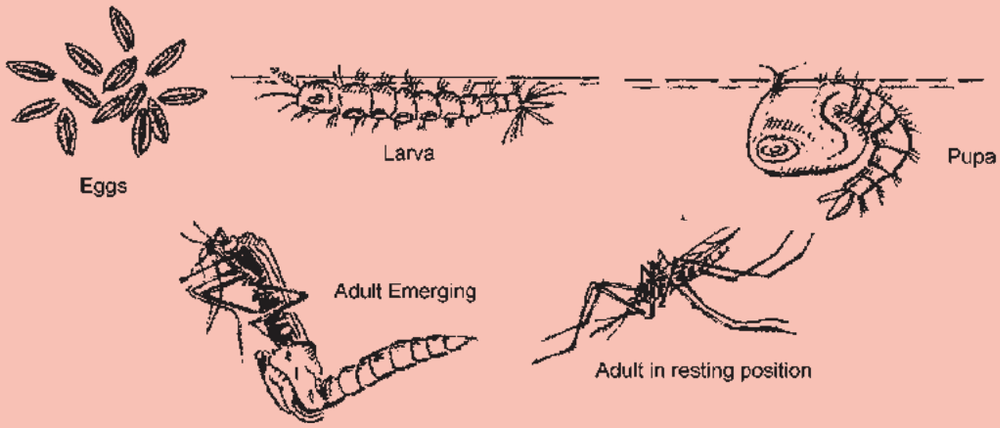


Fig: *Life cycle of mosquito: egg, larva, pupa and mosquito.*

Dengue

Dengue is a viral disease caused by the **Dengue virus**. It is transmitted by bites of **Aedes aegypti mosquito**. It is a black mosquito with white stripes. It is a day biter that mainly feeds on human beings in domestic situations. It breeds in any type of **man-made containers** (desert coolers and storage tanks). Man develops the disease after 5-6 days of being bitten by an infective mosquito.

Dengue occurs in two forms: **Dengue Fever** and **Dengue Haemorrhagic Fever** (DHF). Dengue Fever is a severe, flu-like illness. Dengue Haemorrhagic Fever (DHF) is a more severe form of disease, which may cause death. Disease is prevalent throughout India in most of the metropolitan cities and towns. Outbreaks of dengue have been reported from rural areas also.

Prevention is better than cure. No drug or vaccine is available for the treatment of Dengue/ DHF. The **control of Aedes aegypti mosquito** is the only method of choice. With early detection and proper case management, mortality can be reduced. **Methods for prevention & control** are:

1. Personal Prophylactic Measures

- Use of **mosquito repellent** creams, liquids, coils, mats etc.
- Wearing of full sleeve shirts and full pants with socks.
- Use of **bed nets** for sleeping infants and young children during day time to prevent mosquito bite.

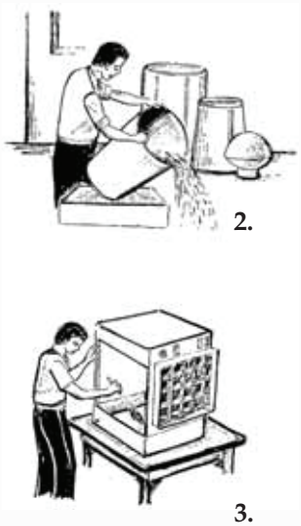


Fig: Drain the water tanks & desert coolers once a week. *That removes any eggs laid by the mosquitoes in the water, before they complete their life cycle.*

2. Biological and Chemical Control

- Use of **larvivorous fish** in ornamental tanks, fountains, etc.
- Use of biocides.
- Use of **chemical larvicides** (like abate) in big breeding containers.
- **Aerosol space spray** during day time.

3. Environmental Management, Source Reduction etc.

- Detection and elimination of mosquito breeding sources.
- Management of **roof tops**, porticos and sunshades.
- Proper covering of stored water.
- Observation of **weekly dry day**.
- **Health education** to common people regarding the disease and vector

through various media sources like Television, Radio, Cinema slides, etc.

- **Involving the community** for detection of Aedes breeding places and their elimination.

Japanese Encephalitis

Japanese Encephalitis (JE) is caused by a **flavivirus**. It is transmitted by infective bites of female mosquitoes mainly belonging to **Culex group**. They breed in rice fields, shallow ditches and ponds. Mosquitoes become infected by the virus when they feed on pigs and birds. **Pigs play the role of amplifier host**. They allow virus multiplication within their body, without actually suffering from the disease. They maintain **prolonged viraemia** and infect the mosquito when they bite. Japanese encephalitis virus is **not transmitted from person-to-person**.

JE virus infection causes fever and neurological symptoms. Symptoms include headache, fever, neck rigidity, disorientation, coma, tremors, paralysis (generalized), etc. There is **no specific treatment** for JE. **Clinical management is supportive**. It is directed at maintaining fluid and electrolyte balance and control of convulsions, etc.

Inactivated Mouse Brain-Derived JE Vaccine is available against JE in India. Three doses of the vaccine provide immunity, which lasts a few years.

Preventive measures include reducing the mosquito density and using insecticide treated mosquito nets. The reduction in mosquito breeding requires **ecological management**. The role of insecticides is limited.

Kala-azar

Kala-azar is a slow progressing disease caused by a protozoan ***Leishmania donovani***. The parasite lives in bone marrow, spleen and liver. Kala-azar is a vector borne disease that spreads by **sandfly** of genus Phlebotomus argentipes. Sand flies are small insects, about one fourth the size of a mosquito. The patient has recurrent fever, loss of appetite, pallor and weight loss. There is enlargement of spleen and liver. Kala-azar is treated by drugs like Sodium stibogluconate & Amphotericin-B.

Vector control is achieved through **residual insecticide spray** with DDT, up to 6 feet height from the ground, twice a year.

Filariasis

Filariasis is caused by **coiled and thread-like parasitic worms** belonging to the family filaridae. These parasites after getting deposited on skin penetrate on their own or through

the opening created by mosquito bites to reach the lymphatic system. The disease is caused by the parasites Wuchereria bancrofti and Brugia malayi. These parasites are transmitted by Culex and Mansonia mosquitoes.

Lymphatic Filariasis (commonly known as **elephantiasis**) is a disfiguring and disabling disease. It is usually acquired in childhood. In the early stages, there are no specific symptoms. The long term physical consequences are ***painful swollen limbs*** (lymphoedema or elephantiasis). Swelling of the scrotum (**hydrocele**) in males, is common in endemic areas.

The National Filaria Control Programme (NFCP) was launched in the country in 1955. The main control measures were mass administration of the drug Di-ethyl Carbamazine (DEC), anti-larval measures in urban areas and indoor residual spray in rural areas. Anti-parasitic measures include detection and treatment of **microfilaria carriers & diseased persons** with DEC at **Filaria Clinics**.

The National Health Policy goal is to eliminate lymphatic filariasis from India by 2015. The strategy is:

- **Single day mass therapy with DEC** given to all members of community (except children less than 2 years and pregnant women).
- Management of acute and chronic cases.
- Information Education and Communication (IEC) for the community to undertake preventive measures for filaria control.
- Anti vector measures.

10.9.3 National Leprosy Elimination Programme

Leprosy affects skin, mucous membranes and peripheral nerves that can lead to deformities. Leprosy produces social & psychological problems. That is why leprosy is important in public health.

Leprosy is caused by **Mycobacterium leprae**, which resembles Mycobacterium tuberculosis. The **reservoir** of leprosy is an infectious leprosy patient who is in prolonged contact with healthy persons. Only 20% of leprosy patients are infectious to others.

Leprosy bacilli multiply very slowly. So, they have very weak potential of causing the disease.With modern **Multi Drug Therapy** (MDT), leprosy patients become non-infectious very rapidly, so there is no threat of disease transmission to others. It takes **six months to one year of complete treatment with MDT** to cure pauci-bacillary & multi-bacillary type of patients. Under the programme, **domiciliary treatment** (treatment at home) is advised.

National Leprosy Control Programme was launched in 1955 through early detection of cases and treatment with the drug Dapsone. It did not succeed due to very long duration of treatment and irregular compliance by patients. **National Leprosy Eradication Programme** was launched in 1983 with the objective to arrest the disease activity in all the known cases of leprosy. In 1991 the World Health Assembly resolved to eliminate leprosy at a global level by the year 2000.

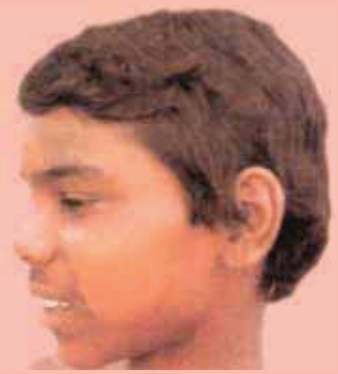


Fig: *Anaesthetic patch on the right cheek. It is a leprosy patch. Test it for pain & touch sensation. If the sensations are lost, refer him for investigations.*

The National Leprosy Eradication Programme introduced **Modified Leprosy Elimination Campaign** in 1997-98. Whole country has been covered by MDT and prevalence of Leprosy declined from 57 per 10,000 in 1983 to 0.95 per 10,000 in 2005. Thus, **elimination goal has been achieved at national level**.

But still some districts/blocks are having leprosy problem. **Block Leprosy Awareness Campaign** (BLAC) are being conducted in all these blocks. **Leprosy deformity** is not associated with infectivity of the disease. The patients seen with mutilated hands/feet etc. are already cured cases with no active disease. So, they do not transmit infection to others. They should be rehabilitated in the society and any sort of discrimination should be avoided.

10.9.4 National AIDS Control Programme

Acquired Immune Deficiency Syndrome (AIDS) is caused by the **Human Immunodeficiency Virus (HIV)**. It is transmitted through

- unprotected sexual intercourse with an infected partner,
- transfusion of infected blood or blood products,
- sharing of infected needles, and
- from an infected mother to her baby.

Prevention is the mainstay of the strategic response to HIV transmission in India, as 99 percent population is uninfected. The following have disproportionately **higher incidence of HIV infection**:-

- Female sex workers (FSWs),
- Men who have sex with men (MSM), and
- Injecting drug users (IDUs).

The first case of AIDS was discovered in India in 1986 in Tamil Nadu. Now it has spread to all the states. Nationally, the prevalence of HIV is less than 1%. But we have a large population. So, **India is the country with second largest number of People Living with HIV/AIDS**. In six states the epidemic is classified as a generalized one. These states have >1% of **women attending ante natal care** being infected. Also they have a HIV prevalence of >5% among **STI clinic patients**.

The three Phases of the Programme

The National AIDS Control Programme was started in1987. National AIDS Control Programme **Phase-I** was launched for the period of 1992-99. Its main strategies were:

- **Preventing HIV transmission through blood & blood products**: ensuring blood safety by testing all blood samples for HIV, Hepatitis B, malaria and syphilis.
- **Control of hospital infections**: to prevent transmission in the health care settings.
- Increasing people's awareness about HIV.
- Strengthening **clinical services for STDs/HIV** (HIV is more common among patients suffering from STDs).

Phase II of the programme (1999-2006) included:

- **Targeted interventions**: focus on **high risk groups** (e.g. female sex workers, men having sex with men, intravenous drug users and bridge population).
- School AIDS education programme.
- Voluntary Counseling and Testing Centers, and Parent to Child Transmission Prevention Centers established.
- Free **Anti-Retroviral Therapy** (ART) at selected centers.
- Information Education Communication (IEC) activities.

Phase III of the programme (launched in 2007) focuses on:

- Targeted interventions.
- Control of STDs.
- **Condom promotion**: sexual transmission of HIV can be prevented by condom use.
- **IEC** about the disease, modes of transmission, prevention and control.

- Blood safety.
- **Integrated Counseling and Testing Centers.**
- **Prevention of parent to child transmission**: counseling and testing of all pregnant women for HIV is being done. HIV positive mothers are treated with drugs against HIV to prevent transmission to baby.
- **Anti Retroviral treatment**: the programme makes drugs against HIV available to persons with AIDS.
- Post exposure prophylaxis for health care workers.
- **Surveillance of HIV/AIDS**: to detect the spread of disease and plan strategy for prevention and control.

10.9.5 National Programme for Control of Blindness

Blindness is defined as **inability of a person to count fingers** from a distance of 6 meters (20 feet); or **acuity of vision 6/60 or less** with the best possible spectacle correction. The prevalence of blindness in India is 1.1 percent. The main causes of blindness are:

- Cataract (62 % of blindness in India),
- Refractive errors (20 %), and
- Glaucoma (6%).

Cataract is a term applied when the human lens loses its transparency and become opaque. Hence the light cannot pass through the lens so as to produce a clear image. It cannot be treated by giving medicines. The only treatment of cataract is by **surgery**.

National Programme for Control of Blindness was launched in 1976 with the goal to reduce the prevalence of blindness from 1.4% to 0.3%. **The objectives** of the programme are:

- To reduce the backlog of blindness through identification and treatment of blind.
- To develop **eye care facilities** in every district and develop **human resource** for providing eye care services.
- To secure participation of voluntary organizations in eye care.

The main activities of the programme are:

1. **Cataract surgery by Intra Ocular Lens Implantation**: The blind people are identified and listed. Camps are organized to confirm diagnosis of cataract and are transported to hospital for surgery.

2. **School eye screening**: screening is done in schools to identify children with eye problems. Glasses are provided free of cost to the poor.

3. **Eye banking**: eye donation is encouraged.

4. **Eye care education**.

10.9.6 National Rural Health Mission

The National Rural Health Mission (2005-12) seeks to provide effective healthcare to rural population throughout the country. It specially focuses on 18 states, which have weak public health infrastructure. The key components of the Mission are:

- Train and enhance capacity of **Panchayati Raj Institutions (PRIs)** to own, control and manage **public health services**.
- A **village health plan** is prepared through a local team headed by the **Health and Sanitation Committee** of the Panchayat;
- **Strengthening of Primary Health Centers**, Community Health Centers and rural hospitals for effective curative care. The facilities are required to meet the **Indian Public Health Standards** (IPHS).
- **Integration of vertical Health and Family Welfare Programmes** at National, State, District & Block levels.
- **Developing capacities for preventive health care** at all levels for **promoting healthy life styles**, for reducing consumption of tobacco and alcohol, etc.
- Provision of a female **Accredited Social Health Activist (ASHA)** in each village has been made. She is chosen by Panchayat. ASHA is an honorary volunteer, who receives **performance-based compensation**. She promotes universal immunization. She provides **referral & escort services** for Reproductive and Child Health (RCH), construction of household toilets, etc. ASHA facilitates preparation and implementation of **Village Health Plan**. For this, she works with Anganwadi worker, ANM, functionaries of other departments, Self Help Group (SHG) members. The leadership is provided by **Village Health Committee** of the Panchayat. ASHAs will be available all over the country. Special emphasis is being laid on **18 high focus States**. Government of India bears costs related to training, incentives being given and medical kits given to ASHAs.

10.9.7 Reproductive and Child Health (RCH) Programme

Mother and child health (MCH) is a priority in our country. Mothers include women in the reproductive age group, i.e. 15-49 years of age (19% of population). Child includes

children less than five years of age (17%), school going children (28%) and adolescents. In numbers they together constitute almost 70% of the population. They are a high risk group as maternal and child mortality is very high as compared to the developed world. Improving the health of the mother and child will benefit the whole community and will prevent and decrease premature deaths.

India was the first country to launch a National Family Planning Programme in 1952. In 1969-74 it was made an integral part of mother and child health activities of Primary Health Centers and Sub Centers. It was renamed Family Welfare Programme in 1977. The Reproductive and Child Health Programme was formally launched in October 1997. It covers services for women and children. The Reproductive and Child Health Programme phase II was launched in April 2005.

(a) Services for mothers:

(i) Antenatal care: It is the care given to a pregnant mother. This includes:

- early registration during pregnancy.
- three or more antenatal check ups - during each check up, the mother is asked about complaints during the present pregnancy. The weight and blood pressure of the preganant lady are measureed and physical examination is done.
- iron and folic acid tablets to prevent and treat anemia are given.
- two doses or a booster of tetanus toxoid vaccine are given.

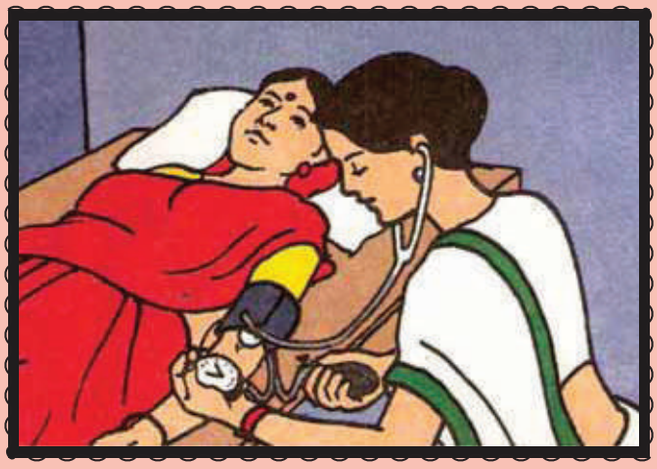


Fig: Monitoring pregnant women's blood pressure *is very important. This detects eclampsia & pre-eclampsia, which are well manageable when detected early.*

(ii) **Care during child birth**: all deliveries should be conducted in a hospital or health centre and by skilled birth attendants. Five cleans should be observed at the time of delivery.

- Clean hands
- Clean surface
- Clean cord tie
- Clean razor blade
- Clean cord stump

Fig: Breast feeding: *Promoting breast feeding is a priority of every health worker. Colostrum is rich in immunoglobulin and vitamin-A. That is why mother should be advised not to discard it.*

(iii) **Postnatal care**: Post natal period begins from the birth of the baby to 6 weeks after delivery. It is the care of mother and newborn in this period. At least 3 post natal check ups should be done by a doctor or female health worker. During each check up the mother is asked about any complications and both the mother and baby are examined. The mother is advised about -

- Diet with extra calories, protein and iron
- Personal and perineal hygiene
- Iron and folic acid tablets
- Breastfeeding
- Care of the baby
- Family planning

Fig: *ANM addressing a group of Reproductive Age Group (RAG) Women.*

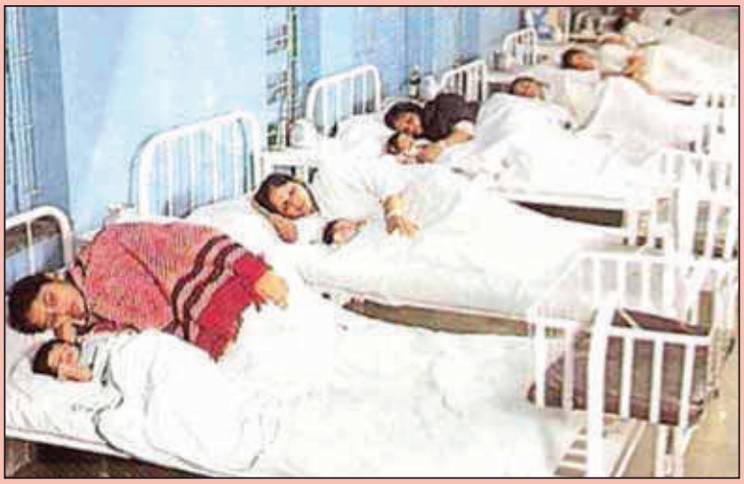


***Fig: Baby friendly hospital initiative** (BFHI): the baby sleeps besides the mother.*

(b) Package for Newborn and Child health includes:

Skilled care at birth: The following to be done to all new borns:

- umbilical cord to be cut by a new blade,
- the cord to be tied by a clean thread,
- cleaning of respiratory passages,
- body temperature to be maintained,
- eyes and skin to be cleaned,
- weight to be recorded, and
- breast feeding to be started within one hour of birth.

Integrated Management of Child Illness (IMCI) Strategy:

Five childhood illnesses- Pneumonia, diarrhoea, measles, malaria and malnutrition are recognized as the **cause of 70% of deaths** in children less than five years. Most of the children present with overlapping symptoms and signs of diseases. This makes a single diagnosis difficult or even inappropriate. To meet this challenge, a strategy known as **Integrated Management of Childhood Illness** (IMCI) was evolved. It is an integrated approach to child health that focuses on the well-being of the whole child. The **IMCI strategy** includes three main components:

- Improving **case management skills** of health-care staff,
- Improving the **health care service systems**, and
- Improving **family health practices** & community health practices.

In health facilities, the IMCI strategy promotes the accurate identification of childhood illnesses in outpatient settings, ensures appropriate combined treatment of all major illnesses, strengthens the counseling of caretakers, and speeds up the referral of severely ill children.

In the home setting, it promotes appropriate care seeking behaviours, improved nutrition and preventative care, and the correct implementation of prescribed care. India has adapted the **Integrated Management of Neonatal and Childhood Illness (IMNCI)** which includes the newborn less than 7 days that were not included in IMCI.

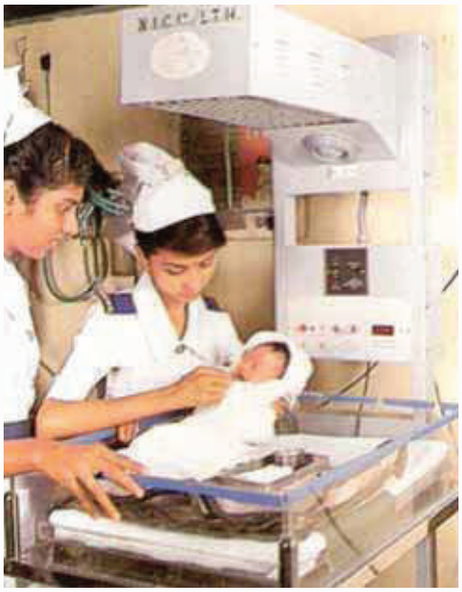


Fig: Care of the new born: *Facilities are being developed for neonatal care under the RCH programme. Special care can substantially reduce neonatal deaths.*

(c) Other services under RCH programme

- Family planning services,
- Reproductive and sexual health services for adolescents, and
- Prevention and management of **reproductive tract infections** (RTIs) and **sexually transmitted infections** (STIs).

10.9.8 National Cancer Control Programme

Cancer is an important public health problem. In India, 8 to 9 lakh cases are occurring every year. At any point of time, there are nearly 25 lakh cancer cases in the country. Every year, about 4 lakh deaths occur due to cancer. About **40% of cancers in the country are related to tobacco** use (smoking or chewing tobacco products). Population based registries are maintained under **National Cancer Registry Programme**. The leading sites of cancer among men are cancer of oral cavity, lungs, oesophagus and stomach. Leading sites among women are cervix of the uterus, breast and oral cavity. **Oral and lung cancers in males**; and **cervical and breast cancers in females** account for more than 50% of all cancer deaths in India.

To collect data on cancer, **National Cancer Registry Programme** (NCRP) was initiated in 1982 by Indian Council of Medical Research (ICMR). **Population-based registries** take sample population in a geographically defined area. **Hospital-based registries** take data from patients coming to a hospital. We have 21 Population-based registries and 6 Hospital-based registries.

National Cancer Control Programme was launched in 1975. Earlier, priority was given for equipping the cancer hospitals. Since 1984, stress is being laid on **primary prevention** and **early detection of cancer cases**. Goals and objectives of NCCP are : -

1. **Primary prevention** of cancers by **health education**: hazards of tobacco consumption are explained. **Tobacco** is the most common and preventable cause of cancer.
2. **Secondary prevention** (i.e. early detection and diagnosis of cancers): Cancer of cervix, breast and oro-pharyngeal cancer can be detected by screening methods. Patients' are educated about self- examination of the breast.
3. Strengthening of **cancer treatment facilities**.
4. **Palliative care** in terminal stage of the cancer.

10.9.9 National Programme for Prevention and Control of Deafness

Hearing loss is the most common sensory deficit in humans today. India has 291 persons per one lakh population, who are suffering from severe to profound hearing loss (NSSO, 2001). Of these, a large percentage is children below the age of 14 years. Even larger percentage of population suffers from milder degrees of hearing loss and unilateral (one sided) hearing loss.

Objectives of the national programme

1. To **prevent** the avoidable hearing loss on account of disease or injury.
2. **Early identification**, diagnosis and treatment of ear problems (**Screening camps** for early detection of hearing impairment and deafness).
3. To **medically rehabilitate** persons suffering with deafness.
4. To strengthen the existing **inter-sectoral linkages** for rehabilitation of persons with deafness.
5. To **develop institutional capacity** for ear care services (by providing support for equipment and material and training for the personnel).
6. To undertake **IEC activities** for early identification of hearing impaired, especially among children (for timely management) and to remove the **stigma** attached to deafness.

A pilot project was implemented in 25 districts till March 2008. The programme is to be expanded to 203 districts, by the end of eleventh five year plan.

10.9.10 National Programme for Prevention and Control of Diabetes, Cardiovascular Diseases and Stroke (NPDCS)

National Programme for Prevention and Control of Diabetes, Cardiovascular Diseases and Stroke (NPDCS) was launched on 4th Jan 2008. Objectives of the pilot phase of the project are:

- Risk reduction for prevention of **Non-Communicable Diseases** (Diabetes, CVD and Stroke).
- Early diagnosis and appropriate management of Diabetes, Cardiovascular Diseases and Stroke.

Strategies

A. Health Promotion activities for General Population

Targeted to healthy, risk free population and involves development of an effective communication strategy to modify individual, group and community behaviour through media. It also focuses on community mobilization and participation and mainstreaming the health promotion agenda to reach till the village level.

1. **Community Based Interventions**: This involves **health education** about benefits of physical exercise and dietary changes.
2. **Workplace Interventions:** For health promotion, by involving peer educators after providing **initial training**.
3. **School Based interventions**: By giving inputs to school health programme (viz. physical education, nutrition and food services, health promotion for school personnel, health education and health services). The programme envisages to make health promotion a defined agenda, in the school curriculum.

B. Services for High Risk Groups

The **high risks groups** are those who suffer from hypertension, obesity, high blood lipid and glucose levels; and those who already had a cerebral or coronary event. They are provided early diagnosis and management services. This reduces morbidity and mortality among them.

Healthcare providers at all levels will be mobilized and trained to involve in risk detection and screening viz. blood pressure checks, recommending lifestyle modifications, dissemination of information and referring for further management.

Special clinic for Diabetes/Cardiovascular disease/Stroke are established at the District Hospital.

Prompt intervention to **manage a cardiac event** can reduce mortality to a large extent. Identification of referral centres and strengthening the linkages are being done.

10.9.11 Integrated Child Development Services (ICDS)

As per 2001 census, India has about 157 million children below the age of 6 years constituting 15.42% of population. The sex ratio among children (0-6 years) is 927 (i.e. 927 females per 1000 males). Many of these children live in economic and social **environment which impedes child's physical and mental development**. These conditions include poverty, poor environmental sanitation, disease, infection, inadequate access to primary health care, inappropriate child caring & feeding practices etc.

The programme of the **Integrated Child Development Services (ICDS)** was launched in 1975. It provides an integrated package of services for holistic development of the child. The objectives of ICDS are :

- To lay the foundation for proper psychological development of the child,
- To improve nutritional & health status of children of 0-6 years of age,
- To reduce incidence of mortality, morbidity, malnutrition and school drop-outs,
- To enhance the capability of the mother and family to look after the health, nutritional and development needs of the child, and
- To achieve effective coordination among various departments to promote child development.

The Scheme provides for converging basic services through community-based workers and helpers. The services are provided at a centre called the **'Anganwadi'** (literally means a courtyard play centre). It is a childcare centre, located within the village. **A package of following six services** is provided under the ICDS Scheme:

1. Supplementary nutrition
2. Non-formal pre-school education
3. Immunization
4. Health check-up
5. Referral services
6. Nutrition and Health Education

Three services (namely immunization, health check-up and referral) are delivered through **public health infrastructure**, under the Ministry of Health & Family Welfare.

Table: ICDS target groups and service providers

Services	Target Group	Services Provided By
Supplementary Nutrition	Children below 6 years; pregnant and lactating mothers	Anganwadi Worker (AWW) & Anganwadi Helper (AWH)
Immunization*	Children below 6 years; pregnant and lactating mothers	Auxillary Nurse Midwife (ANM)/Medical Officer (MO)
Health Check-ups*	Children below 6 years; pregnant and lactating mothers	ANM/MO/AWW
Referral	Children below 6 years; pregnant and lactating mothers	AWW/ANM/MO
Pre-School Education	Children 3-6 years	AWW
Nutrition and Health Education	Women (15-45 years)	AWW/ANM/MO

(*AWW assists ANM in identifying and mobilizing the target group.)

1. **Supplementary Nutrition Services**: This includes supplementary feeding, growth monitoring, ***prophylaxis against vitamin A deficiency and control of nutritional anaemia***. All families in the community are surveyed, to identify children below the age of six and pregnant & nursing mothers. Supplementary feeding is given for 300 days in a year. By providing supplementary feeding, the **Anganwadi attempts to bridge the protein energy gap** (the difference between the recommended dietary allowance and average dietary intake) of children and women.

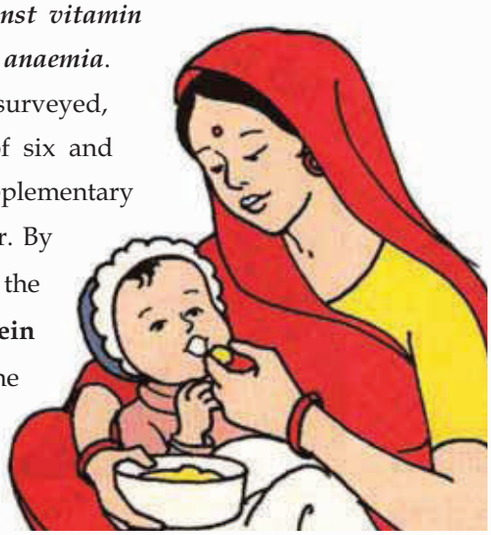


Fig: *An infant has a small stomach. But her calories needs are high. So, feed the baby again & again (say, every two hours!).*

Growth Monitoring and **nutrition surveillance** are two important

activities that are undertaken. Children below the age of three years of age are weighed once a month and children 3-6 years of age are weighed every quarter. **Weight-for-age growth cards** are maintained for all children below six years. Growth monitoring helps to detect growth faltering and helps in assessing nutritional status. Severely malnourished children are given **special supplementary feeding** and referred to PHCs as and when required.

Fig: *Weighing the baby in the field by* ***Salter scale.***

The effort is to provide **daily nutritional supplements** to the extent indicated below:

Beneficiaries	Calories (cal)	Protein (g)
Children 6-72 months	500	12-15
Severely malnourished	800	20-25
Pregnant & Lactating (P&L) Mothers	600	18-20

2. **Pre-School Education Service:** This is for the **three-to six years old children** in the anganwadi. It provide a natural, joyful and stimulating environment for all round development. The methods used are play, group work and development of healthy habits.

3. **Immunisation Service**: Carried out as per the **National Immunisation Schedule** by health worker female. The anganwadi worker helps her in registration, identification and follow up of children.

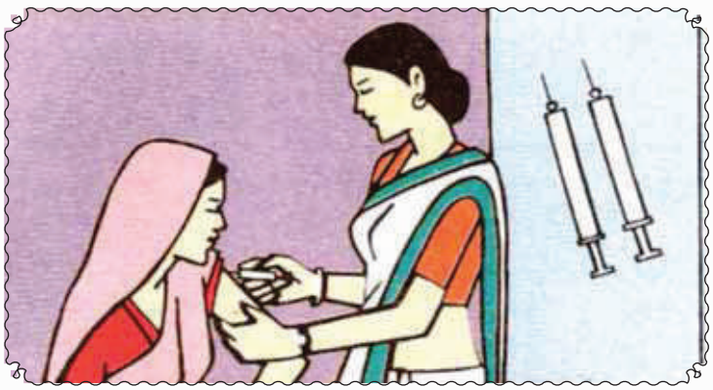


Fig: *Tetanus Toxoid (T.T.) injection: a pregnant woman needs be given TT at least two times.*

4. **Health Check up Service**: Done for all pregnant women and children less than six years by the health worker female or Medical Officer.

5. **Referral services**: Severely ill or severely malnourished children are referred to PHC.

6. **Nutrition and Health Education Service**: This is given to women of reproductive age group belonging to 15 to 49 years age. Nutrition education and health education are provided to them by ANM, AWW and Medical officers.

10.10 Millennium Development Goals

The Millennium Development Goals (MDGs) are eight goals to be achieved by 2015. They are drawn from the targets contained in **Millennium Declaration** that was adopted by 189 nations at **UN Millennium Summit** (September 2000). The eight MDGs break down into **quantifiable targets** that are measured by **specific indicators**. The eight goals are listed below: -

Goal 1 : Eradicate extreme poverty and hunger

Target 1a : Reduce by half the proportion of people living on less than a dollar a day.

Target 1b : Achieve full and **productive employment and decent work** for all, including women and young people.

Target 1c : Reduce by half the proportion of people who suffer from hunger.

Goal 2 : Achieve universal primary education

Target 2a : Ensure that all boys and girls complete a full course of primary schooling.

Goal 3 : Promote gender equality and empower women

Target 3a : **Eliminate gender disparity** in primary and secondary education, preferably by 2005; and at all levels by 2015.

Goal 4 : Reduce child mortality

Target 4a : Reduce by two thirds the mortality rate among children under five.

Goal 5 : Improve maternal health

Target 5a : Reduce by three quarters the **maternal mortality ratio (MMR)**.

Target 5b : Achieve, by 2015, universal access to reproductive health.

Goal 6 : Combat HIV/AIDS, malaria and other diseases

Target 6a : Halt and begin to reverse the spread of HIV/AIDS.

Target 6b : Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it.

Target 6c : Halt and begin to reverse the incidence of malaria and other major diseases.

Goal 7 : Ensure environmental sustainability

Target 7a : Integrate the principles of **sustainable development** into country policies and programmes; reverse loss of environmental resources.

Target 7b : Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss.

Target 7c : Reduce by half the proportion of people without sustainable access to **safe drinking water and basic sanitation**.

Target 7d : Achieve significant improvement in lives of at least 100 million **slum dwellers**, by 2020.

Goal 8 : Develop a Global Partnership for Development

Target 8a : Develop further an open, rule-based, predictable, non-discriminatory trading and financial system.

Target 8b : Address the special needs of the least developed countries.

Target 8c : Address the special needs of landlocked developing countries and small island developing states.

10.11 Data Collection

Data refers to **discreet observations of attributes or events**. Data as collected from various sources may not allow drawing inferences and conclusions. Data has to be transformed to information, to make it meaningful. This is done by **reduction, summarization and standardization** so that comparisons can be made.

Data Collection Methods

The methods used for data collection are classified as primary and secondary data collection methods.

A. **Primary Data Collection Methods:** Primary data is **elicited from patients/subjects** by interview, examination, investigation, etc. This is done by undertaking a study or a survey.

(1) **Studies:** A study is an investigation in which information is systematically collected. Studies are broadly classified as descriptive, analytic and experimental studies.

- Descriptive studies usually describe a situation e.g. distribution of malaria in relation to age, sex, area, season etc.
- Analytic studies aim to study causal factors and explanations for occurrence of a health related event. E.g. Study the factors associated with the occurrence of diabetes.
- Experimental studies study the effect of exposure or deprivation of a factor. E.g. Study the decrease in cancer cervix with HVP vaccine.

(2) **Interviews:** It is an important part of medical practice. History taking by a physician is usually done by interviewing the patient. The physician asks about the symptoms and details related to the illness. The interview may be **structured or unstructured**. For effective communication, know the **language and education level of the respondent**.

Structured Interview: The line of questioning is determined by the interviewer. Wording and order of questions is decided in advance. The advantages is that it is uniform for all subjects. Compilation and analysis

of data is easy. It is **useful for quantitative data**.

Unstructured Interview: The line of questioning is more flexible, the investigator may have a checklist but he follows leads as they arise. It is **useful for qualitative data**.

Steps in conducting an interview are:

- **Establishing contact**: Greet and introduce yourself. State the purpose of the interview. It is good if a **prior appointment** for the interview could be taken.
- **Starting an interview**: Initially more general discussion of the problem is done. Listen actively.
- **Rapport building**: To develop a rapport with subject and family.
- **Asking probe questions**: To provide encouragement
- **Guiding the interview**: If respondents deviate from the topic, guide them back to the subject.
- **Recording**: Take notes of salient points.
- **Closing the interview**: The interview should not end abruptly. Thank the respondent.
- **Report making**: A report of the interview is prepared.

(3) **Questionnaire Surveys:** The questionnaires may be self-administered or interviewer- administered. **Self Administered Questionnaires** are given to the study subjects. They read the questions and fill the answers themselves. The advantages of a self administered questionnaire are that it is simpler, can be administered to many persons simultaneously and cheaper. However, only subjects having **education and skill** can fill the questionnaires.

Interviewer Administered Questionnaires: The investigator reads the questionnaire and fills it. In this, the respondent need not be educated. A good interviewer can stimulate the respondent's interest. He/she can develop rapport and create an atmosphere conducive for answering questions. He or she can repeat the questions and explain. Observations can be noted down about the expressions and behaviour of the respondent.

(4) **Observation**: This may vary from simple observation to those requiring skills (e.g. clinical or laboratory or radiological examination). The evidence usually is considered more valid than that of an interview.

(B) **Secondary Data Collection Methods:** These involve collection of data from **existing sources of data**. The common sources of secondary data are:

(1) **Census:** It is an important source of health information. In India it is conducted every 10 years (in first quarter of the first year in each decade). Demographic, social, economic, housing and reproductive health data was collected in the census held in 2001.

(2) **Registration of vital events**: Registration of vital events like births and deaths is being done in India by local governments. This provides continuous record of the demographic changes.

(3) **Sample Registration System (SRS)**: It is a dual record system. Continuous enumeration of births and deaths is done **by enumerator**; and an independent survey every 6 months is done **by an investigator-supervisor**. The SRS covers the entire country. This provides reliable information.

(4) **Hospital records**: Hospital records provide some information about the diseases in an area. However, information is available only for patients who come to the hospital. So, the information may cover only the severe forms of the disease. Full community data is not available, as sick people go to different hospitals.

(5) **Disease registers**: Registration is done for certain specific diseases like **cancers, tuberculosis, leprosy** etc. These registers details about the cases (disease pattern, treatment given, response to treatment etc.).

(6) **Population surveys**: Surveys are done in a sample of a population to obtain specific information about certain conditions and factors related to these. These provide reliable population based information. For example, **National Family Health Surveys** (NFHS) are conducted periodically in a representative sample of households throughout the country. The Ministry of Health & Family Welfare of Government of India is conducting these surveys, to provide high quality data on population and health indicators.

10.12 Presentation of Data

The data that we collect needs to be organized in a way that the information they contain **clearly show patterns of variation**. Tables, graphs and diagrams are used in the presentation of statistical data. They are **visual methods of presenting the data**. They enable us have the overall picture, rather than the details.

(1) **Tables:** Tables are simplest method for presenting data. Every table has **rows** (horizontal) and **columns** (vertical). A table can be simple or complex, for measurement of a single or multiple set of items. A table should not be too large. A table should have the following:

i) Table number,

ii) Title of the table (should be brief and self explanatory),

iii) **Headings of rows and columns**, and

iv) **An order of presentation** (it may be by size, by chronological order, by alphabetical order etc.).

Frequency Table: The data is classified into different groups based on a characteristic. The number in each group is depicted in the adjacent column (**frequency**). It tells us about the **pattern of distribution** at a glance. The range and shape of distribution of the data can also be seen at a glance. A table should ideally have 5 to 20 groups. The **class interval** should be equal as far as possible, so that the groups can be compared.

Example of frequency table: **Haemoglobin values** (in g/100ml of blood) of 50 pregnant women in a clinic.

10	11	10	12	13	9	8	13	10	9
6	11	9	10	11	10	9	10	9	11
10	12	8	9	5	12	11	10	9	12
10	7	12	11	10	9	10	11	10	9
12	8	10	12	10	5	11	9	10	10

Using intervals, the data may be presented in a frequency distribution table as:

Table: Frequency distribution table of haemoglobin levels.

Haemoglobin values (in g / 100 ml of blood)	Number of observations in the clinic
3-5	2
6-8	6
9-10	26
11-13	16

(2) **Charts and Diagrams**: Charts and diagrams are widely used to present simple data. The advantage of these is that the **visual impact is better** than that of tables. They are a popular method of presentation in the mass media. Only simple data should be presented. If the data is complex, there may be risk of misinterpretation by the observer. The charts and diagrams that are commonly used are:

(a) **Bar diagram:** Used for visual comparison of data between different time periods, different populations or different groups. The **length of the bar** determines the frequency of the characteristic to be presented. They are commonly used in the mass media as these are easy to prepare and understand. There are **three different types of bar charts** : -

- **Simple bar charts**: These represent a simple table. There is **space between bars for clarity**. The scale chosen should be able to include the minimum and maximum values.
- **Multiple bar charts**: Here **two or more bars** are grouped together. It is used when data on two or more characteristics is presented.
- **Component bar chart**: Here, each bar is divided into two or more parts. Represent each part a characteristic. It also shows the proportion of the characteristic to the whole.

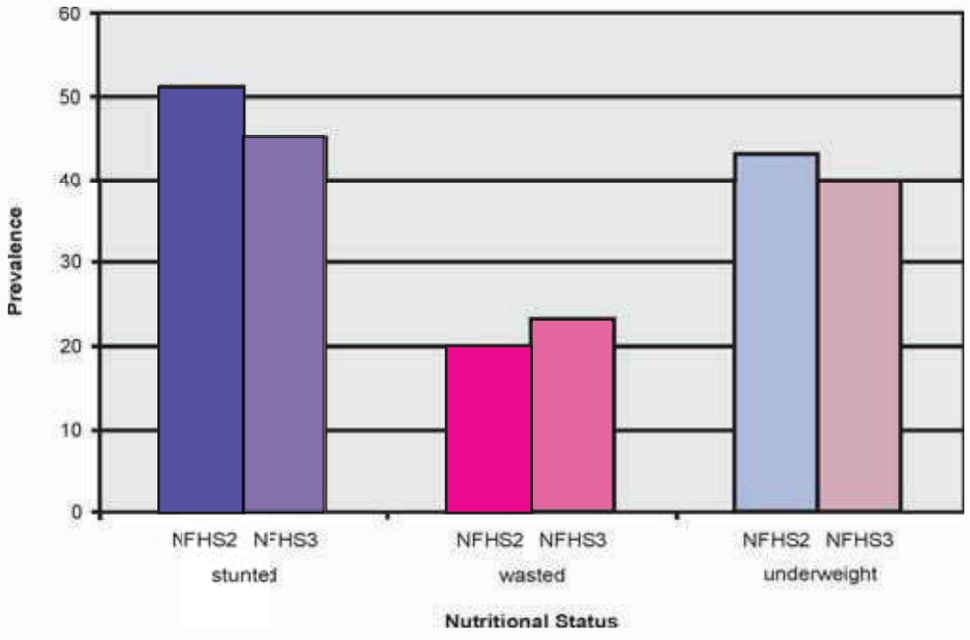


Fig: Multiple bar-chart: *Trends in nutritional status of under five children (National Family Health Survey 2 and 3). Vertical column shows prevalence of the problem.*

(b) **Histogram**: It is a diagrammatic representation of a frequency distribution. The class intervals are presented on the horizontal axis and the frequency along the vertical axis. It consists of bars that represent the frequencies of the characteristic; there is no space between the bars.

(c) **Frequency polygon**: This is another diagrammatic representation of the frequency distribution. Here, the midpoints of the histogram bars are joined to form a polygon.

(d) **Line diagram**: It is a graphical representation that shows change in events with passage of time. It consists of a line (or series of lines) representing **data values over time**.

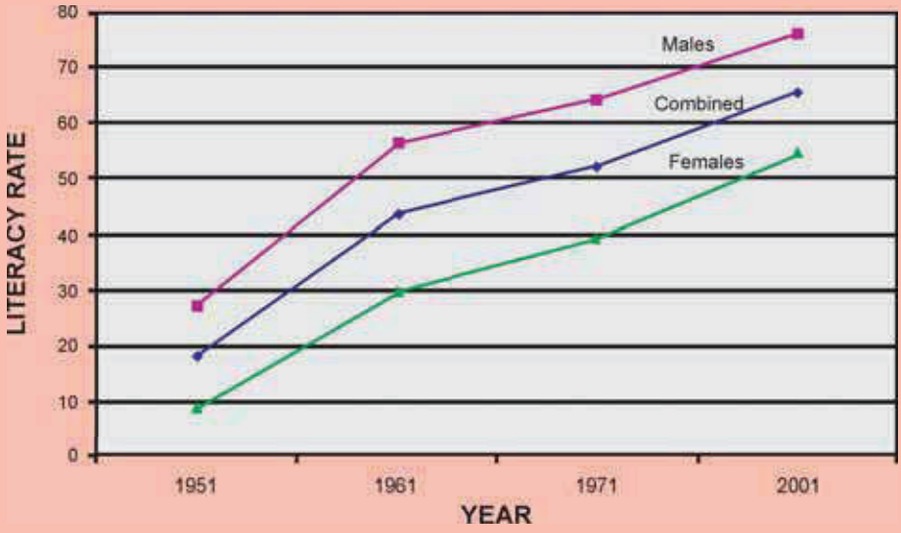


Fig: Line diagram: *Literacy Rate in India.*

(e) **Pie diagram:** A pie diagram is used for representing relative (i.e. proportionate) frequencies for comparison between groups. The frequency is represented by area, which is proportional to the segments of a circle.

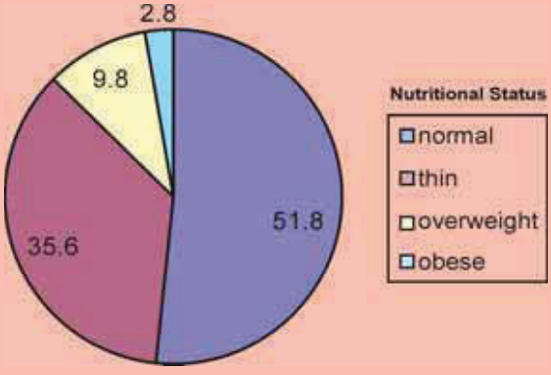


Fig: Pie Diagram: *Nutritional status of women in India.*

(f) **Pictogram:** In pictograms, pictures represent frequencies of the characteristic. A picture indicates a unit (such as 10, 50, 100, 1000 etc.) as required. The number of pictures tells relative magnitude of the problem.

10.13 Sampling

A sample is a **subset of a population**, whose properties are generalized to the **larger population** (or set).

Sampling is the process of picking a sample from a population. **Sampling unit** is a unit of selection in the sampling process for example, a person, a household, a place.

Methods of sampling

(a) **Simple random sampling**: This method gives all the sampling units an equal chance of being picked up for inclusion in the sample. This is done by picking up chits, by using a random number table or a computer. The advantage is that it ensures a good representation of the population. However certain minority groups may not be represented.

(b) **Stratified random sampling**: The population under study is divided into groups or strata according to a characteristic of interest (e.g. age, sex, occupation etc.). **A simple random sample is selected from each stratum**. The advantage is every unit has an equal chance of being included. The representation of **minority subgroups** is ensured by stratification.

(c) **Systematic sampling**: **Every K^{th} unit** in the sampling frame is selected, at regular interval. The first unit is selected at random, from among the k units. The method is simple to carry out.

(d) **Cluster sampling**: The population is first divided into **clusters of homogenous units**, usually based on geographic contiguity. **A sample of such clusters is selected**. All units in the selected cluster are studied. It is a faster and cheaper method.

(e) **Multistage sampling**: Selection is done in stages until the final sampling unit e.g. person, household etc. is reached. At the first stage, a sample of the state or district is selected. At the second stage, a sample of the block or village is selected. This process is repeated till the final sampling unit is selected.

10.14 Basics of Medical Statistics

Biostatistics is a branch of statistics that is applied to biological or medical sciences. It is the application of statistical methods to solve biological problems.

Statistical averages

Average refers to a value in the data around which the other values are distributed. It denotes the central value. The commonly used averages are:

(a) **The Mean:** The arithmetic mean is the most commonly used calculation. It is calculated by adding the individual observations and dividing the sum by the number of observations. The formula is:

$$\overline{X} = \text{total of individual values} = \frac{x_1, x_2 + \ldots . x_n}{N}$$

E.g. the incubation period of a disease is 5, 4, 6, 8, 7 days in 5 children. The arithmetic mean or mean is:

$$\overline{X} = \frac{5+4+6+8+7}{N} = 6$$

Advantages: It is easy to calculate and understand. Also it takes all the values into account and is not affected by sampling.

Disadvantages: It is affected by extreme values in the data, so that on calculation true mean is different from actual mean. The value calculated may appear absurd for the characteristic e.g. mean number of sick children is 4.5.

(b) **The median:** The median is the middle value of a data that divides the values into two equal parts when the values are arranged in ascending or descending order of magnitude.

E.g. the incubation period of a disease is 5, 4, 6, 8, 7 days in 5 children. On arranging in ascending order, the values are 4, 5, 6, 7, 8. The middle value is 6. Here the number of values is odd so the middle value divides the data into equal parts.

If the number of values is even, the median is the arithmetic mean of the middle values. E.g. the incubation period of a disease is 5, 4, 6, 8, 7, 9 days in 6 children. On arranging in ascending order the values are 4,5,6,7, 8, 9. The middle values are 6 and 7. The median is 6+7/2=6.5.

Advantage: It is easy to calculate and is not affected by the number of observations and extreme values.

Disadvantage: It is not based on all the observations in the data.

(c) **The Mode**: The mode is the most commonly occurring value in the data.

E.g. the incubation period of a disease is 5, 4, 6, 8, 7, 6, 9. As 6 occur most frequently the mode is 6 days.

It is easy to understand and is not affected by extreme values. It is used in data with wide variation.

Questions

1. Define public health.
2. Write the principles of public health.
3. Mention five major public health problems of our country. List the factors that contribute to their existence.
4. Describe the natural history of disease.
5. Explain the four levels of prevention of diseases in relation to natural history of disease. Give examples for each.
6. Define epidemiology. What do you understand by disease frequency and distribution of disease?
7. Explain the basic concepts of epidemiology.
8. Define immunization.
9. What is a vaccine? Mention different types of vaccines.
10. What is cold chain? List the cold chain equipment in the UIP.
11. Describe the Expanded Programme of Immunization.
12. List the National Immunization Schedule.
13. Explain the objectives and strategies of the ICDS.
14. Name any four National Health Programmes.
15. Mention the strategies for eradication of poliomyelitis.
16. Explain DOTS.
17. Explain the components of the DOTS strategy under Revised National Tuberculosis Control Programme.
18. What are the malarial control strategies under the National Vector Borne Diseases Control Programme?
19. Mention the components of the National AIDS Control Programme.
20. What is NRHM?
21. Define the Millennium Development Goals.
22. Mention four data collection methods.
23. How do you calculate the mean, median and mode?