Social and Preventive Pharmacy

As per the latest syllabus prescribed by
Pharmacy Council of India (Course BP 802T)



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Social and Preventive Pharmacy

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Preface

Pharmacy Council of India has notified the subject of Social and Preventive Pharmacy (BP 802T) in its syllabus for B Pharm course. The purpose of this course is to introduce the students to a number of health issues and their challenges including a number of national health programmes, particulary in the context of prevailing COVID-19 scenario. The course objectives are to make the students able to : (i) Acquire high consciousness/realization of current issues related to health and pharmaceutical problems within the country and worldwide, (ii) have a critical way of thinking based on current healthcare development, and (iii) evaluate alternative ways of solving problems related to health and pharmaceutical issues.

The role of the pharmacist in social and preventive pharmacy is widely recognized by the government but the general public is not so well versed. Thus, there is a need for public realization about the contribution of pharmacists in healthcare. This book is an attempt to addresses these and other relevant issues.

The subject matter and treatment of the topics are expected to facilitate the learning objective. Glossary will serve as a handy compilation of definitions of common terms. The question bank is aimed to facilitate the self-evaluation of the knowledge gained by the students.

It is expected that this simple and easy to understand book will provide the up-to-date knowledge and meet the requirements of *degree* students as envisaged in the PCI syllabus.

Suggestions and criticisms from any corner shall be appreciated and duly acknowledged.

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SOCIAL AND PREVENTIVE PHARMACY

(BP 802T)

UNIT 1: Concept of health and disease: Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick.

Social and health education: Food in relation to nutrition and health, balanced diet, nutritional deficiencies, vitamin deficiencies, malnutrition and its prevention.

Sociology and health: Sociocultural factors related to health and disease, impact of urbanization on health and disease, poverty and health.

Hygiene and health: Personal hygiene and healthcare; avoidable habits.

UNIT 2: Preventive medicine: General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chikungunya, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse.

UNIT 3: National health programmes, its objectives, functioning and outcome of the following: HIV and AIDS control programme, TB, Integrated Disease Surveillance Programme (IDSP), National Leprosy Control Programme, National Mental Health Programme, National Programme for Prevention and Control of Deafness, Universal Immunisation Programme, National Programme for Control of Blindness, Pulse Polio Programme.

UNIT 4: National health intervention programme for mother and child, National Family Welfare Programme, National Tobacco Control Programme, National Malaria Prevention Programme, National Programme for the Healthcare for the Elderly, Social Health Programme; role of WHO in Indian National Programme.

UNIT 5: Community services in rural, urban and school health: Functions of PHC, improvement in rural sanitation, National Urban Health Mission, health promotion and education in school.

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Abbreviations

ACD	Active Case Detection
ACT	Artemisinin-based Combined Therapy
ADL	Activities of Daily Life
AES	Acute Encephalitis Syndrome
AFP	Acute Flaccid Paralysis
AI	Adequate Intake
AIDS	Acquired Immunodeficiency Syndrome
AIIMS	All India Institute of Medical Sciences
ALRI	Acute Lower Respiratory Tract Infections
AMR	Anti-microbial Resistance
ANC	Antenatal Care
ANM	Auxiliary Nurse Midwife
APGAR	Appearance, Pulse, Grimace, Activity, and Respiration
API	Annual Parasite Incidence
APL	Above Poverty Line
ARI	Acute Respiratory Infections
ARSH	Adolescent Reproductive and Sexual Health
ART	Antiretroviral Treatment
ASHA	Accredited Social Health Activist
AURI	Acute Upper Respiratory Tract Infection
AUWSP	Accelerated Urban Water Supply Programme
AWC	Anganwadi Centre
AWW	Anganwadi Worker
AYUSH	Ayurvedic, Unani, Siddha and Homeopathic System of Medicine
BCC	Behaviour Change Communication
BCG	Bacillus Calmette-Guérin
BDO	Block Development Officer
BMI	Body Mass Index
BPL	Below Poverty Line
CBC	Complete Blood Count
CCS	Country Cooperation Strategy
CHC	Community Health Centre
CHIKV	Chikungunya Virus
CHW	Community Health Worker

CMO	Chief Medical Officer
COVID	Coronavirus Disease
CPR	Couple Protection Rate
CRSP	Central Rural Sanitation Programme
CBR	Crude Birth Rate
CSF	Cerebrospinal Fluid
CSSM	Child Survival and Safe Motherhood
CVD	Cardiovascular Diseases
DALY	Disability-Adjusted Life Year
DANIDA	Danish International Development Agency
DDT	Dichlorodiphenyltrichloroethane
DHS	District Health Society
DOTS	Directly Observed Treatment Short course
DRC	Democratic Republic of the Congo
DTC	District Tuberculosis Centre
DTCC	District Tobacco Control Cell
DTP	District Tuberculosis Programme
DTaP	Diphtheria, Tetanus, acellular Pertussis
EAA	Essential Amino Acids
ECP	Emergency Contraceptive Pill
EDD	Expected Date of Delivery
EDTA	Ethylenediaminetetraacetic Acid
EFA	Essential Fatty Acids
ELISA	Enzyme-Linked Immunosorbent Assay
EMCP	Enhanced Malaria Control Project
EPI	Expanded Programme on Immunisation
EVD	Ebola Virus Disease
FHW	Female Health Worker
FP	Family Planning
FPG	Fasting Plasma Glucose
FRUs	First Referral Units
FSW	Female Sex Worker
G6PD	Glucose-6-Phosphate Dehydrogenase
GATS	Global Adult Tobacco Survey
GDP	Gross Domestic Product
GFR	General Fertility Rate
GIS	Geographic Information System
GoI	Government of India
GP	Gram Panchayats
HA	Health Attendant
HAV	Hepatitis A Virus
Hb	Haemoglobin
HBNC	Home-based Newborn Care
HBP	High Blood Pressure
HBV	Hepatitis B Virus

HCV	Hepatitis C Virus
HDL	High Density Lipoproteins
HI	Haemagglutination Inhibition
HIV	Human Immunodeficiency Virus
HPV	Human Papillomavirus
HSS	Health Systems Strengthening
HW(F)	Health Worker (Female)
HW(M)	Health Worker (Male)
HWC	Health and Wellness Centers
ICDS	Integrated Child Development Services
ICMR	Indian Council of Medical Research
ICT	Information and Communication Technology
IDD	Iodine Deficiency Disorder
IDDM	Insulin Dependent Diabetes Mellitus
IDSP	Integrated Disease Surveillance Programme
IEC	Information Education and Communication
IFA	Iron and Folic Acid
IFR	Infant Fertility Rate
IGNOAPS	Indira Gandhi National Old Age Pension Scheme
IHD	Ischaemic Heart Disease
IHHL	Individual Household Latrines
IHP	Integrated Health Information Platform
IHR	International Health Regulations
ILO	International Labor Organization
IMCP	Intensified Malaria Control Project
IMNCI	Integrated Management of Neonatal and Childhood Illness
IMR	Infant Mortality Rate
INH	Isoniazid
IPHS	Indian Public Health Standards
IPPI	Intensified Pulse Polio Immunisation
IPV	Inactivated Polio Vaccine
IRS	Insecticidal Residual Spray
ITNs	Insecticide Treated Bed Nets
IUCD	Intrauterine Contraceptive Device
IUD	Intrauterine Device
JDY	Jan Dhan Yojana
JE	Japanese Encephalitis
JSSK	Janani Shishu Suraksha Karyakaram
JSY	Janani Suraksha Yojana
LBW	Low Birth Weight
LDL	Low Density Lipoproteins
LEC	Leprosy Elimination Campaign
LEM	Leprosy Elimination Monitoring
LHV	Lady Health Visitor
LMP	Last Menstrual Period

LW	Link Worker
M&E	Monitoring & Evaluation
MAA	Mothers' Absolute Affection
MAP	Malaria Action Program
MAS	Mahila Arogya Samiti
MC	Municipal Councillors
MCD	Municipal Corporation of Delhi
MCH	Maternal and Child Health
MDMP	Mid Day Meal Programme
MIS	Management Information System
MLA	Member of Legislative Assembly
MMR	Maternal Mortality Rate
MNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MO	Medical Officer
MoHFW	Ministry of Health & Family Welfare
MP	Member of Parliament
MPO	Modified Plan of Operations
MPW	Multipurpose Worker
MSM	Men having Sex with Men
MSS	Mahila Swasthya Sangh
MTCT	Mother to Child Transmission
MTP	Medical Termination of Pregnancy
MUFA	Monounsaturated Fatty Acids
MVA	Manual Vacuum Aspiration
NACO	National AIDS Control Organisation
NACP	National AIDS Control Programme
NADPH	Nicotinamide Adenine Dinucleotide Phosphate
NAMP	National Anti-Malaria Programme
NAT	Nucleic Acid Tests
NBA	Nirmal Bharat Abhiyan
NBCC	Newborn Care Corner
NCCP	National Cancer Control Programme
NCD	Noncommunicable Diseases
NCDC	National Centre for Disease Control
NDMC	New Delhi Municipal Corporation
NDT	Neglected Tropical Diseases
NE	Niacin Equivalents
NFCP	National Filaria Control Programme
NFHS	National Family Health Survey
NFWP	National Family Welfare Programme
NGO	Non-governmental Organisation
NGP	Nirmal Gram Panchayats
NHM	National Health Mission
NHP	National Health Policy

NIDDCP	National Iodine Deficiency Disorders Control Programme
NIDs	National Immunisation Days
NIMR	National Institute of Malaria Research
NLCP	National Leprosy Control Programme
NLEP	National Leprosy Eradication Programme
NMCP	National Malaria Control Programme
NMEP	National Malaria Eradication Programme
NMHP	National Mental Health Programme
NNMR	Neonatal Mortality Rate
NOHP	National Oral Health programme
NORAD	North American Aerospace Defence Command
NPCB	National Programmer Control of Blindness
NPCBVI	National Programme for Control of Blindness and Visual Impairment
NPCDCS	National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke
NPEP	National Polio Eradication Programme
NPHCE	National Programme for the Health Care for the Elderly
NPOP	National Policy on Older Persons
NPPCD	National Programme for Prevention and Control of Deafness
NPPCF	National Programme for Prevention and Control of Fluorosis
NPPMBI	National Programme for Prevention and Management of Burn Injuries
NRA	National Regulatory Authority
NRCP	National Rabies Control Programme
NRHM	National Rural Health Mission
NRT	Nicotine Replacement Therapy
NSAIDs	Non-steroidal Anti-inflammatory Drugs
NSLP	National School Lunch Programme
NSSK	Navjaat Shishu Suraksha Karyakram
NTCC	National Tobacco Control Cell
NTCP	National Tobacco Control Programme
NUHM	National Urban Health Mission
NVBDCP	National Vector Borne Disease Control Programme
NVHCP	National Viral Hepatitis Control Program
OCP	Oral Contraceptive Pills
OGTT	Oral Glucose Tolerance Test
OPD	Outpatient Department
OPV	Oral Polio Vaccine
ORS	Oral Rehydration Salt
PEM	Protein Energy Malnutrition
PHC	Primary Health Care/Center
PLHIV	People Living with HIV/AIDS
PMDT	Programmatic Management of Drug Resistant-TB
PMNDP	Pradhan Mantri National Dialysis Programme

PMSM	Pradhan Mantri Surakshit Matritva Abhiyan
PMSSY	Pradhan Mantri Swasthya Suraksha Yojana
PMU	Programme Management Unit
PNC	Postnatal Care
PPI	Pulse Polio Immunisation
PPTCT	Prevention of Parent to Child Transmission
PRIs	Panchayati Raj Institutions
PRNT	Plaque Reduction Neutralization Tests
PUFA	Polyunsaturated Fatty Acids
PWB	Patient-Wise Boxes
QAC	Quality Assurance Committee
RAE	Retinol Activity Equivalents
RBSK	Rashtriya Bal Swasthya Karyakram
RCH	Reproductive and Child Health
RDA	Recommended Daily Allowance
RDI	Recommended Daily Intake
RDT	Rapid Diagnostic Test
RGC	Regional Geriatric Centres
RIO	Regional Institute of Ophthalmology
RKSK	Rashtriya Kishor Swasthya Karyakram
RMNCH+A	Reproductive Maternal Neonatal Child and Adolescent Health
RNTCP	Revised National Tuberculosis Control Programme
RSBY	Rashtriya Swasthya Bima Yojana
RTI	Reproductive Tract Infection
RT-PCR	Reverse Transcription-Polymerase Chain Reaction
SARS	Severe Acute Respiratory Syndrome
SARS-CoV	SARS-associated Coronavirus
SHC	Sub-health Centre
SHS	State Health Society
SIDA	Swedish International Development Cooperation Agency
SLWM	Solid and Liquid Waste Management
SNIDs	Sub-National Immunisation Days
SPIP	State Programme Implementation Plan
STCC	State Tobacco Control Cell
STI	Sexually Transmitted Infection
TB	Tuberculosis
TBA	Trained Birth Attendant
TFR	Total Fertility Rate
TG	Triglycerides
TPE	Tropical Pulmonary Eosinophilia
TPP	Thiamine Pyrophosphate
TSC	Total Sanitation Campaign
TSH	Thyroid Stimulating Hormone
TT	Tetanus Toxoid

U-CHC	Urban Community Health Centre
UCI	Universal Child Immunisation
UHC	Urban Health Center
UIP	Universal Immunisation Programme
UMS	Urban Malaria Scheme
UNCRPD	United Nations Convention on the Rights of Persons with Disabilities
UNFPA	United Nations Fund for Population Activities
UNICEF	The United Nations International Children's Emergency Fund
UPHC	Urban Primary Health Centre
USAID	United States Agency for International Development
UT	Union Territory
VBD	Vector Borne Disease
VHG	Village Health Guide
VWSCs	Village Water Sanitation Committees
WHO	World Health Organization
WHPI	Weight Height Product Index

UNIT 1

Concepts of Health and Disease

INTRODUCTION

Health is considered as the fundamental human right of any person and is a worldwide social goal. The aim of the Government of any nation is to improve the health of the people through high-quality healthcare services that are equally accessible to all at affordable prices. *'Health is wealth'* is taught to us since childhood. Thus, health is of concern to every individual, community, state and nation. Now health has attained global status and relies on continuous advancement in the field of medicine and public health.

The concept of health varies widely. Pharmacists as well as members of healthcare team are much more actively concerned with the concept of health. In 1977, the World Health Assembly committed that the main social target of governments and WHO (World Health Organization) in the coming decades would be 'the attainment by all citizens of the world by the year 2000 of a level of health that will permit them to lead a socially and economically productive life'. Thus *'Health for All by 2000 AD'* was adopted as internationally attainable target. It was not merely a slogan but recognition of the importance of health in national and international perspective. *'Health for All'* means that health must be within the reach of everyone. It suggests the elimination of major obstacles like malnutrition, contaminated water supply, unhygienic living condition and diseases, etc. that are major obstacles to health. Unfortunately, India failed in attaining this objective. In 1979, the United Nations adopted health as an essential part of socioeconomic development.

Health has been defined in various ways and hence there exist a number of definitions. However, a perfect definition is still not settled mainly because different people view it in different perspectives.

According to WHO, '*Health is a state of complete physical, mental and social well-being and not merely an absence of disease or infirmity'*.

This is an old definition, which has been appraised as being too broad and idealistic. According to this definition all of us are sick and nobody is healthy. During the last few decades, the WHO definition of health has been gradually revised and supplemented by the fourth dimension-spiritual health.

According to the Oxford English Dictionary *'health is soundness of body or mind, that condition in which its functions are duly and effectively discharged'*.

Webster dictionary definition *'health is the condition of being sound in body, mind or spirit, especially freedom from physical disease and pain'*.

According to the **modern philosophy '***health is a fundamental right without any distinction of race, religion, political belief, economic or social condition. It is the essence of productive life and integral part of development. It is a worldwide goal and involves individual, national and international responsibility'*.

CONCEPTS OF HEALTH

Health has evolved as a concept over centuries from an individual concern to a global social goal. The concept of health is dynamic. As all other concepts change and the newer concepts emerge, the concept of health also keeps on changing. The members of a community including professional groups like health administrators, scientists, ecologists, politicians, etc. perceive it in different ways. This obviously leads to confusion and we come across different concepts of health. These concepts include the definitions of a health norm and a systematic way of identifying and dealing with the deviations. **Disease** is considered as a deviation from normal health. Important concepts of health are discussed below.

A. Biomedical Concept

This concept is based on the **germ theory of disease**. The medical profession considers the human body as a machine, disease as a result of the breakdown of the machine, and one of the doctor's tasks being to repair the machine. However, the biomedical concept is found inadequate to solve major health problems like accidents, chronic diseases, malnutrition, mental illness, population explosion, drug abuse, environmental pollution, etc.

B. Ecological Concept

The ecologists considered health as a dynamic equilibrium between man and the environment and disease as maladjustment of the human organism to environment. According to Dubos 'health implies the relative absence of pain and discomfort and a continuous adaptation and adjustment to ensure optimal function'. We must appreciate that human ecological and cultural adaptations do determine the occurrence of diseases as well as the availability of food and population explosion. It is believed that greater human acclimatization to environments can result in longer life expectancies and a healthier life even in the absence of modern healthcare services. Recently, there has been an increasing recognition for 'environmental friendly' products including pharmaceutical and specially packaging materials.

C. Psychological Concept

According to this concept health is both a biological as well as social phenomenon because it is influenced by psychological, social, cultural and political factors. Psychological and social considerations are very important in the concept of health.

D. Holistic Concept

Holistic means encompassing the whole of a thing, and not just the part. *Holistic* medicine looks at the whole person for answers, not just at physical symptoms. Holistic concept of health represents the combination of all the above concepts. It takes into account all the factors like social, economic, political and environmental. This concept is defined as a unified and multidimensional process involving the well-being of the person in the context of his environment. It indicates that all sectors of society, e.g. animal husbandry, agriculture, food, industry, public works, education, communication, etc. have an influence on health. The holistic concept is mainly concerned with the protection and promotion of public health.

The preference for different theories varies by social and demographic characteristics, such as education, occupation, income and ethnic group membership. As members of healthcare team and experts on drugs, pharmacists can play an important role in clarifying for the consumer/patients the points on which folk or coexistent therapies may be in conflict with scientific procedure.

MODELS FOR HEALTH DESCRIPTION

A model is a hypothetical method of understanding an idea or concept. It characterizes different ways of handling complex issues. Health beliefs, i.e. person's ideas, opinions, and attitudes about health and disease generally influence health behavior which in turn affect person's health either positively or negatively. '*Prevention of disease is better than cure*' is a positive health belief. Some common positive health behaviors include immunisation, proper nutrition, proper sleep, and adequate level of exercise and good nutrition. Preventing illness is important aspect of healthcare that focuses on detection or prevention of disease. Important models used to describe health are explained below:

1. **Clinical model**
    a. Good health is indicated by the absence of signs and symptoms of disease.
    b. Illness is the presence of conspicuous signs and symptoms of disease.
    c. People who follow this health model to guide their use of healthcare services generally do not seek preventive health services or they wait until they are very ill to seek care.
2. **Role performance model**
    a. An important component of the role performance model is the sick role, in which individuals are exempted from performing their social roles during sickness.
    b. Health is indicated by their ability to perform social roles.
    c. Role performance includes work, family and social roles.
    d. Illness would be the failure to perform a person's roles at the level of others in society.
    e. This model is the basis for work and physical examination by a physician.
3. **Adaptive model**
    a. Health is indicated by the ability of the person to adapt positively to social, mental, and physiological change.
    b. Illness occurs when a person fails to adapt toward these changes.
4. **Agent-host-environmental model**
    a. This model was postulated by Leavell and Clark in 1965.
    b. It is useful for investigating causes of disease in a person.
    c. The agent, host and environment interact in many ways and create various risk factors. It is very important to understand these factors for the promotion and maintenance of health.

d. An illness is caused by the presence or absence of an agent (environmental factor or stressor).
e. A host is a living organism infected or affected by an agent.
f. The host reaction is influenced by age, family history, and health habits.

5. **High level wellness model**
   a. It was proposed by Dunn in 1961.
   b. It considers health as an ongoing process toward a person's highest potential of functioning. This process involves the person, family and the community.
   c. It describes the high-level wellness as 'the experience of a person alive with the glow of good health, alive to the tips of their fingers with energy to burn, tingling with vitality—at times like this world is a glorious place'.
6. **Holistic health model**
   a. It was proposed by Edelman and Mandle in 2002.
   b. Holism recognizes the interaction of a person's mind, body and spirit within the environment. Holism is an antidote to the atomistic approach of contemporary science. An atomistic approach takes things apart, examining the person piece by piece in an attempt to understand the larger picture.
   c. Holism is based on the belief that people cannot be fully understood if examined solely in pieces apart from their environment.
7. **Nightingale's theory of environment**
   a. It was postulated by Florence Nightingale.
   b. This model considers health as a constantly changing state, with high level wellness and death being on opposite ends of a graduated scale, or continuum.
   c. This continuum illustrates the dynamic state of health, as a person adapt to changes in the internal and external environments to maintain a state of well-being. A patient with chronic illness may view himself/herself at different points of the continuum at any given time, depending on how well the patient believes he/she is functioning with.

Dimensions of Health

Health is **multidimensional;** important dimensions being physical, mental, social and spiritual. Other dimensions could be emotional, vocational, political, etc. Each dimension functions and interacts

with each other but has certain characteristics. These dimensions of health are explained below:

A. **Physical dimension:** It is easiest to understand physical dimension of health. It represents the health as a state of fitness in which the functioning of every cell and every organ of the body is optimum and is in perfect harmony with the rest of the body. Thus, physical health implies absence of an obvious disease.

   It is characterized by normal functioning of the body organs, e.g. normal blood pressure, normal liver functioning, normal skin and so on. A *nomogram* correlating the average height with average weight could be used as an indicator of physical health. It should be remembered that physical health is assessed in terms of age and sex of an individual by comparing, e.g. the vital capacity of his/her lung with the reported normal value for that age and sex.

B. **Mental dimension:** Mental health is defined as a state of balance between the individual and the surrounding world, a state of harmony between oneself and others, a coexistence between the realities of self and that of other people, and that of environment. Mental health is difficult to assess. It is certainly not mere absence of mental disease but is the ability of the person to respond to the experiences of life with flexibility and is influenced by psychological factors. Schizophrenia and depression are examples of mental illness. Mental illness can also lead to physical illness, e.g. mental tension may lead to peptic ulcer. Similarly, physical illness can also lead to mental illness, e.g. a leprotic person may suffer from depression. Exact assessment of mental health is difficult but approximate comparisons are possible by assessing the mental functioning. Positive mental health is one of the keys to good health and indicates that the person is free from undue conflicts and has harmonious relationship with family and community.

C. **Social dimension:** Social health is defined as the quantity and quality of an individual's interpersonal ties and the extent of involvement with the community. It recognizes the fact that every individual is part of the society and takes into consideration the socioeconomic status and health of the 'whole person' in the context of his social network. Social health involves harmony and integration with the individual, between each individual and other members of society, and between individuals and the world that he lives in.

D. **Spiritual dimension:** Spiritual dimension of health includes integrity, principles and ethics, purpose in life, commitment to some higher being and belief in concepts that are not subject to the 'state-of-art' explanation. It is linked to that part of the person, which reaches out and strives for meaning and purpose in life. It is related to the 'spirit', the sole. All religions and religious leaders consider the attainment of spiritual health as the ultimate goal of life.
E. **Emotional dimension:** Emotional health refers to 'feeling'. A person is said to be emotionally healthy when he does not loose temper or does not develop tension and maintains self-control.
F. **Vocational dimension:** It is a part of the human existence. A person is said to be healthy vocationally, when he/she is able to earn sufficiently to lead a successful life. Goal achievement and self-realization in work are source of life success and increased self-esteem.

In addition to the above, health could also be defined in terms of many other dimensions, such as nutritional, socioeconomic, educational, curative, preventive environmental, etc. The WHO definition of health as 'a state of complete physical, mental and social well-being and not merely an absence of disease' is certainly very broad and covers most of the dimensions of health, directly or indirectly.

DETERMINANTS OF HEALTH

Health of an individual is not static; it is a dynamic phenomenon and a process of continuous change. It is a state, which is to be attained first and then maintained. Health fluctuates within a range of optimum well-being to various levels of deficiencies including death. Disease may manifest itself at any time of life.

Factors, which either alone or in combination are responsible for diseases, include genetics, infective organisms, nutritional deficiencies, metabolic disturbances, allergic disorders, ageing and degenerative processes, cancer and other neoplasm, iatrogenesis, accidental injuries and social pathology. The health of individuals and communities may be considered as the result of interactions due to genetic and environmental factors.

Important determinants of healthare described below:

A. Heredity

Besides other factors, health is also dependent on the genetic makeup of an individual. These inborn actors play a part in determining

lifespan and likelihood of developing certain illnesses. In this context health is defined as 'that state of the individual, which is based upon the absence from the genetic constitution of genes that cause serious defect or the presence in the genetic constitution of the genes, which correspond to the normal characterization'. It is the nature of genes at the time of conception, which governs the characteristics of an individual. This is the reason why most of the genetic diseases are difficult to cure. Common diseases of genetic origin are mental retardation, errors of metabolism and chromosomal anomalies. Currently scientists all over the world are attempting to synthesize genes, which are best in every respect including health as genetic heritage.

B. Environment

A pharmacist knows very well that environment directly affects the physical, mental and social health of the person. The physical, biological and social components of environment are linked with one another and collectively influence the health status of people. Person's physical and mental capabilities can be realized only in a favorable environment. The whole world is seriously concerned with the promotion and protection of family and environmental health. Clean environment is absolutely essential for good health. Main determinants of physical environment include a varying range of factors like environmental sanitation, soil condition, forests, atmospheric pollution, and rainfall, etc. The socioeconomic status, traditions, relationship, customs and superstitions of people are important social aspects of environment. Biological environment comprises disease causing plants and animals including bacteria, viruses, parasites, arthropods and pathogens. Environment is classified as internal, external, and domestic environment.

The internal environment is concerned with each and every element, every tissue, every organ, and organ system and their harmonious functioning within the system.

The ***external environment*** *or* ***macroenvironment*** pertains to everything that is external to the person and includes the things to which person is exposed after conception.

Microenvironment *or* ***domestic environment*** is the personal environment pertaining to the person's way of living and lifestyle, e.g. personal habits, smoking or drinking, exercise, etc. All the above types of environment can influence the health status of the people.

C. Lifestyle

Lifestyle basically reflects the social values, activities, and attitudes of people. It is comprised of cultural and behavioral patterns and life-long personal habits like smoking and drinking. It plays an important role in the presentation of health status of people. Thus, health can be viewed as the quality of lifestyle that enables the individual to live most and serve best. Habit is called second nature. Habits are largely responsible for determining one's lifestyle. Lifestyles are learnt through social interaction, school and mass media. Healthy lifestyles would include adequate nutrition, sufficient sleep, enough physical activity, etc. Negative lifestyle including smoking, alcoholism and certain 'drugs', are not conducive to health.

D. Socioeconomic Conditions

Socioeconomic conditions like education, economic status, political system, employment, housing, etc. have a great deal of influence on the human health. These factors are multiple, interactive and frequently go beyond the control of person. Integrated and multi-levels of public health interventions are vital to shape these factors for a positive health impact. Educated people better appreciate the importance of health. Health status improves with level of education. Education is closely tied to socioeconomic status. It increases job opportunities and income security, improves peoples' ability to access and understand health related information to stay healthy. Education improves the overall human attitude to health. Low mortality rate in Kerala is partly due to high literacy rate. The economic status as indicated by per capita GNP also influences the health status. Higher income and better economic status mostly result in more control and discretion. Income determines living conditions such as safe housing and ability to buy sufficient good quality food. This way better economic status can be responsible for increased life expectancy, reduced mortality rate, and improved quality of life. WHO recommends the expenditure of at least 5% out of GNP of a country on healthcare. This is possible only if the political system in the country is committed to provide improved healthcare by framing and implementing prior policies and by allocating necessary funds. Unless the political leaders make serious efforts, the health development would be difficult. It is equally important to realize that factors like housing, sanitation, nutrition, employment, etc. also contribute in the overall socioeconomic conditions.

E. Health and Family Welfare Services

Effective health services improve healthcare and health. The extent to which health services are provided is directly reflected in terms of life expectancy and various mortality rates. Health services should be available at reasonable cost and equally to all individuals starting from pregnant women, infants, adults, males and females, cancer patients, mentally retarded people, etc. In India the Ministry of Health and Family Welfare is responsible for planning and implementing health services. Primary Health Centers (PHCs) at village level, family welfare schemes, hospitals, etc. help in improving health services.

F. Other Factors

Health is a resultant of so many factors including the primary factors discussed above. In addition, there are other factors outside the formal healthcare system such as rural development, social welfare, food and agriculture, industry, economic and social policies, which should assist in improving the standard of living and ultimately the health status of individuals, the society, the nation and the world. Pharmacist is a part of healthcare team as one who is expert on drugs and related matters.

People's health is influenced by numerous factors, which go beyond the healthcare sector. Therefore, community contribution and intersectoral cooperation are essential to integrate and transform health promotion actions and health determinants for the better. The healthy cities project provides an excellent platform to enable combined strenuous effort of all sectors of the community to improve health in the place where we live and work.

HEALTH INDICATORS FOR EVALUATION OF PUBLIC HEALTH

Health indicators are used to assess the health status of a specific population, e.g. a community, district, state, country, and compare it with other community, district, state or country. According to WHO 'indicators are variables, which help to measure changes'. Indicators are expressed as rates for a particular base over a definite period of time. The general formula for a rate of any type is:

$$\text{Rate} = \frac{\text{No. of events measured}}{\text{Population at risk}} \times \text{K}$$

where K is a constant and multiple of time.

Such indicators are helpful in monitoring and evaluation of healthcare services, healthcare activities and health programs. They can also assess the success or failure of any health program.

Groups of Health Indicators

Ideal indicators of health should be *valid, reliable, sensitive* and *specific*. Main groups of health indicators are discussed below:

a. Mortality indicators

Mortality represents expectancy of life at various ages, etc. Obviously, it takes into consideration the number of deaths out of a definite population. Mortality indicators represent the traditional measures of health status. The rate can be calculated for any age or sex group or both, in an area, during a year. Common mortality indicators are calculated as follows:

i. $$\text{Crude death rate} = \frac{\text{No. of deaths during the year}}{\text{Mid-year population}} \times 1000$$

ii. $$\text{Age and sex specific death rate} = \frac{\text{No. of deaths registered or estimated in an age and sex group during a year in an area}}{\text{Estimated population of that age and sex group for the year in that area}} \times K$$

iii. $$\text{Infant mortality rate} = \frac{\text{No. of deaths registered or estimated of children below one year of age during a year in area}}{\text{No. of live births registered or estimated during the year in the area}} \times 1000$$

iv. Maternal mortality rate: It accounts for deaths during antenatal, natal and postnatal.

v. $$\text{Child mortality rate} = \frac{\text{No. of deaths registered or estimated of children between one to four years of age during a year in area}}{\text{Mid-year population of one to four years of age group}} \times 1000$$

b. Morbidity indicators

Morbidity means any departure from a state of well-being due to a disease, an injury or any impairment. Morbidity indicators supplement the mortality data to describe the health status of a population. They are designed to measure the occurrence of diseases, injuries, and disabilities in populations. Commonly used morbidity indicators are explained below:

i. **Incidence rate:** Rate of incidence of any disease either for the number of persons or spells of sickness can be calculated as:

$$\text{Incidence rate} = \frac{\text{No. of cases of sickness starting during the period in an area}}{\text{Average no. of persons exposed to risk during that period in that area}} \times 1000$$

ii. **Prevalence rate:** It measures the extent of total prevalence of a disease during a period (whether starting before or during that period). **Point prevalence rate** gives the rate at a point of time, whereas **period prevalence rate** gives the rate for a period of time. It is calculated as:

$$\text{Period prevalence rate} = \frac{\text{No. of cases of a disease prevalent at any point (or period) in the area}}{\text{Average no. of persons exposed to the risk during that point (or period) of time}} \times 1000$$

iii. **Case fatality rate:** It measures the extent of fatality of any disease, e.g. the proportion of deaths from a disease to the reported cases of that disease.

$$\text{Case fatality rate} = \frac{\text{No. of people who die of a disease}}{\text{No. of people who have the disease}} \times K$$

c. Disability rates

It represents the percentage of the population unable to perform the expected daily routine activities like walking, eating, dressing due to injury or illness (e.g. cerebral palsy, paralysis, poliomyelitis, blindness, Down syndrome and depression) and personal and

environmental factors (e.g. inaccessible transportation, negative attitudes, and limited social supports).

i. **Sullivan's index:** It is the most advanced indicator based on the expectation of life, free of disability. It is calculated as:

Sullivan's index = Life expectancy (years) – duration of bed disability and inability (years) to perform major activities

Thus, if the life expectancy is 60 years and bed disability and inability to perform major activities is 5 years, then Sullivan's index would be 60–5 = 55 years.

ii. **Health adjusted life expectancy (HALE):** HALE, previously known as disability adjusted life expectancy (DALE), is based on life expectancy at birth yet, includes an adjustment for life period spent in the state of poor health. It can be defined as the number of years a newborn is expected to live in full health based on current rates of ill-health and mortality.

iii. **Disability adjusted life years (DALYs):** It is the easiest and the most commonly used measure to find out the overall burden of disease and the efficiency of the interventions. It is defined as the number of years of healthy life of a person lost due to premature mortality, mortality or disability.

DALY = Years of lost life (YLL) + Years lost to disability (YLD)

To measure DALYs, data on number of the losses due to premature deaths, number of losses of healthy life years resulting from disability that may be permanent (polio) or temporary (TB, leprosy), physical or mental, is needed. One DALY is one lost year of healthy life.

iv. **Quality adjusted life year (QALY):** QALY measures the number of years of life added by an effective treatment or adjustment for better quality of life. It indicates the cost effectiveness of health interventions. Each year in perfect health measures is assigned a value of 1.0 and a value of 0.0 for death.

d. Nutritional status indicators

It is a positive health indicator. Following indicators are considered important as indicators of health status:

1. Weight, length and head circumference at the time of birth.
2. Anthropometric measurements (e.g. weight, height, midarm circumference) of preschool children.
3. Weight and height of children at the time of school entry.

e. Utilization rate

It is the proportion of the people actually receiving the healthcare services in a given population in a given period usually a year, e.g. proportion of infants fully immunized against 6 EPI diseases (measles, tetanus, polio, tuberculosis, pertussis, and diphtheria), proportion of pregnant women getting antenatal care or have deliveries by trained doctor, and percentage of people using various methods of family planning, bed occupancy rate, bed-turnover ratio, etc.

f. Indicators of social and mental health

These include the rates of theft, crimes, assault, murder, suicides, juvenile delinquency, accidents, alcohol and substance abuse, and domestic violence. These indicators are a guide to implement social action for the improvement of the social and mental health of the people.

g. Environmental indicators

These indicators reflect the quality of physical and biological environment and measure the percentage of population having access to good sanitation facilities and safe drinking water. They describe the occurrence of communicable diseases in a given population. These indicators include the indicators relating to measurement of the water pollution, air pollution, soil pollution, noise pollution and exposure to toxic substances in food and water.

h. Socioeconomic indicators

These do not directly measure health status of people but are important in interpreting healthcare indicators. These include rate of increase of population, literacy rates, dependency ratio, housing ratio (number of persons per room, family size, per capita 'calorie' availability). Very less health problems have been reported in countries with favorable socioeconomic indicators.

i. Health policy indicators

One most important indicator of political commitment is allocation of suitable resources. The relevant indicators are:

i. Proportion of budget spent on health services, health activities like nutrition, water supply, community development, sanitation, and housing.
ii. Proportion of total health resources dedicated to primary healthcare.

j. Other indicators

i. **Social indicators:** United Nations Statistical Office have categorized social indicators into various groups including population, families, housing and its environment, learning and educational services, health services, nutrition, income, social security and welfare services, public order and safety, social stratification and mobility time use.

ii. **Basic needs indicators:** These include access to water, calorie consumption, illiteracy, life expectancy, deaths due to illness, doctors and nurses per population, rooms per person.

iii. **'Health for all' (HFA) indicators:** WHO had listed the following four categories of indicators for monitoring towards the goal of health for all by 2020 AD.

A. *Health policy indicators*
- Community involvement
- Degree of equity of distribution of health services
- Political commitment to HFA
- Resource allocation
- Organizational framework and managerial process.

B. *Social and economic indicators related to health*
- Adult literacy rate
- Food availability
- Housing
- GNP or GDP
- Income distribution
- Rate of population growth
- Work conditions.

C. *Indicators for the provision of healthcare*
- Accessibility
- Availability
- Quality of care
- Utilisation.

D. *Health status indicators*
- Child mortality rate (1–4 years)
- Disability prevalence
- Disease specific mortality
- Infant mortality
- Life expectancy at the time of birth
- Low birth weight
- Maternal mortality rate
- Incidence and prevalence of morbidity
- Nutritional status and psychosocial development of children.

CONCEPT OF DISEASE

Disease is just opposite to health. Disease can be defined as 'an impairment of the normal state of the living animal that affects the performance of the vital functions'. It is also defined as 'a pathological condition of the body that presents a group of symptoms peculiar to it and which sets the condition apart as an abnormal entity differing from other normal or pathological body states'.

Like health, disease is also viewed differently by different people or groups. From a sociological point of view disease is regarded as a social phenomenon occurring in all societies. From an ecological point of view disease is *'maladjustment of the human organism to the environment'*.

The terms disease, illness and sickness have been used synonymously but they are actually different. Whereas **disease** is a physiological/psychological dysfunction, **illness** is a subjective state of the person who feels aware of not being well; and **sickness** is a state of social dysfunction, a role that an individual assumes when ill (sickness role).

Diseases could be physical, mental (psychological) or social. They could be caused by bacteria, and viruses, insects and animal bites, strain, accident, injury, etc.

Natural History of Disease

Natural history of disease refers to the progress of a disease process in an individual over time, in the absence of intervention. The process begins with exposure to or accumulation of factors capable of causing disease. Without medical intervention, the process ends with recovery, disability, or death (Fig. 1.1).

Natural history of a disease traces the sequence of event in the evolution of a disease; from the initial stage of its pre-pathogenesis phase to its termination as recovery, disability or death in the absence of treatment or prevention. The natural history of one disease differs from another. Similarly, the natural history of same disease may also differ in individuals. It is a key concept in epidemiology.

Natural history of a disease comprises two phases, (a) pre-pathogenesis (progress in the environment), and (b) pathogenesis (progress in the human beings). Thus, natural history of a disease gives us an idea as to how and why a disease is caused and how can it be prevented or cured.

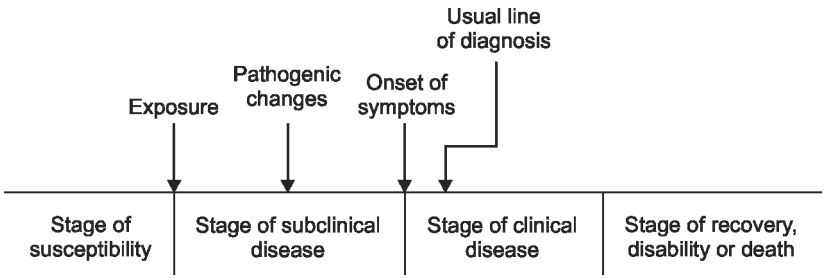


Fig. 1.1: Different stages of a disease

A. Pre-pathogenesis Phase

Every disease is an interaction between **man**, the **causative agent** of the disease and the **environment**. Pre-pathogenesis phase signifies the period when the causative agent has not actually entered the host but the factors are favorable to its interaction with host. Thus the situation could be described as 'man exposed to the risk of disease'. In this way all of us are in the pre-pathogenesis phase of most of the communicable and non-communicable diseases!

B. Pathogenesis Phase

In this phase the disease agent actually enters the susceptible human host and, in case of infectious diseases, it multiplies and induces tissue and physiological changes. Recovery, disability or death of the host may follow this. Immunisation and chemotherapy serve as intervening measures in pathogenesis phase. The infection may be clinical or subclinical or the host may become a symptomatic or asymptomatic **carrier.** In chronic diseases such as cancer, hypertension, coronary heart diseases, this phase normally consists of a pre-symptomatic phase and a symptomatic phase. In the **pre-symptomatic phase** there are no recognizable symptoms and there is no manifest disease but in the **symptomatic phase** the disease is already well advanced. The sequence of events in the natural history of a disease is shown in detail in Fig. 1.2 and the iceberg of disease is shown in Fig. 1.3.

According to the concept of 'iceberg of disease', disease in a population can be compared with an iceberg. The floating tip of the iceberg represents those persons who have shown symptoms of the disease and are recognized as cases (diseased persons). The vast submerged portion of the iceberg represents latent or in apparant or pre-symptomatic or undiagnosed cases and carriers in

the community. The water line represents the demarcation between clinical and subclinical or undiagnosed patients.

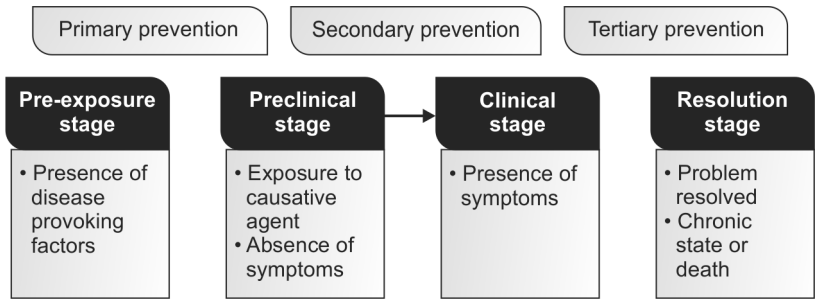


Fig. 1.2: Natural history of a disease

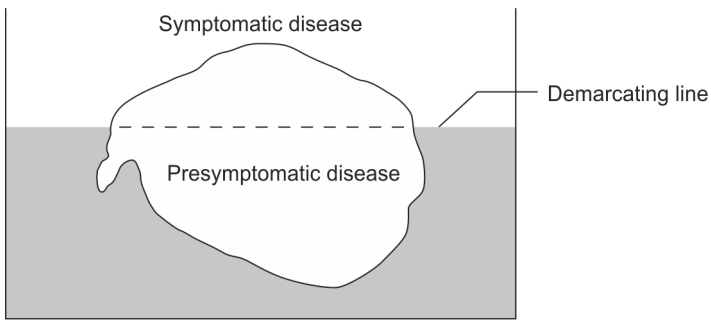


Fig. 1.3: Iceberg of disease

In some cases (e.g. hypertension, anemia, diabetes, malnutrition and mental diseases) the unknown morbidity (represented by submerged portion of iceberg) far exceeds the known morbidity. Thus, detection and control of undiagnosed reservoir of disease is challenging.

Disease agent

The word etiology is derived from words *aitia* meaning cause and *ology* meaning science. Hence etiology is the scientific study of the causes of disease. Disease agent is the first link in the chain of disease transmission. It is the most important factor causing the disease (Fig. 1.4).

The disease agent is defined as 'a living or non-living substance or a tangible or intangible force the excessive prevalence or selective lacks of which may initiate or perpetuate a disease process'.

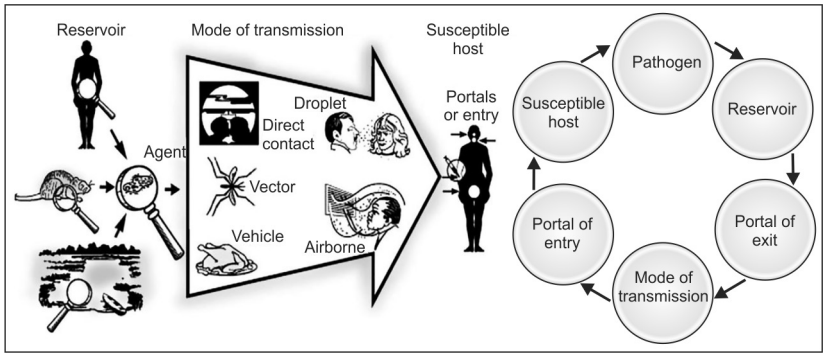


Fig. 1.4: Chain of infection

C. Classification of Etiological Factors

1. **Biological agents:** Viruses, rickettsiae, fungi, bacteria, etc. are the living, biological agents of disease. These living agents exhibit:
    a. **Infectivity** (the ability of an infectious agent to invade, multiply and produce infection in a host).
    b. **Pathogenicity** (the ability to induce clinically apparent illness).
    c. **Virulence** (the degree of pathogenicity). Such agents can multiply in the body and exaggerate the initial danger. They can spread the disease in different parts of the body and produce toxins.
2. **Nutrient agents:** Any excess or deficiency of nutrient agent may result in nutritional disorders. Examples of nutrient agents include carbohydrates, fats, proteins, vitamins, minerals, enzymes and water; and examples of nutritional problems are anemia, goiter, obesity, night blindness, protein energy malnutrition, etc. Dietary deficiency may lower body resistance against infectious diseases.
3. **Physical agents:** Physical agents like heat, cold, humidity, radiation, electricity, sound, etc. may also cause illness. Severe cold can depress the functional efficacy of the ciliated epithelium of the respiratory tract, allowing the passage of bacteria into the lungs. Exposure of whole body to severe heat in combination with humidity can result into a heat stroke. Overexposure to ultraviolet rays causes burns. High voltage currents may cause instantaneous death.
4. **Chemical agents:** Chemical agents may be endogenous or exogenous. Endogenous chemicals are produced inside the body

due to disease, e.g. serum bilirubin (jaundice), calcium carbonate (kidney stone), and uric acid (gout), etc. Exogenous chemical agents are present outside the body but enter the host through inhalation, ingestion, or inoculation, e.g. allergens, fumes, dust, metals, insecticides, gases, etc.

5. **Mechanical agents:** Exposure to mechanical forces may sometimes result into diseases like sprains, dislocations, etc. A mechanical injury may produce a breach in the skin or mucous membrane thus facilitating the entry of organisms into tissues. Mechanical injuries are caused by a collision between the body and an external mass. Mechanical trauma causes disruption of tissue or a wound. Some amount of internal hemorrhage is inevitable but if the skin has been ruptured, there will be external hemorrhage also. Mechanical injuries also cause primary and secondary shock.
6. **Social agents:** These are the social factors that play an important role in the occurrence of disease. Unhygienic living conditions, unhealthy lifestyles, poverty, illiteracy and lack of awareness, smoking, abuse of drugs and alcohol, etc. are the examples of social agents.

CONCEPT OF PREVENTION OF DISEASE

Prevention is always better than cure. A detailed understanding of the natural history of disease and the causative agents is useful in adopting preventive measures against diseases. The object of preventive medicine is to control the 'cause' and hence the disease processes. Prevention could be better understood by dividing it into:

A. Primary prevention.
B. Secondary prevention.
C. Tertiary prevention.

A. Primary Prevention

It includes the concept of positive health and indicates intervention in the pre-pathogenesis phase of a disease. It is defined as action taken *before* the onset of disease, which rules out the possibility that a disease will ever occur. Primary prevention is based on measures, which promote general health of the people by protective measures like education, literacy campaigns, and food production. WHO has recommended the following approaches for the primary prevention of chronic diseases, if the 'risk factors' are established. The term

'risk factor' is used to explain the etiology of a disease when the disease agent is not clearly established. It is defined as 'an activity or exposure that is significantly associated with the development of a disease'. It is also defined as a determinant that can be modified by intervention, thereby reducing the possibility of occurrence of disease or other specified outcome.

a. **Primordial prevention:** Primordial (meaning—ancient) prevention is of special interest in prevention of chronic diseases. It is the primary prevention in the real sense. In this approach efforts are directed towards discouraging children from adopting harmful lifestyles mainly through individual and mass education. For example, the diseases like hypertension and obesity have their origin in early childhood when the lifestyles are formed, e.g. eating habits, unhygienic habits, physical exercise, smoking, etc.
b. **Population (mass) strategy:** The population strategy is directed towards the lifestyles, socioeconomic and behavioral changes in the whole population irrespective of individual risk levels. Thus, it has been proved that even a little decline in the average blood pressure of a population would produce a large decrease in the incidence of cardiovascular diseases. Similarly an increase in the average income of a population suffering from malnutrition would improve the health status of the population.
c. **High-risk strategy:** In any population there may be certain individuals who may be at high-risk. High-risk strategy is based on the detection of individuals at high-risk by optimum use of clinical methods. AIDS is a relatively new fatal disease but its rate of spread is alarming. Better control of this disease would anticipate detection of individuals at high-risk and taking preventive care in such cases.

B. Secondary Prevention

Secondary prevention is related to the preventive measures taken after the occurrence of disease to arrest the disease process and restore health. It can also help in protecting the individuals who have not acquired the disease so far. Hence secondary prevention can prevent spread of infection in already infected persons and at the same time potential contacts get primary prevention. Secondary prevention may be defined as 'action that stops the progress of a disease at its early stage and prevents complications'. These actions include early diagnosis, adequate treatment, governmental health programmes, etc.

However, secondary prevention is an imperfect tool. It is more expensive and less effective than primary prevention. The patient has already suffered from mental stress, pain and the community has been subjected to loss of productivity. This does not happen in primary prevention. Thus long-term health policy would lay greater emphasis on primary prevention as compared to secondary prevention. Primary prevention is safer and least costly.

C. Tertiary Prevention

It is defined as 'all measures available to reduce or limit impairments and disabilities, minimizing suffering caused by existing departures from good health and to promote the patient's adjustment to intermediate condition'. Tertiary prevention means intervention in the late pathogenesis stage as when the disease process has crossed its early stages. Tertiary prevention, if undertaken in the natural history of disease, may prevent sequel and limit disability. This can be followed by rehabilitation programmes. Tertiary prevention extends the concept of prevention into fields of rehabilitation. Modern day rehabilitation programmes include psychological, vocational and medical components involving the team wok of a variety of professionals.

As per the natural history of disease, epidemiology has derived three levels of prevention of disease, which are summarized in Table 1.1.

TABLE 1.1: Levels of prevention of disease

Primary prevention	*Secondary prevention*	*Tertiary prevention*
a. **Health promotion:** Through health education, nutritional intervention, lifestyle behavioral changes and regular exercises	a. **Early diagnosis:** Regular checkup of community	a. **Disability limitation:** Through proper exercise, physio- and occupational therapy, corrective plastic surgery to improve mobility
b. **Specific protection:** Through immunisation, chemoprophylaxis, nutritional supplements, pollution free environment, noise control, standardization of consumer products and accident control	b. **Prompt treatment:** Proper treatment of diagnosed diseases to prevent complications	b. **Rehabilitation:** Mental and physical make-up to become productive, establishing independence and status in the society

CONCEPTS OF DISEASE CONTROL

Disease control involves all the measures designed to prevent or reduce the rate of transmission, morbidity and mortality of the infectious disease in local setting to an acceptable level. In disease control, a state of equilibrium becomes established between the disease agent, host and environment components of the disease process and the disease agent persists in population at a level at which it does not pose a problem to public health. The main aims of disease control are as follows:

i. To reduce the incidence of disease.
ii. To reduce the prevalence of disease.
iii. To reduce the duration of disease.
iv. To reduce the consequences of disease.
v. To reduce the risks of transmission of disease.
vi. To reduce the complications of infection.
vii. To reduce the financial burden of the community.

Prevalence of a disease is the product of incidence and the duration of disease (P = I x D). Therefore, prevalence of a disease depends not only on the actual number of people who develop a disease but also on the duration of a disease. For short duration diseases like common cold, the prevalence and incidence are almost identical while for chronic or long-standing diseases like tuberculosis, leprosy or blindness the prevalence is always much higher than the incidence.

Disease control activities are mainly focused on primary prevention or secondary prevention, or combination of the two. The concept of tertiary prevention is comparatively less relevant to disease control. Malaria is a good example of a disease that can be controlled in local settings. Malaria cannot be entirely eliminated because the mosquito-borne parasites that transmit the disease can develop drug resistance. But it can be controlled through various healthcare and prevention strategies like use of bednets and mosquitoes repellants. Disease control is the first step toward disease elimination.

Disease Elimination

Elimination of disease implies the interruption of transmission of a disease and reduction of the incidence of disease in a specific geographical area or country to zero. Disease elimination is considered as an important precursor of disease eradication. After several years of elimination, countries contact the WHO for certification.

Disease Eradication

Disease eradication is termination of all the transmission of infection caused by a specific agent and permanent reduction of the specific disease cases to zero worldwide. Smallpox is the only disease that has been eradicated globally. It was declared officially eradicated by the World Health Organization (WHO) in 1980. Once a disease has been eradicated, intervention measures are no longer needed.

Every disease has its own epidemiological characteristics and specific strategies for control. During recent years, three diseases including polio, measles and dracunculiasis have been considered as candidates for global eradication. The feasibility of eradicating polio appears to be greater than that of others.

Components of Disease Control

Monitoring, surveillance and evaluation of interventions are necessary to maintain achievements in infectious disease control.

i. Monitoring

Monitoring is the systematic and routine collection of information about all the projects and programmes aimed at detecting changes in the environment or health status of population, e.g. monitoring of air pollution, water quality, growth and nutritional status, etc. It also refers to on-going measurement of performance of a health service or a health professional, or of the extent to which patients comply with the advice from health professionals. It is basically to have a continuous oversight of activities to ensure that they are going according to plan. It also helps the project managers to identify and solve problems quickly. It keeps track of project inputs and outputs such as achievements, staff movements, documentation, finances and budgets, and the money spent in relation to the resources available. Monitoring is an ongoing activity that should be incorporated into everyday project work. The data acquired through monitoring is used for evaluation. Monitoring is routinely carried out by project staff, project partners and peer educators to keep track of their work.

ii. Surveillance

Surveillance is a vital component of any disease control programme. The purpose of surveillance is action. Surveillance for a disease means:

1. To continuously watch over the distribution and trends of incidence of a disease through the systematic collection, consolidation and evaluation of morbidity and mortality.
2. To monitor, observe, or determine health status, diseases or risk factors within a population.

Surveillance can be epidemiological surveillance, demographic surveillance, nutritional surveillance, etc.

The main objectives of surveillance are:

a. To monitor health problems to facilitate their prevention or control.
b. To set priorities, plan, and conduct disease control programs.
c. To assess the effectiveness of control efforts.
d. To provide timely warning of public health disasters so that interventions can be taken.

Surveillance requires professional analysis and sophisticated judgement of data leading to recommendations for control activities. Those persons conducting surveillance:

1. Identify, define, and measure the health problem of interest.
2. Collect and compile data about the problem (and if possible, factors that influence it).
3. Analyze and interpret these data.
4. Provide these data and their interpretation to those responsible for controlling the health problem.
5. Monitor and periodically evaluate the usefulness and quality of surveillance to improve it for future use.

It is to be noted that surveillance of a problem does not include actions to control the problem.

iii. Sentinel surveillance

A sentinel surveillance system is used when high-quality data are needed about a particular disease:

1. To monitor the rate of occurrence of specific disease.
2. To assess the stability or change in health levels of a population that cannot be obtained through a passive system.

Most passive surveillance systems receive data from as many health workers or health facilities as possible, whereas a sentinel system involves only a limited network of carefully selected specific reporting sites or population group. Data collected can be used to estimate disease prevalence, identify outbreaks and monitor the burden of disease in a community. It provides a rapid, economical alternative to other surveillance methods. As sentinel surveillance is conducted only in selected locations, so it may not be as effective

for detecting rare diseases or diseases that occur outside the sentinel sites.

In selecting a sentinel health facility following criteria should be considered:

- It should have easy access to large population.
- It must have qualified specialist to diagnose, treat and report cases of the disease under surveillance.
- It must have a high-quality diagnostic laboratory.

iv. Evaluation

Evaluation is the process by which results of a project are compared with the intended aims, goals and objectives. It is the assessment of how well a programme is performing. It helps to understand how and why the intervention has worked well. In case the project is unsuccessful, then what could have been done better or differently. Evaluation should always be considered during the planning and implementation stages of a programme or activity. Evaluation studies can be useful in generating information on extension of control activities, training and patient management, etc.

SOCIAL CAUSES OF DISEASES

In addition to genetic reasons, social environment affects the health status of people.

1. **Income and social status**: Poverty increases the chances of poor health. Higher income and social status determine the quality and standard of healthy living and are thus linked to better health. The greater the gap between the richest and poorest people, the greater the differences in health.
2. **Lifestyle:** Lifestyle is the sum total of habits, beliefs. Lifestyle habits like smoking, alcohol, poor diet leading to obesity or malnutrition, lack of physical exercise, sedentary lifestyle and drug abuse increases the chances of poor health.
3. **Social isolation:** Exposure to discrimination, crime and violence is linked with poor health. Social support networks affect the health status of the person. Support from families, friends and communities is linked to better health. Persons who have small number of social contacts are more likely to die earlier than those who have more extended networks.
4. **Literacy level:** Illiteracy is linked with poor health, more stress, and lower self-confidence, increased morbidity, and mortality. Illiterate people are more likely to indulge in unhealthy activities,

such as smoking. People with more education are more likely to live longer. They participate in healthy activities like exercising and visiting their doctor regularly. Education compensates the effect of poverty as educated people get higher-paying jobs that often come with benefits, such as health insurance and healthier working conditions that add up to better health.

5. **Employment and working conditions:** Employed people with healthy working conditions are healthier than unemployed with low morbidity and mortality.
6. **Marital status:** Married persons generally have good health and have a lower mortality risk.
7. **Stress:** Exposure to stressful situations such as death or divorce of parents, desertion, loss of service, birth of a handicapped baby.
8. **Cultural practices:** Health status, morbidity and mortality rate, customs and traditions, and the beliefs of the family and community all affect health.

SOCIAL PROBLEMS OF SICK

People with illness encounter economic as well as social problems in their everyday life. Illness can be disruptive to sick person's daily life and can interfere with their self-management. A chronic illness may present various challenge for sick person. A person with a visible disability or one who receives special treatment may be singled out by his colleagues. Many of the sick people face difficulty in performing activities of daily living, in solving work-related issues and underachieve at work place for various reasons. Their stamina may be lower or their medication may impair their alertness or make them irritable. They may face difficulty in seeking expert advice on the disease state and treatment due to lack of money and resources. Social problems experienced by patients may have an important impact on their mental health and quality of life. If their illness causes them frustration, they may have emotional or behavioral problems that can interfere with work. Some sick people have conflict over relationships with family and non-family members. Sick people may have difficulty in adapting to changes in the social environment. Lack of local support services, and lack of information on available welfare services during treatment may further worsen their illness.

Sick people have problems, such as family life, relationships with people around them, lifestyle adjustments, work, income, leisure activities, and relationships with healthcare provider.

Treatment of disease alone is not likely to solve the problem of patient. There has been an increasing need for support for their social problems, as well as the mental care of patients. The economic and social problems of the patient and his family should be identified and met. They must be given social assistance and social support, assistance to travel to and from the clinic, help in terms of food grains, clothes, care of children and their education, and job placement, programmes such as slum improvement, etc. Such care should be provided through voluntary agencies and Departments of Social Welfare. Healthcare providers should also actively address the social circumstances of people with chronic illness and the problems they might have with self management.

SOCIAL AND HEALTH EDUCATION

Health education is combination of learning practices designed to help individuals and communities to promote, improve and restore their health, by increasing their knowledge or influencing their attitudes. It is aimed at encouraging people.

Aims and Objectives

a. To develop health consciousness in people and encourage them to stay healthy.
b. To arise interest in the people to know how to stay healthy.
c. To encourage people to adopt necessary health practices and maintain healthy lifestyles and attitude to reduce the occurrence of disease, disabilities and deaths.
d. To promote the proper use of available health services by people.
e. To provide health knowledge and skills to people to enable them to identify and solve their health problems.
f. To stimulate individual and community self-reliance and contribution to achieve health development.
g. To provide a healthy environment for physical and mental growth.
h. To improve the health and the quality of life of the individual and community level.

Approach to Health Education

1. Regulatory approach (managed prevention).
2. Service approach.

3. Health education approach.
4. Primary health care approach.

Contents of Health Education

1. **Human biology**
   a. Understanding the importance of good health and methods to keep physically fit demands an understanding of human biology.
   b. To provide knowledge about child spacing, safe motherhood, breastfeeding, weaning and child growth, immunisation, respiratory infections, diarrheal disease, house hygiene.
2. **Nutrition**
   a. To provide knowledge about nutrient value of food stuffs.
   b. To guide people to choose balanced diets to prevent malnutrition.
   c. To remove preconceptions and promote good dietary habits.
3. **Hygiene:** To teach people about the importance of hygiene (personal and environmental) and methods of maintaining hygiene.
4. **Family Health**
   a. Strengthen and improve the health of the family.
   b. Disease prevention.
   c. Maternal and child healthcare.
   d. Early diagnosis and care of the ill person.
   e. Family planning, immunisation, nutrition, etc.
5. **Disease prevention and control:** To educate people about locally endemic diseases.
6. **Mental health**
   a. To help people to keep mentally healthy and to prevent a mental breakdown.
   b. To provide basic knowledge of common psychological ailments such as depression, mental anxiety, neurosis, and emotional disturbances
7. **Prevention of accidents:** To teach people about basic safety rules and prevention of common accidents at the home, road and the workplace.
8. **Use of health services:** To inform people about various health services and preventive programmes.

FOOD IN RELATION TO NUTRITION AND HEALTH

The level of general public health in India is not satisfactory but it has been improving over the years. Food and nutrition are important in maintaining good health. Several non-communicable chronic diseases like hypertension, coronary artery disease, diabetes mellitus and certain types of cancers are due to imbalanced diet and sedentary lifestyle. Nutrition is important in maintaining health.

Food may be defined as 'any substance, which can be utilized to yield heat or energy, to build up new tissues and to repair worn-out tissues, to regulate body processes and to aid in the production of important body compounds'.

Nutrition may be defined as 'the science of food and its relationship to health'. It is concerned mainly with the role of nutrients in body growth, physical and mental development, and maintenance. Good nutrition is a cornerstone of good health as it increases the body's immunity and decreases the susceptibility to disease.

Public health nutrition may be defined as 'the branch of human nutrition dealing with human health and the services necessary to maintain human health'. It deals with all the schemes of national health services and other health related agencies and institutions to promote human nutrition.

Dietetics is the practical application of the principles of nutrition in the prophylaxis and treatment of disease. It includes the making of diet plans for the well and the sick.

Today most of us are aware about the relation between nutrition and infection, immunity, maternal and child health, fertility and family health. Nutritional indicators have been developed to monitor health for all.

Classification of Foods

Foods can be classified in many ways as shown in Fig. 1.5.

Nutritional levels

Adequate nutrition enables individuals to grow, mature, reproduce and function in a healthy and normal manner. **Undernutrition** is a shortage in the total essential nutrients in the diet caused by an insufficient supply of food. **Malnutrition** means bad nutrition either due to deficiency or due to excess of one or more nutrients.

NUTRITIONAL REQUIREMENTS

An adequate diet should perform the following functions:

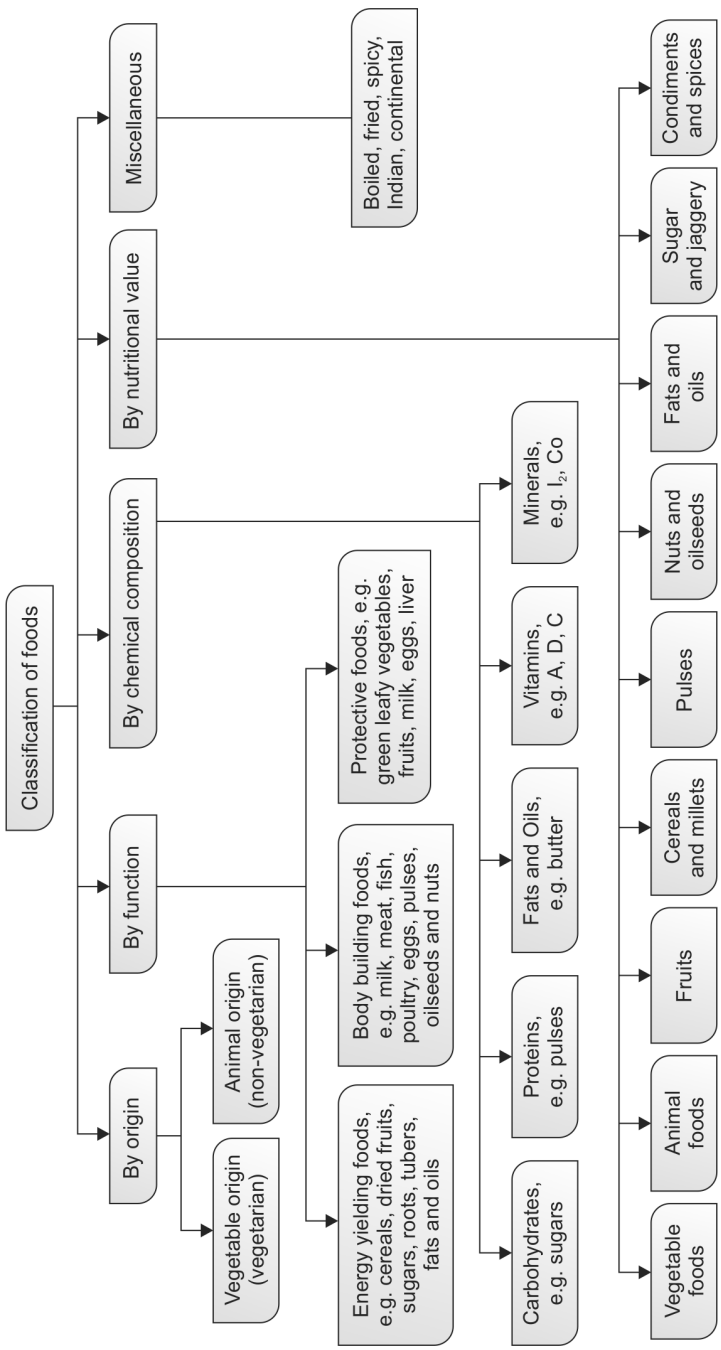


Fig. 1.5: Classification of foods

a. It must supply energy for the basal metabolism as well as muscular and other work of the body.
b. It must supply energy and material for the synthesis of structural components necessary for optimum growth.
c. It must supply agents necessary to perform chemical reactions in the above processes.
d. It must supply energy and chemicals for reproduction.

The amount of nutrients needed for the body can be expressed in terms of **Recommended Daily Allowance** (RDA) or **Recommended Daily Intake**. RDA is defined as 'the amounts of nutrients sufficient for the maintenance of health in all the people'. *RDA of different nutrients vary according to the age, sex and special conditions like pregnancy and lactating mothers.*

Common nutritional requirements include proteins, vitamins and minerals.

1. Proteins

Proteins are most important for the maintenance of human life. Tissues, muscles, enzymes, organs and hormones are protein in nature. Proteins from diet are important because they provide amino acids for:

a. Synthesis of body proteins in children when they are growing.
b. In adults for synthesis of new proteins to replace those being broken down.
c. In pregnant women for the requirement of the fetus and placenta.
d. For nursing mothers for synthesis of proteins in breast milk.

The body cannot store excess amount of protein. Protein requirement is expressed in terms of grams/kg body weight. The daily requirement of protein for an adult is about 0.83 g/kg body weight. It is desirable that one-fifth of this requirement should be animal protein.

Protein deficiency is related to amino acid deficiency and is accompanied by deficiency of minerals and vitamins.

Protein calorie malnutrition (PCM) means deficiency of calories due to deficiency of protein. It is also known as **protein energy malnutrition** (PEM).

A. Protein deficiency diseases

Diseases induced due to deficiency of protein are kwashiorkor, marasmus and marasmic kwashiorkor.

1. **Kwashiorkor:** Kwashiorkor means 'red boy'. It is a severe protein deficiency disease and is the most widespread deficiency disease of the world. Kwashiorkor is usually seen in the children between the age groups of 1 to 4 years. This disease is common in countries of low agricultural productivity, e.g. southern Mexico, northern South America, tropical Africa and India. It is most common in poor rural children.

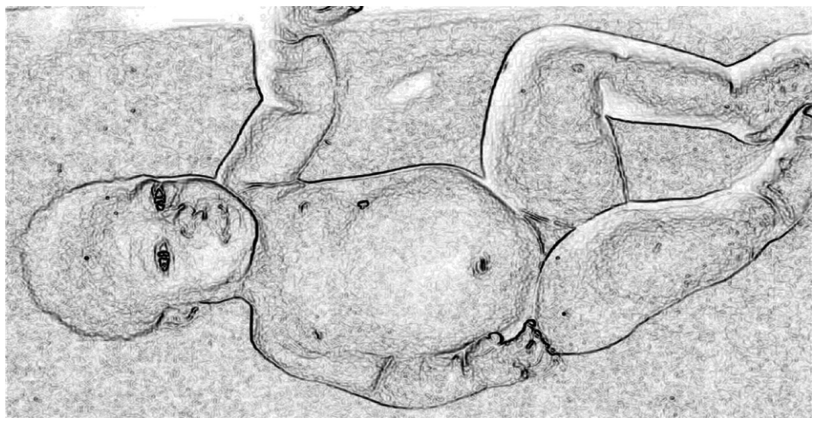


Fig. 1.6: Kwashiorkor

Synthesis of two proteins made in the liver is reduced:

a. Plasma albumin, hence edema.
b. Low density lipoproteins, hence lipids accumulate in the liver.

Some of the features of kwashiorkor may be due to associated zinc deficiency. The principal clinical features include:

- Retarded growth
- Anemia
- Loss of appetite
- Edema
- Diarrhea
- Scanty hair growth
- Tissue swelling
- Loss of pigmentation
- Apathy.

Pure cases of kwashiorkor can develop within a few weeks and the patients sometimes have normal weight for age. It is less common than marasmus. Treatment consists of a diet comprised largely of dry skim milk. Improving the quantity and quality of proteins in the diet can prevent the disease.

Features

- Edema
- Pale and thinned hair
- Abdominal distension.

2. **Marasmus:** Nutritional marasmus is the commonest severe form of protein-energy malnutrition, i.e. the childhood version of starvation, and involves lack of requisite calories needed by the body. It generally occurs in children between age groups of 0.5 to 5 years. This condition occurs at a younger age than kwashiorkor. The characteristic syndromes include failure to gain weight, wasting of muscles and subcutaneous fat. The child is irritable but feels good appetite.
   The cause of this condition is a poor diet, low in both calories and protein. Poor hygiene leads to gastroenteritis and a vicious circle starts. Diarrhea leads to poor appetite and more dilute foods. In turn, further depletion leads to intestinal atrophy and more susceptibility to diarrhea.



Fig. 1.7: Marasmus

Features

- Wasted muscles
- Very little fat
- Very underweight
- No edema.

TABLE 1.2: Difference between kwashiorkor and marasmus

S.No.	Kwashiorkor	Marasmus
1.	Develops in children more than one year of age due to deficiency of proteins	Develops in infants due to deficiency of proteins, fats and carbohydrates
2.	Extensive edema is present	Edema is absent
3.	Pale and thin hair	Normal hair
4.	Patches of pigmentation and desquamation on skin	No patches of pigmentation and desquamation on skin
5.	Moon face	Old man's face
6.	Subcutaneous fat is present	Subcutaneous fat disappears
7.	Enlarged fatty liver	No fatty liver
8.	Mild or no muscle wasting	Severe muscle wasting
9.	Poor appetite	Voracious feeder
10.	Skin appears to be swollen	Skin is dry and wrinkled

3. **Marasmic kwashiorkor:** Marasmic kwashiorkor has combined features of both marasmus and kwashiorkor conditions. Severe protein-energy malnutrition have combined spectrum from marasmus to kwashiorkor. Children have some skin lesions, hair changes, and fatty liver (as in kwashiorkor) together with the wasting of marasmus. Malnourished children are mostly depleted in other nutrients also.

B. Treatment of protein deficiency induced diseases

Severe protein deficiency induced diseases can be treated in three phases:

a. **Resuscitation:** For correction of dehydration, acidosis, electrolytes imbalance, hypothermia, hypoglycemia and the treatment of infections.
b. **Start of cure:** Re-feeding, steadily increasing the calories (from 100 to 150 kcal per kg) and protein (to about 1.5 g per kg). There may be anorexia, and children have to be hand fed, if possible in the lap of their mother or a nurse. Potassium, zinc, magnesium and a multivitamin mixture are needed but iron should not be given for the first week.
c. **Nutritional rehabilitation:** After about three weeks, the child does not have edema, has a good appetite, and is no longer ill and but is underweight for age. It takes many weeks of good

feeding for catch up growth to be complete. During this stage the child should be looked after in a recovery home or by its mother, who must be educated about nutrition and be provided with extra food. Locally available foods are best.

C. Prevention of protein-energy malnutrition

To prevent protein-energy malnutrition five measures described below are being actively promoted around the world:

a. Growth monitoring: World Health Organization (WHO) has devised a simple growth chart—the Road to Health card. The mother should keep the card and bring the child (plus card) to the nearest clinic regularly for weighing and advice.

b. Oral rehydration: UNICEF formula of oral rehydration salt (ORS) is saving many lives from gastroenteritis. It includes:

Sodium chloride	3.5 g
Sodium bicarbonate	2.5 g
Potassium chloride	1.5 g
Glucose/sucrose	20 g/40 g
Clean drinking water to make a solution	1 liter.

c. Breastfeeding is a matter of life and death in a poor community with lack of facilities for hygiene. Additional food, prepared from locally available products, is needed from four to six months of age.

d. Immunisation must be done against measles, pertussis, diphtheria, tetanus, polio, and tuberculosis.

e. Family planning advice so that people can better take care of their children.

2. Vitamins

Vitamins are complex substances that act as coenzymes or partners with enzymes and work as *regulators*. Vitamins are called *micronutrients* as they are needed in small amount by body as compared to carbohydrates, proteins, and fats. Vitamins do not supply energy directly but they do regulate many processes that produce energy. Vitamins are themselves not synthesized by the body in sufficient amounts but they enable the body to use other nutrients.

Vitamins are organic compounds divided into two groups

i. Fat-soluble vitamins.

ii. Water-soluble vitamins.

As their name suggests, fat-soluble vitamins (vitamins A, D, E, and K) dissolve in fat. Our body can store fat-soluble vitamins

in body fat only, thus it is harmful to consume too much of any fat-soluble vitamins (vitamins A and D) in the form of vitamin pills or other dietary supplements for too long-time. High intake of vitamins E and K is usually not toxic. Water-soluble vitamins (B-complex vitamins and vitamin C) dissolve in water. For the most part, water-soluble vitamins are not stored in our body in significant amounts.

i. Fat-soluble vitamins

☛ Vitamin A (Retinol):

Functions: Vitamin A plays following vital functions:

a. It works as an antioxidant in the form of carotenoids, and may reduce the risk for certain types of cancers and other diseases of aging.
b. It is necessary for normal growth of bone and skin.
c. It improves vision.
d. It is necessary for differentiation of epithelial tissue.
e. It promotes the growth of cells and tissues in body.
f. It protects us from infections by keeping skin and tissues in our mouth, stomach, intestines; and respiratory, genital, and urinary tracts healthy.

Carotenoids offer health benefits in addition to acting as precursors for vitamin A.

Deficiency: Symptoms of a significant deficiency of vitamin A include night blindness, xerophthalmia, dry scaly skin; and poor growth. The deficiency of vitamin A may lead to night blindness, xerophthalmia, Bitot's spots, and keratomalacia.

Overconsumption: As vitamin is stored in our body, large intake of vitamin A, can be quite harmful and may cause liver damage, bone and joint pain, headache, vomiting or appetite loss, abnormal bone growth, nerve damage, and birth defects. β-carotene from fruits and vegetables is acceptable.

Daily requirement: From age 14 onward, the RDA is 900 μg Retinol Activity Equivalents (RAE) of vitamin A for males and 700 μg RAE for females. During pregnancy the recommendation is 770 μg per day while during breastfeeding recommended daily RAE is 1200 μg.

The tolerable upper intake limit is 2800 μg of RAEs daily for ages 14 to 18, and 3000 μg daily during adulthood. Retinol, β carotene, and other pro-vitamin A carotenoids determine RAE.

Note: The RDAs measure vitamin A in Retinol Activity Equivalents (RAEs), reflecting retinol and carotenoid units. The quantity of vitamin A can be expressed in other ways: *International Units* (IU) used for food labels and dietary supplements, or as *Retinol Equivalents* (RE) used in the RDAs and many nutrient databases.

- Vitamin A derived from animal-based foods or supplements: 1 RE = 1 RAE
- Vitamin A derived from plant-based foods: 1 RE = 2 RAE

Sources: Main sources of vitamin A are liver, fish oil, carrot, tomato, milk and eggs. Foods fortified with vitamin A include margarine, vanaspati, and milk are also good sources of vitamin A. Carotenoids, such as α-carotene and β-carotene also known as pro-vitamin A carotenoids found in foods of plant origin (e.g. red, yellow, orange, and many dark-green leafy vegetables) get modified to vitamin A in our body.

TABLE 1.3: Marketed preparations of vitamin A

Marketed preparation	*Formulation*	*Manufacturer*
Arovit (7.5 ml)	Drops	Roche Pharmaceutical
Aquasol-A	Injection	US Vitamins Limited
Vitamin A	Tablet	Abbott Healthcare Pvt Ltd (AHPL)
Wyamin	Capsule	Wyeth Ltd.
Lipo (Skin) (60 ml)	Lotion	Elder Pharmaceuticals Pvt. Ltd.

☛ Vitamin D (Calciferol)

It is also known as the *Sunshine Vitamin*. Vitamin D_2 (calciferol) and vitamin D_3 (cholecalciferol) are nutritionally important forms of vitamin D.

Functions: It promotes the absorption of two minerals, *viz.* calcium and phosphorus from the gastrointestinal tract and helps in the formation of bones and teeth. It helps to deposit these minerals in bones and teeth, making them stronger and healthier. It controls calcium deposition in bone. Additional vitamin D must be available through the diet in places where solar radiation is insufficient.

Deficiency: Vitamin D deficiency is responsible for rickets in growing children and oesteomalacia in adults. Both diseases are common in India.

Overconsumption: Too much vitamin D can be toxic, possibly leading to kidney stones /kidney damage, weak muscles and bones, excessive bleeding.

Daily requirement: The daily requirements of vitamin D are 2.5 μg (100 IU) for adults, 5 μg (200 IU) for infants and children and 10 μg (400 IU) during pregnancy and lactation.

To maintain healthy bones, the guideline for vitamin D goes up to 10 μg (400 IU) daily for adults over age 50. Over 70 years, the guideline increases to 15 μg (600 IU) per day.

1 μg cholecalciferol = 40 IU vitamin D

Sources: Skin can make vitamin D on exposure to sunlight. Only 20 to 40 minutes of sun exposure on hands, arms, and face is needed three times a week to get enough vitamin D. Darker skin needs more sun exposure than lighter skin. Older people's skin is less efficient at converting sun exposure to vitamin D. Other sources of vitamin D are egg yolk and fish liver oils, milk, butter. Cheese, and some fishes (like sardines and salmon), and fortified breakfast cereals and margarine also contain small amounts of vitamin D.

TABLE 1.4: Marketed preparations of vitamin D

Marketed preparation	Formulation	Manufacturer
Rocaitrol	Capsules	Abott Healthcare Pvt. Ltd.
Calcit SG	Tablets	Zydus Cadila Healthcare Ltd.
Arachitol	Injection	Solvay Pharma India Pvt. Ltd.
Calotec D_3	Powder	Lupin Laboratories
Sorvate	Ointment	Glenmark

☛ Vitamin E (Tocopherol)

It occurs as alpha, beta, gamma and delta tocopherols.

Functions:

i. It works as good antioxidant by preventing the oxidation of low density lipids (LDL), cholesterol, and perhaps lowering the risk for heart disease and stroke. Its antioxidant activity also may help to reduce the risk of other health problems, such as some types of cancer.
ii. It is essential for normal functioning of reproductive organs.

Deficiency: Reproductive failure.

Overconsumption: Eating plenty of vitamin E rich foods does not produce a problem. However, taking large doses of it as a dietary supplement appears to have no benefits and hence it is not recommended.

Daily requirement: The RDA guideline for males and females age 14 and over is 15 mg of α-tocopherol each day. Depending on their age children need lesser vitamin E. During pregnancy, women still need 15 mg daily; during breastfeeding the recommendation goes up to 19 mg daily.

Note: Vitamin E is a group of substances called tocopherols with different potencies. α-tocopherol is its most potent form. On food and supplement labels, the amount is given in International Units (IU) of α-tocopherol, *not* in milligrams. Fifteen milligrams of α-tocopherol is equal to: about 22 IU of *d*-α-tocopherol (natural vitamin E) and about 33 IU of *dl*-α-tocopherol (a synthetic form in fortified foods and some supplements). The 'natural' form of vitamin E is more fully used than the synthetic form.

Sources: The richest sources of vitamin E are seed oils and wheat germ oil, green leafy vegetables, fats of vegetable origin.

TABLE 1.5: Marketed preparations of vitamin E

Marketed preparation	***Formulation***	***Manufacturer***
EEE	Capsule	Cadila Pharmaceuticals Ltd.
E-Cap	Capsule	Glenmark Pharmaceuticals Ltd.
Evitam Sg	Softgel capsule	Cipla Limited
Evion	Softgel capsule	Merck Limited (India)
Bio-E	Capsule	Dr. Reddy's laboratories

☛ Vitamin K

There are three derivatives of vitamin K, *viz.* K_1 (phylloquinone), K_2 (menaquinone), K_3 (menadione), which refer to a group of related compounds derived from menadione. Vitamin K is stable to heat and exposure to air but is destroyed by light, strong acids, alkalis and oxidizing agents.

Functions

i. Vitamin K helps in blood clotting. Synthesis of the four blood clotting factors, II, VII, IX and X is dependent on vitamin K.
ii. It helps to make some proteins that cause our blood to coagulate, or form a clot, when there is bleeding. In this way, bleeding stops.

iii. It also promotes the formation of some other body proteins for our blood, bones, and kidneys.

Deficiency: Deficiency of vitamin K causes hypoprothrombinaemia. Blood does not coagulate normally and therefore blood-clotting time is significantly prolonged. This may lead to hemorrhages.

Overconsumption: No symptoms have been observed but control is still the best approach. People taking blood thinning drugs, or anti-coagulants, need to eat foods with vitamin K in moderation.

Daily requirement: The daily requirement for an adult is 0.03 mg/kg body weight. During adulthood the intake goes up, i.e. 120 μg and 90 μg daily for men and women, respectively. The recommendations remain the same during pregnancy or breastfeeding. To make sure infants have enough, newborns typically receive a shot of vitamin K.

Sources: Like vitamin D, our body can produce vitamin K on its own from certain bacteria in our intestines. The best food sources are green leafy vegetables such as spinach and broccoli. However, a variety of foods, milk and other daily foods, meat, eggs, cereal, fruits and other vegetables provide smaller amounts.. Vitamin K is synthesised by bacteria of large intestine.

TABLE 1.6: Marketed preparations of vitamin K

Marketed preparation	Formulation	Manufacturer
KVI	Injection	Dewcare Concept Pvt. Ltd.
K Stat	Injection	Mercury Laboratories Ltd.
Kapilin	Injection	Galxo-Smithkline Pharmaceuticals Ltd.
Styptindon	Injection	Zydus Alidac
Phytonadione	Injection	Dr. Reddy's Laboratories Inc.

TABLE 1.7: Major food sources, function, deficiency and toxicity symptoms of fat-soluble vitamins

Nutrient	*Major food sources*	*Function*	*Deficiency symptoms*	*Toxicity symptoms*
Vitamin A	Liver, egg yolk, dark green and deep yellow	Preserves integrity of epithelial cells; C	Night blindness, dry eyes, poor bone growth,	Fatigue; night sweats; vertigo; headache; dry

Contd.

TABLE 1.7: Major food sources, function, deficiency and toxicity symptoms of fat-soluble vitamins *(Contd.)*

Nutrient	***Major food sources***	***Function***	***Deficiency symptoms***	***Toxicity symptoms***
	vegetables and fruits	formation of rhodopsin for vision in dim light; wound healing, growth, and normal immune function	impaired resistance to infection, papillary hyperkeratosis of the skin	and fissured skin; lips; hyper-pigmentation; retarded growth; bone pain; abdominal pain; vomiting; jaundice; hyper-calcemia
Vitamin D	Egg yolk, liver, fatty fish, sunlight	Bone formation; promotes the absorption of calcium and phosphorus in the intestine	Rickets (symptoms: costochondral beading, epiphyseal enlargement, cranial bossing, bowed legs, persistently open anterior fontanelle)	Hyper-calcemia, retarded growth, vomiting, nephrocalci-nosis
Vitamin E	Vegetable oils; liver; egg yolk; butter; green leafy vegetables; whole-grain breads, cereals, and other fortified or enriched grain products; wheat germ	Antioxidant in the tissues; coenzyme; neuromuscular function	Hemolytic anemia in the premature and newborn; hyporeflexia, and spino-cerebellar and retinal degeneration	Prolonged bleeding and clotting time.

Contd.

TABLE 1.7: Major food sources, function, deficiency and toxicity symptoms of fat-soluble vitamins *(Contd.)*

Nutrient	*Major food sources*	*Function*	*Deficiency symptoms*	*Toxicity symptoms*
Vitamin K	Infant formula, vegetable oils, green leafy vegetables, pork, liver	Catalyzes prothrombin synthesis; required in the synthesis of other blood clotting factors	Prolonged bleeding and prothrombin time; hemorrhagic manifestations	Possible hemolytic anemia; jaundice

ii. Water-soluble vitamins

☛ Vitamin B_1 (Thiamine)

Functions

i. Thiamine acts as thiamine pyrophosphate (TPP) in oxidative decarboxylation of pyruvate.
ii. It is essential in the synthesis of pentoses and NADPH (nicotinamide adenine dinucleotide phosphate).
iii. It is also involved in nerve impulse transmission.
iv. It is essential for repair and growth of tissues.

Deficiency

a. The principal thiamine deficiency disease is beriberi. It is classified into dry, wet and infantile beriberi. Dry beriberi is characterized by peripheral polyneuritis, paralysis and muscle atrophy. Wet beriberi is characterized by congestive heart failure with cardiac dilatation, damage of the cardiac musculature, serous effusions and edema. Infantile beriberi is the leading cause of infant mortality in many developing areas of the world.
b. Generally thiamine deficiency affects the cardiovascular, muscular, nervous and gastrointestinal systems.
c. In alcoholics vitamin B_1 deficiency causes Wernicke's syndrome and Korsakoff's syndrome.

Daily requirement: The RDA for thiamine is tied to our energy needs: 1.2 mg daily for males age 14 through adulthood. For females, the recommendation is 1 mg daily from ages 14 to 18 and 1.1 mg daily from age 19 onwards. During pregnancy and breastfeeding, the recommended amount may go up to 1.4 mg daily.

Sources: It is present in cereals, legumes, pulses, nuts, yeasts, whole-grain, pork, meat, eggs, liver, nuts, fish. It is also present in small amounts in milk, cheese, and vegetables.

TABLE 1.8: Marketed preparations of vitamin B_1 (thiamine)

Marketed preparation	*Formulation*	*Manufacturer*
Therabine	Injection	Parex Pharmaceuticals Pvt. Ltd.
Berin	Tablet	GlaxoSmithKline Pharmaceuticals Ltd.
BENALGIS	Tablet	Franco Indian Pharmaceuticals Pvt. Ltd.
RB 1	Tablet	Regardia Pharmaceuticals
Fide 75	Tablet	Psycogen Captab

☛ Vitamin B_2 (Riboflavin)

Functions:

i. It helps to produce energy in all cells of our body.
ii. It helps in conversion of tryptophan amino acid in our food into niacin.
iii. It helps in RBCs production.

Deficiency: Riboflavin deficiency is common in India. It is characterized by cheilosis, angular stomatitis, glossitis, seborrheic dermatitis, scrotal deformities and ocular manifestations like corneal vascularization, photophobia, itching, burning and circumcorneal capillary engorgement. Deficiency symptoms also include eye disorders (including cataracts), dry and flaky skin and a sore, red tongue.

Overconsumption: No problem reported.

Daily requirement: Like thiamine, the RDA for riboflavin is tied to our energy needs. Adult men need 1.3 mg daily while adult women need 1.1 mg daily. During pregnancy, the recommendation is 1.4 mg and, during breastfeeding the amount goes up to 1.6 mg daily.

Sources: Milk and other dairy products are major sources of riboflavin. Some organ meats like liver, kidney, and heart are also excellent sources. Eggs, green leafy vegetables, and nuts supply smaller amounts. Riboflavin content of pulses and cereals can be increased by germination.

Note: Since sunlight (ultraviolet light) destroys riboflavin, milk should be packed in opaque plastic or cardboard containers, not in clear glass containers.

TABLE 1.9: Marketed preparations of vitamin B_2

Marketed preparation	*Formulation*	*Manufacturer*
Riboflavin	Tablet	Shraya
Anvit fort	Capsule	Anrose Pharma
Retolbid	Capsule	East African
Savent plus	Tablet	Saviour Drugs
Vitone	Capsule	Cosmas Pharmacis

☛ Vitamin B_3 (Niacin)

It is also known as nicotinic acid. Niacin is readily converted to niacinamide (nicotinamide) in human. Strictly speaking niacin is not a vitamin as it may be synthesized endogenously from the essential amino acid, tryptophan in the presence of vitamin B_6 as pyridoxal phosphate. Sixty milligrams of tryptophan provide 1 mg of niacin. Niacin intake is therefore expressed in terms of niacin equivalents (NE) where:

1 NE = 1 mg niacin (nicotinic acid) = 60 mg tryptophan

Functions

i. Niacin reduces hyperlipidemia, since it reduces LDL cholesterol (bad cholesterol) and increases HDL cholesterol (good cholesterol).
ii. It is essential for the metabolism of carbohydrates, fat and protein.
iii. It is required for the normal functioning of skin, intestinal and nervous systems.
iv. It helps the enzymes to function normally in body.
v. It helps to produce energy in all the cells of our body.

Deficiency: Niacin deficiency can lead to nutritional disease called *pellagra,* which presents as the **4 D's**—*dermatitis, diarrhea, dementia and death*. Early signs of niacin deficiency include fatigue, anorexia, weakness, mild gastrointestinal disturbance, anxiety, irritability and depression. A scaly, bilateral, pigmented dermatitis appears generally in areas exposed to sunlight.

Overconsumption: Consuming excessive amounts, likely from a dietary supplement, may cause flushed skin, rashes, or liver damage.

Daily requirement: Niacin recommendations are given in Niacin Equivalents (NE). Like thiamine and riboflavin, its recommendation

is tied to energy needs. The advice for adult males is 16 mg NE daily, and for adult females, 14 mg NE daily. During pregnancy, 18 mg NE is advised and during breastfeeding, 17 mg NE daily is recommended.

Sources: High protein foods are typically good sources of niacin like poultry, fish, meat, yeast, beef, nuts, butter, whole grains and legumes. Niacin is also added to many enriched and fortified grain products.

TABLE 1.10: Marketed preparations of niacin

Marketed preparation	*Formulation*	*Manufacturer*
5 -HTPN	Capsule	Molekule India Pvt. Ltd.
Bilamide	Tablet	Johnson & Johnson
Nicocin ER	Tablet	Ordain Health Care Pvt. Ltd.
Neasyn-SR	Tablet	Torrent Pharmaceuticals Ltd.
Nialip	Capsule	Dr. Reddy's Laboratories Ltd.

☛ Vitamin B_6

It refers to three pyridines: pyridoxine, pyridoxal and pyridoxamine. These compounds are closely related and are converted to the biologically active coenzyme form of pyridoxal phosphate. In animal products, vitamin B_6 is found largely as pyridoxal and pyridoxamine. In plants the main form of vitamin B_6 is pyridoxine.

Functions:

i. It is important in proteins metabolism.
ii. It helps our body to make non-essential amino acids, or protein components, which are then used to make body cells.
iii. It helps in conversion of tryptophan amino acid into two important body substances: Niacin and serotonin.
iv. It helps to produce other body chemicals, including insulin, hemoglobin, and antibodies that fight infection.

Deficiency: Vitamin B_6 deficiency causes dermatitis, peripheral neuritis, retarded growth, loss of hair, premature greying of hair, convulsions, depression, nausea, or greasy and flaky skin.

Overconsumption: Large doses, taken over time, can cause nerve damage.

Daily requirement: The RDA is 1.3 mg daily for adult males and females through age 50 years. After age 50, the RDA increases

to 1.7 mg daily for males and 1.5 mg for females. The amount increases to 1.9 mg daily during pregnancy and 2.0 mg daily during breastfeeding.

Sources: Chicken, fish, pork, liver, and kidney are the best sources of vitamin B_6. Green vegetables, whole grains, soyabean, peanuts, banana, bran of cereals and legumes also supply reasonable amounts of vitamin B_6.

TABLE 1.11: Marketed preparations of vitamin B_6

Marketed preparation	*Formulation*	*Manufacturer*
Folikit	Tablet	Unique Life Sciences
Spera 69	Tablet	Indoco Remedies Ltd.
Genprot	Syrup	Cipla Pharmaceutical Limited
Swimor OD EC	Tablet	Swiss Pharma Pvt. Ltd.
Pyridoxine 50 mg	Tablet	Wockhardt Ltd.

☛ Pantothenic acid

Pantothenic acid, also called **vitamin B_5**, is a water-soluble B vitamin and an essential nutrient. Its name derives from the Greek *pantos*, meaning 'from everywhere', as small quantities of pantothenic acid are found in nearly every food. Pantothenic acid is the combination of pantoic acid and β-alanine. As a dietary supplement ingredient, it is commonly found as calcium pantothenate.

Functions:

i. Pantothenic acid is a component of coenzyme-A, which functions in acyl transfer reactions of the citric acid (Krebs) cycle.
ii. It helps our body cells to produce energy.
iii. It helps to metabolize or use proteins, and carbohydrates from food.
iv. It is also involved in the metabolism of lipids and in the synthesis of steroids.

Deficiency: Dietary deficiency of pantothenic acid is rare in healthy people. Symptoms of its deficiency are abdominal pain and soreness, nausea, personality changes, insomnia, impaired adrenal function, weakness and cramps in the legs, paresthesia of the hands and feet and impaired antibody production.

Overconsumption: Occasional diarrhea and water retention.

Daily requirement: The AI (adequate intake) for pantothenic acid is 5 mg daily for ages 14–18 and for adults. During pregnancy and breastfeeding, the AI increases to 6 and 7 mg, respectively.

Sources: It is widely available in food. Meat, poultry, fish, whole-grain cereals, and legumes are among the better sources. Milk, vegetables, and fruits also contain varying amounts.

TABLE 1.12: Marketed preparations of pantothenic acid (vitamin B_5)

Marketed preparation	*Formulation*	*Manufacturer*
Glentona	Syrup	Glenmark Pharmaceuticals Ltd.
Oxi Red	Red	Intra Labs India Pvt. Ltd.
Mittavin	Capsule	Nicholas Piramal India Ltd.
Optineuron	Tablet	Lupin Laboratories Ltd.
Supradyn	Tablet	Piramal Enterprises Ltd.

☛ Folic acid

Folate and folic acid (also called vitamin B_9) are forms of a water-soluble B vitamin. Folate occurs naturally in food, and folic acid is the synthetic form of this vitamin. Folic acid occurs either as free or bound folate form and often used in combination with other B vitamins.

Functions:

i. It plays an essential role in making new body cells.
ii. It works with vitamin B_{12} to form hemoglobin in red blood cells.
iii. It may help to protect against heart disease.
iv. It helps to lower the risk of delivering a baby with neural tube defects such as spina bifida, and it helps to control plasma homocysteine levels, which is associated with increased risk of cardiovascular disease.
v. It increases appetite.

Deficiency: Folate deficiency affects normal cell division and protein synthesis, especially impairing growth. Pregnant women, who do not get enough folate, especially during the first trimester, have a greater risk of delivering a baby with neural tube defects such as spina bifida (the neural tube in an embryo becomes the spinal cord and brain). To reduce risk, all women of child-bearing

age should consume adequate amounts. Deficiency of folate may also cause megaloblastic anemia, infertility or even sterility.

Overconsumption: Overconsuming can mask a vitamin B_{12} deficiency and may interfere with certain medications. Taking excess amounts as a dietary supplement offers no known benefits.

Daily requirement: For folate, the RDA for males from age 14 through adulthood is 400 μg daily. Women capable of becoming pregnant (14 to 50 years) should get 400 μg of folic acid daily from fortified foods, vitamin supplements, or a combination of the two, in addition to the folate found naturally in certain foods. Pregnancy increases the recommended amount to 600 μg daily and during breastfeeding, 500 μg are advised.

Sources: It is present in large amounts in fresh green leafy vegetables, cauliflower, liver, kidney and yeast. Orange juice, lentils, dried beans, spinach, broccoli, peanuts, and avocados are among the good sources of naturally occurring folate. Enriched grain products, such as most of breads, flour, crackers, corn grits, cornmeal, farina, rice, macaroni, and noodles must be fortified with folic acid. It is also synthesized by intestinal bacteria. Most of the folic acid is destroyed during cooking.

TABLE 1.13: Marketed preparations of folic acid

Marketed preparation	*Formulation*	*Manufacturer*
Olic	Tablet	Ozone Pharmaceuticals Ltd.
Foldivit	Tablet	Cadila Pharmaceuticals Ltd.
Folvite	Tablet	Wyeth Pharmaceuticals Ltd.
Folitab	Tablet	Intas Pharmaceuticals Ltd.
Vacofol	Tablet	Sandoz Pvt. Ltd.

☛ Vitamin B_{12}

Cyanocobalamin or vitamin B_{12} is a water-soluble vitamin synthesized exclusively by microorganisms.

Functions:

i. It works closely with folate to make red blood cells.
ii. It serves as a vital part of many body chemicals and so occurs in each body cell.
iii. It helps our body to use fatty acids and some amino acids.

Deficiency: It is mainly stored in liver in coenzyme forms and hence deficiency is rare. Deficiency of vitamin B_{12} causes megaloblastic anemia and may also result in fatigue, nerve damage, a smooth tongue, or very sensitive skin. Nutritional Megaloblastic Anemia (NMA) is common in India. Foods fortified with vitamin B_{12} or dietary supplements can prevent vitamin B_{12} deficiency.

A deficiency of vitamin B_{12} can also be masked, if extra folic acid is taken to treat or prevent anemia. People who develop pernicious anemia miss a body chemical called *intrinsic factor*. This problem can be medically treated with injections of vitamin B_{12}.

Overconsumption: No symptoms are known, but taking extra vitamin B_{12} to boost energy is useless.

Daily requirement: The RDA is 2.4 μg daily for adults. The recommendation increases to 2.6 μg daily during pregnancy and 2.8 μg daily during breastfeeding.

Sources: It is present in large amounts in animal products, liver, kidney, meat, eggs, fish, yeast, milk and cheese. It is also synthesized by bacteria in colon.

☛ Vitamin C (Ascorbic acid)

Functions:

i. It works as an antioxidant to inhibit damage to body cells.
ii. It helps in the formation of collagen, or the intracellular cement substance, which is necessary for body growth, tissue repair and wound healing.
iii. It helps to keep capillary walls and blood vessels firm, and so protects our body from bruising.
iv. It helps our body to absorb iron and copper from plant sources of food.
v. It helps to keep our gums healthy.
vi. It helps in the synthesis of adrenaline and hydrocortisone.
vii. It protects us from infection by stimulating the formation of antibodies, which boost our body immunity.
viii. Vitamin C may also play a role in membrane permeability, leukocyte function and prevention of accumulation of histamine in the body.
ix. Roles of ascorbic acid in prevention of common cold and protection against infection are yet to be proved scientifically.

Deficiency: A severe deficiency of vitamin C leads to scurvy. Its deficiency also causes anemia, joint pain, hemorrhages in skin and other hemorrhages. Wounds may not heal properly either. Because

vitamin C rich foods are widely available, so its deficiency is no longer a common deficiency.

Overconsumption: Since vitamin C is water-soluble, our body excretes the excess. Very large doses may cause kidney stones and/or diarrhea, and for those with iron overload, excessive vitamin C (which enhances iron absorption) can worsen the problem.

Daily requirement: The RDA for females and males ages 14–18 is 65 mg and 75 mg of vitamin C daily, respectively. Adult males need 90 mg daily; adult females, 75 mg of vitamin C daily for everyday needs (about the amount in 3/4 cup of orange juice). Women need somewhat more during pregnancy (80 to 85 mg) and breastfeeding (115 to 120 mg). For people who smoke, the RDA for vitamin C is increased by 35 mg daily to help counteract the oxidative damage from nicotine.

Sources: Vitamin C mainly comes from plant sources of food. All citrus fruits, including oranges, grapefruits, and tangerines, are good sources. *Amla* is one of the richest sources of ascorbic acid. Many other fruits and vegetables, including berries, melons, peppers, fresh green and leafy vegetables, potatoes and tomatoes also supply significant amounts.

TABLE 1.14: Marketed preparations of vitamin C

Marketed preparation	***Formulation***	***Manufacturer***
Celin	Tablet	Glaxosmithkline Pharmaceuticals
Cell-c, Limcee	Tablet	Nicholas Piramal India Ltd.
Chewcee	Tablet	Wyeth Ltd.
Redoxon	Tablet	Nicholas Piramal India Ltd.
Cecon	Drops	Pfizer Limited (Pharmacia India Pvt. Ltd).

☛ Vitamin B_7 (Biotin)

Biotin is a water-soluble B-vitamin that helps our body convert food into energy. It is especially important during pregnancy and breastfeeding. In addition, biotin is important for the health of our hair, skin and nails.

Functions:

i. It helps our body to produce energy in cells.
ii. It helps in metabolism of proteins, fats, and carbohydrates.

Deficiency: Poor growth, loss of muscular control, loss of appetite, hair fall, weakness,

Overconsumption: Not reported.

Daily requirement: The adequate intake (AI) for biotin is 30 μg daily for adult males and females, including during pregnancy. The AI increases to 35 μg daily during breastfeeding.

Sources: Biotin is found in a wide variety of foods. Egg yolk, fish, milk, yeast breads, nuts, honey, liver, meat and cereals are among the best sources.

TABLE 1.15: Marketed preparations of biotin

Marketed preparation	*Formulation*	*Manufacturer*
Apotin	Tablet	Apotex Life Sciences
Axytin	Tablet	Axyzen Life Sciences
Beten forte	Tablet	Dr. Derma Expert Skin Care & Cure
Weltin	Capsule	Articon Labs
Wintin	Tablet	Dermawin Pharmaceuticals

TABLE 1.16: Major food sources, function, deficiency and toxicity symptoms of water-soluble vitamins

Vitamin	*Major food sources*	*Function*	*Deficiency symptoms*	*Toxicity symptoms*
Ascorbic acid (vitamin C)	Infant formula; citrus fruits; papaya; strawberries; vegetables (potatoes; cabbage)	Essential in the synthesis of collagen and thus; strengthens tissues and improves wound healing and resistance to infection; iron absorption and transport; antioxidant	Scurvy; pinpoint peripheral haemorrhages; bleeding gums; diarrhea	Nausea; abdominal cramps; diarrhea; possible formation of kidney stones
Thiamin (vitamin B_1)	Breast milk; infant formula; lean	Combines with phosphorus to form thiamin	Beriberi; neuritis; edema;	

Contd.

TABLE 1.16: Major food sources, function, deficiency and toxicity symptoms of water-soluble vitamins *(Contd.)*

Vitamin	*Major food sources*	*Function*	*Deficiency symptoms*	*Toxicity symptoms*
	pork; wheat germ; whole-grain and enriched breads; cereals; and other grain products; legumes; potatoes	pyrophosphate (TPP) necessary for metabolism of protein; carbohydrate; and fat; essential for growth; normal appetite; digestion; and healthy nerves	cardiac failure	
Riboflavin (Vitamin B_2)	Meat; dairy products; egg yolk; legumes; green vegetables; whole-grain breads; cereals; and fortified or enriched grain products	Essential for growth; plays enzymatic role in tissue respiration and acts as a transporter of hydrogen ions; synthesis of FMN and FAD	Photophobia; cheilosis; glossitis; corneal vascularization; poor growth	
Niacin (Vitamin B_3)	Meat; poultry; fish; whole-grain breads; cereals; and fortified or enriched grain products; egg yolk	Part of the enzyme system for oxidation; energy release; necessary for synthesis of glycogen and the synthesis and breakdown of fatty acids	Pellegra: dermatitis; diarrhea; dementia	Transient due to the vasodilating effects of niacin; flushing; tingling; dizziness; nausea; liver abnormalities; hyperuricemia; decreased

Contd.

TABLE 1.16: Major food sources, function, deficiency and toxicity symptoms of water-soluble vitamins *(Contd.)*

Vitamin	*Major food sources*	*Function*	*Deficiency symptoms*	*Toxicity symptoms*
				LDL and increased HDL cholesterol
Pyridoxine (vitamin B_6)	Liver; meat; whole-grain breads; cereals; or other grain products; legumes; potatoes	Aids in the synthesis and breakdown of amino acids and unsaturated fatty acids from essential fatty acids; essential for conversion of tryptophan to niacin; essential for normal growth	Microcytic anemia; convulsions; irritability	Sensory neuropathy with progressive ataxia; photo sensitivity
Biotin (vitamin B_7)	Infant formula; liver; meat; egg yolk; yeast; bananas; most vegetables; strawberries; grapefruit; watermelon;	Essential component of enzymes; important in reactions involving the lengthening of carbon chains; coenzyme carrier of carbon dioxide; plays an important role in the metabolism of fatty acids and amino acids	Seborrheic dermatitis; glossitis; nausea; insomnia;	
Cyano-cobalamin (vitamin B_{12})	Meat; fish; poultry; cheese; egg yolk; liver	Essential for biosynthesis of nucleic acids and	Pernicious anemia; neurologic deterioration	

Contd.

TABLE 1.16: Major food sources, function, deficiency and toxicity symptoms of water-soluble vitamins *(Contd.)*

Vitamin	*Major food sources*	*Function*	*Deficiency symptoms*	*Toxicity symptoms*
		nucleoproteins; red blood cell maturation; involved with folate metabolism; central nervous system metabolism		
Folic acid	Liver; green leafy vegetables; legumes; whole-grain breads; cereals; and fortified or enriched grain products; legumes; oranges; cantaloupe; lean beef	Essential in the biosynthesis of nucleic acids; necessary for the normal maturation of red blood cells	Poor growth; megalo-blastic anemia	Masking of B_{12} deficiency symptoms in those with pernicious anemia not receiving cyano-cobalamin

The recommended vitamins intake for individuals are summarized in Table 1.18.

3. Minerals

A number of minerals are essential for body functions. They are classified as *macro*minerals or *micro*minerals (trace elements) depending on their dietary requirement. The macrominerals include calcium, phosphorus, potassium, sodium, chloride, sulfur and magnesium. The trace elements include copper, cobalt, chromium, fluorine, iodine, iron, manganese, molybdenum, nickel, selenium, silicon, tin, vanadium and zinc. Minerals may function as cofactors of enzymes, as components of organic compounds and as structural components of bones and teeth and are catalysts for many

TABLE 1.17: Major food sources, function, deficiency and toxicity symptoms of fat-soluble vitamins

Nutrient	*Major food sources*	*Function*	*Deficiency symptoms*	*Toxicity symptoms*
Vitamin A	Breast milk, infant formula, liver, egg yolk, dark green and deep yellow vegetables and fruits	Preserves integrity of epithelial cells; formation of rhodopsin for vision in dim light; wound healing, growth, and normal immune function	Night blindness, dry eyes, poor bone growth, impaired resistance to infection, papillary hyperkeratosis of the skin	Fatigue; night sweats; vertigo; headache; dry and fissured skin; lips; hyperpigmentation; retarded growth; bone pain; abdominal pain; vomiting; jaundice; hypercalcemia
Vitamin D	Egg yolk, liver, fatty fish, sunlight	Bone formation; promotes the absorption of calcium and phosphorus in the intestine	Rickets (symptoms: costochondral beading, epiphyseal enlargement, cranial bossing, bowed legs, persistently open anterior fontanelle)	Abnormally high blood calcium (hypercalcemia), retarded growth, vomiting, nephrocalcinosis
Vitamin E	Vegetable oils; liver; egg yolk; butter; green leafy vegetables; whole-grain breads, cereals, and other fortified or enriched grain products; wheat germ	Antioxidant in the tissues; coenzyme; neuromuscular function	Hemolytic anemia in the premature and newborn; hyporeflexia, and spinocerebellar and retinal degeneration	Prolonged bleeding and clotting time.
Vitamin K	Vegetable oils, green leafy vegetables, pork, liver	Catalyzes prothrombin synthesis; required in the synthesis of other blood clotting factors	Prolonged bleeding and prothrombin time; hemorrhagic manifestations	Possible hemolytic anemia; jaundice

TABLE 1.18: Recommended vitamins intake for individuals

Age group (years)	*A RDA(DV) (µg/d)*	*C RDA(DV) (µg/d)*	*D RDA(DV) (µg/d)*	*E RDA(DV) (µg/d)*	*K RDA(DV) (µg/d)*	*Thiamine RDA(DV) (mg/d)*	*Riboflavin RDA(DV) (mg/d)*	*Niacin RDA(DV) (mg/d)*	*B_6 RDA(DV) (mg/d)*	*B_{12} RDA(DV) (µg/d)*	*Folic acid RDA(DV) (µg/d)*	*Biotin RDA(DV) (µg/d)*
Males												
19–70 y	900 (900)	90 (90)	15 (20)	15 (15)	120 (120)	1.2 (1.2)	1.3 (1.3)	16 (16)	1.3 (1.7)	2.4 (2.4)	400 (400)	30 (30)
Females												
19–70 y	700 (900)	75 (90)	15 (20)	15 (15)	90 (120)	1.1 (1.2)	1.1 (1.3)	14 (16)	1.3 (1.7)	2.4 (2.4)	400 (4000)	30 (30)
Pregnancy												
19–50 y	770 (1300)	85 (90)	15 (15)	15 (19)	90 (90)	1.4 (1.4)	1.4 (1.6)	18 (18)	1.9 (2)	2.6 (2.8)	600 (600)	30 (35)
Lactation												
19–50 y	1300 (1300)	120 (120)	15 (15)	19 (19)	90 (90)	1.4 (1.4)	1.6 (1.6)	17 (18)	2.0 (2)	2.8 (2.8)	500 (600)	35 (35)

**RDA-Recommended Daily Allowance *DV-Daily Value*

biological processes. Minerals may also participate in contraction and conduction of nerve impulses.

A. Macrominerals

☛ Calcium

Calcium is the most abundant cation in the human body. The body of an adult usually contains about 1200 g of calcium. More than 99% of the calcium is present in bones and teeth. The remaining 1% of total body calcium is necessary for a variety of metabolic processes including enzyme activation, hormone function, nerve transmission, muscle contraction, blood clotting and membrane transport.

Sources: Milk and milk products are the richest dietary sources of calcium. Lesser amounts of calcium are found in shellfish, egg yolk, canned sardines and salmon (with bones), soybeans and certain green leafy vegetables such as spinach, turnip and mustard greens, broccoli and kale. As a result of fortification, infant cereals are excellent sources of calcium. More recently, the fortification of foods such as orange juice and flour has become additional sources of calcium in the diet. In hard water areas, drinking water may also be a significant source.

Deficiency: Indian diets are poor in calcium. Calcium deficiency may occur in infants who are breast fed by mothers suffering from vitamin D deficiency. Calcium deficiency may occur in pregnant and lactating women. Low dietary calcium intake may produce rickets and osteomalacia. Severe calcium deficiency in children may also result in stunted growth, muscle weakness, parathyroid hyperplasia, hyperirritability, tetany and death.

☛ Magnesium

The human body contains 20 to 28 g of magnesium. About 55% is present in bone while 27% is found in muscles. The remainder is found in the cells and extracellular fluids. Magnesium performs a vital role in the enzymatic reactions involving ATP (adenosine triphosphate). It is needed for the activation of thiokinases used in fatty acid oxidation as well as amino acid acyl synthetases. Magnesium is required for protein synthesis. It plays a role in maintenance of cell membranes and neuromuscular transmission.

Sources: Magnesium occurs widely in foods, particularly those of plant origin. Sources include green vegetables (magnesium is a component of chlorophyll), cereals, grains, meat, milk, seafood,

cocoa and nuts. Plasma magnesium concentrations range from 2 to 3 mg/dL.

Deficiency: Due to the abundance of magnesium in the food supply, primary magnesium deficiency is rare. Magnesium deficiency results in hypocalcemia and hypokalemia. Its deficiency affects the gastrointestinal, neuromuscular, cardiovascular and hematologic systems. Dysphagia, anemia, cardiac arrhythmias, tremors, weakness, failure to thrive and psychiatric disturbances may be present. Magnesium deficiency ultimately results in tachycardia, fibrillations, convulsions and death.

☛ Phosphorus

The phosphorus content of an adult man is approximately 700 g. About 80% of the body's phosphorus is found in bone as calcium phosphate and hydroxyapatite. In the bone the phosphorus to calcium ratio is 1 : 2. There is no free elemental phosphorus in the body. It is present as a constituent of various lipids, proteins, carbohydrates, enzymes, nucleic acid and ATP. In its ionic form, phosphorus serves to modify acid–base balance in the blood. Phosphorus acts as a cofactor in a number of enzyme systems involved in carbohydrate, protein and fat metabolism. Phosphorus is important as a component of phospholipids in cell membranes, lipoproteins, etc. and is involved in the renal excretion of hydrogen ions.

Sources : Protein foods of animal origin such as meat, fish, poultry and eggs are excellent sources of phosphorus. Milk and cheese are good sources of phosphorus.

Deficiency: Phosphorus deficiency has been reported in individuals consuming a prolonged and excessive intake of non-absorbable antacids, which bind dietary phosphorus preventing its absorption. Symptoms of phosphorus deficiency include weakness, anorexia, malaise and pain in the bones. Hemolytic anemia, granulocyte dysfunction, erythrocyte glycolysis, neurologic and psychiatric disorders, hypercalciuria and renal calculi may also result from phosphorus deficiency.

☛ Sodium and Potassium

Sodium and potassium are essential for normal growth and body functions. Sodium is the predominant extracellular electrolyte and potassium is the major intracellular cation. They are both involved in regulating water- and acid–base balance, in membrane permeability, nerve conduction and muscle action. Changes in

extracellular sodium concentration can affect arterial pressure, whereas changes in blood potassium concentration can affect cardiac performance.

Sources: Sodium and potassium are widely distributed in foods. Dietary sources of sodium include table salt (sodium chloride) and sodium-based food additives used in commercially processed and cured foods. Foods that have relatively high levels of naturally occurring sodium include milk and milk products, meat, fish (particularly ocean fish), seafood, poultry and eggs. Good sources of potassium are meat, poultry, fish, organ meats, milk and milk products and certain fruits and vegetables. High potassium fruits include avocado, banana, apricot, dried fruit, melons and oranges. Some high potassium vegetables are broccoli, brussels sprouts, parsnips, squash, potatoes, dry beans and peas.

Deficiency: Deficiency of both sodium and potassium under ordinary conditions is virtually unknown. However, in excessive sweat loss, severe vomiting and diarrhea, and in renal pathology; depletion of sodium can result in muscular cramps, mental confusion, apathy, anorexia and coma. Potassium depletion, which occurs when using diuretics, will cause muscular weakness, cardiac arrhythmia and mental confusion.

B. Trace elements

☛ Fluoride

Traces of fluoride are normally present in human tissues, notably in the bones, teeth, thyroid gland and skin. Fluoride is essential for the normal mineralization of bones and formation of dental enamel. The primary significance of this element in human nutrition is in the prevention of dental caries. Fluoride reduces the risk of tooth decay.

Drinking water should usually contain 1 ppm of fluorine. Less than 0.5 ppm of fluorine in water leads to dental carries, whereas excessive amounts lead to endemic fluoresces.

Sources: Most human adults ingest between 2 and 3 mg of fluorine daily. The chief source is usually drinking water, which, if it contains 1 ppm of fluorine, will supply 1 to 2 mg/day and will confer optimal protection against tooth decay. Compared with this source, the fluoride in foodstuffs is of a little importance. Very few foods contain more than 1 ppm; the exception is sea fish, which may contain relatively large amounts in the order of 5 to 10 ppm. Another significant source is tea, particularly Chinese tea, which

in the dry state, may contain as much as 100 ppm. In Britain and Australia, where tea is a popular beverage, the adult intake from this source may be as much as 1 mg daily.

Commercial baby foods generally contain less than 0.1 ppm fluoride. A significant source of fluoride for preschool children is fluoridated toothpaste. As the practice of tooth brushing becomes more widespread among preschool children, probably 75% of children may be using toothpaste by 18 months of age.

The Committee on Nutrition of the American Academy of Pediatrics recommends that infants in non-fluoridated areas (water less than 0.3 ppm) be given a fluoride supplement from about 2 weeks of age. The dosage depends on the concentration of fluoride in the local drinking water.

Deficiency: Mottling of teeth, deformity in bones (Hunch back).

☛ Iodine

Iodine is essential for all animals, including humans. Iodine is required as a component of the thyroid hormones thyroxine (T_4) and triiodothyronine (T_3). Thyroxine and triiodothyronine are required for normal energy metabolism, thermoregulation, intermediary metabolism, protein synthesis, reproduction, growth, physical and mental development, hematopoiesis and neuromuscular function. The adult human body contains 10–20 mg iodine. About 70–80% of the iodine is concentrated in the thyroid gland. The remainder is distributed throughout the body with higher concentrations occurring in the salivary and gastric glands as well as in the dense connective tissue.

Sources: The best sources of iodine are seafood and seaweed, which are of limited significance in Western diets. Meat, milk and eggs may also provide iodine; their iodine content is influenced by the iodine provided in the animal feed. Soils of coastal areas are rich in iodine. Food fortification with iodine has been most effective in the eradication of iodine deficiency. In Canada, table salt must contain 0.01% potassium iodide. In the United States, where non-iodized salt is also available, iodized salt contains 76 μg iodine per gram of salt. Since the introduction of iodized salt, goiter resulting from iodine deficiency has been virtually eliminated. Certain foods such as cabbage, rutabaga, and other members of the Brassica family contain *goitrogens*, which interfere with thyroid hormone synthesis. The uptake, synthesis and release of iodine by the thyroid gland is stimulated by thyroid stimulating hormone (TSH) released by the anterior pituitary gland.

Deficiency: Iodine deficiency is the most common cause of endemic goiter, abortion, infant death and cretinism in the world. Endemic goiter is one of the most prevalent nutritional deficiency problems that afflict millions of people in many parts of the world. Iodine deficiency results in enlargement of the thyroid gland (goiter). Severe iodine deficiency can produce myxedema, which is characterized by a dry, waxy type swelling, with abnormal deposits of mucoproteins under the skin.

Toxicity: Excessive dietary intake of iodine results in inhibition of thyroid hormone synthesis clinically known as the *Wolff-Chaikoff effect*. Generally, the body will adapt to the higher intake but in a few individuals the effect continues and the individual develops a goiter. *Hyperthyroidism* resulting from excessive iodine intake is characterized by increased basal metabolism, goiter and disturbances in the autonomic nervous systems causing hyperirritability and increased creatinine metabolism.

☛ Iron

Iron is an essential element in all cells of the body. It plays a key role in oxygen transport and cellular respiration as a constituent of hemoglobin, myoglobin and the enzymes—cytochrome oxidase, peroxidase and catalase. Iron in the cellular cytochrome system is required for energy metabolism. In the adult male, total body iron amounts to 3.5 to 5.0 g. In the premenopausal woman approximately 2.5 g of iron is normally present.

Sources: Good sources of iron include liver, heart, kidney, red meats, shell fish, egg yolk, dried beans, other legumes, dried fruits, nuts, green leafy vegetables, dark molasses and whole grain cereals. Iron-fortified cereal and cereal products such as flour, bread, infant- and breakfast cereals are also good sources when consumed as a dietary staple. Cow's milk is a poor source of iron as the iron in milk is poorly absorbed. Although breast milk supplies only about 0.5 to 0.8 mg of iron per day, the bioavailability of its iron is high. Normally, an infant born with an adequate store of iron will receive sufficient iron from breast milk in the first 4 to 6 months of life. Thereafter, additional sources such as iron-fortified infant cereals and other iron-rich baby foods are required.

Deficiency: Iron deficiency is one of the most prevalent nutritional problems in the world. Vegetable diets in India are mostly poor in iron content. The populations most susceptible to iron deficiency

problem are infants and young children, menstruating females, pregnant women and individuals on energy restricted diets and older people. Iron deficiency leads to anemia, i.e. reduction in the hemoglobin content of RBCs. Hemoglobin contains iron and hence deficiency of iron in diet causes a deficiency in hemoglobin content. Hemoglobin carries oxygen in the blood and therefore in iron deficiency anemia oxygen reduction in the blood causes sluggishness and fatigue and diminishes work and physical performance.

Iron deficiency is characterized by weakness, fatigue, poor work performance and changes in behavior.

Toxicity: Excessive iron ingestion may result in hemosiderosis or deposition of iron in the tissues without harmful effect. Prolonged excessive intake may result in hemochromatosis in which further iron storage results in tissue damage, particularly the liver and the pancreas. Hyperpigmentation of the skin is another feature of this disorder.

The recommended minerals intake for individuals are summarized in Table 1.19.

The requirement of nutrients for pregnant and lactating women is usually greater. Similarly these requirements also vary according to the age group like infants, children, adolescents and adults (Table 1.20).

TABLE 1.19: Recommended minerals intake for individuals

Age group	*Ca (mg/day)*	*Mg (mg/day)*	*P (mg/day)*	*F (mg/day)*	*I (µg/day)*	*Fe (mg/day)*
Children						
1–3 y	600	50	460	0.7	90	9
4–8 y	600	70	500	1	90	13
Male						
19–70 y	600	340	700	4	150	17
Female						
19–70 y	600	310	700	3	150	21

Marketed preparations containing different minerals are given in Table 1.21.

TABLE 1.20: Major food sources, functions, deficiency and toxicity symptoms of minerals

Mineral	*Major food sources*	*Function*	*Deficiency symptoms*	*Toxicity symptoms*
Calcium	Yogurt, cheese, some green leafy vegetables such as collards, kale mustard greens, and turnip greens, tofu (if made with calcium sulfate), salmon	Builds and maintains bones and teeth; essential in clotting of blood; influences transmission of ions across cell membranes; required in nerve transmission	Rickets; abnormal development of bones.	Excessive calcification of bone; calcification of soft tissue; hypercalcemia; vomiting; lethargy
Magnesium	Whole-grain breads, cereals, and other grain products; tofu; legumes; green vegetables	Required for many coenzyme oxidation-phosphorylation reactions, nerve impulse transmissions, and for muscle contraction	Muscle tremors; convulsions; irritability; tetany; hyper- or hypo-flexia	Diarrhea; transient hypocalcemia
Phosphorus	Cheese; egg yolk; meat; poultry; fish; whole-grain breads, cereals, and other grain products; legumes	Builds and maintains bones and teeth; component of nucleic acids, phospholipids; as coenzyme functions in energy metabolism; buffers intracellular fluid	Phosphate depletion unusual effects, renal, neuromuscular, skeletal systems as well as blood chemistries	Hypocalcemia (when parathyroid gland not fully functioning)
Sodium	Sodium chloride (table salt), abundant in most foods except fruit	Helps regulate acid–base equilibrium and osmotic pressure of body fluids; plays a role in normal muscle irritability and contractility; influences cell permeability	Nausea; cramps; vomiting; dizziness; apathy; exhaustion; possible respiratory failure	

Contd.

TABLE 1.20: Major food sources, functions, deficiency and toxicity symptoms of minerals *(Contd.)*

Mineral	*Major food sources*	*Function*	*Deficiency symptoms*	*Toxicity symptoms*
Potassium	Fruits especially orange juice, bananas, and dried fruits; yogurt; potatoes; meat; fish; poultry; soy products; vegetables	Helps regulate acid–base equilibrium and osmotic pressure of body fluids; influences muscle activity, especially cardiac muscle	Muscle weakness; decreased intestinal tone and distension; cardiac arrhythmias; respiratory failure	
Iron	Meat; liver; legumes; whole-grain breads, cereals, or fortified or enriched grain products; and dark green vegetables	Essential for the formation of hemoglobin and oxygen transport; increases resistance to infection; functions as part of enzymes involved in tissue respiration	Hypochromic microcytic anemia; malabsorption; irritability; anorexia; pallor; lethargy	Hemochromatosis; hemosiderosis.
Zinc	Meat; liver; egg yolk; oysters and other seafood; whole-grain breads, cereals, legumes	Component of many enzyme systems and insulin	Decreased wound healing, hypogonadism, mild anemia, decreased taste acuity, hair loss, diarrhea, growth failure, skin changes	Acute gastrointestinal upset; vomiting; sweating; dizziness; copper deficiency
Fluoride	Fluoridated water	Helps protect teeth against tooth decay; may minimize bone loss	Increased dental caries	Mottled, discolored teeth; possible increase in bone density; calcified muscle insertions and exotosis

Contd.

TABLE 1.20: Major food sources, functions, deficiency and toxicity symptoms of minerals *(Contd.)*

Mineral	*Major food sources*	*Function*	*Deficiency symptoms*	*Toxicity symptoms*
Iodine	Seafood, iodized salt	Helps regulate thyroid hormones; important in regulation of cellular oxidation and growth	Endemic goiter; depressed thyroid function; cretinism	Possible thyroid enlargement
Chloride	Sodium chloride (table salt)	Helps regulate acid–base equilibrium and osmotic pressure of body fluids; component of gastric juices	Usually accompanied by sodium depletion	

TABLE 1.21: Marketed preparations containing different minerals

Marketed preparation	*Formulation*	*Manufacturer*
Prenatal	Capsule	Wyeth Ltd.
Polybion	Injection	Merck Ltd.
Sandocal plus	Tablet	Novartis India Ltd.
Ossidos-t	Tablet	Wockhardt Ltd.
Macalvit	Syrup	Novartis India Ltd.

Fortunately several marketed formulations containing multivitamins plus minerals are available, which meet the nutritional requirement of both, vitamins as well as minerals (Table 1.22). Such preparations are easier to administer and hence have better compliance. Drops and syrups are particularly useful in children.

TABLE 1.22: Marketed preparations containing multivitamins + minerals

Marketed preparation	*Formulation*	*Manufacturer*
ABCD	Drop	Geneka Biotech
Kenimix	Syrup	Kendall Health Care
Menal	Tablet	Essay Bee Pharma
MMG	Syrup	Amro Pharma
Provit	Tablet	Hitech Formulation

MALNUTRITION

Malnutrition is a condition that results from nutrients deficiency or overconsumption. Malnutrition may affect any person, but following persons are at a higher risk:

1. Individuals with increased nutrient needs, especially children and pregnant or breastfeeding women.
2. Poor people having low socioeconomic status.
3. Older adults.
4. People with issues such as Crohn's disease or ulcerative colitis that affect nutrient absorption.

Types of malnutrition include

a. **Undernutrition:** This type of malnutrition results from not getting enough protein, calories or micronutrients including vitamins and minerals, especially iron, zinc, vitamin A and

iodine. It leads to low weight-for-height (wasting), low height for age (stunting) and low weight for age (underweight) and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals). Undernutrition can increase your risk of death.

b. **Overnutrition:** Overconsumption of certain nutrients, such as protein, calories or fat, can also lead to overnutrition. This usually results in overweight or obesity and diet-related noncommunicable diseases (such as heart disease, stroke, Type 2 diabetes and cancer). Overnutrition results from the overconsumption of high calories food such as fried and sugary foods, tend to be high in calories and fat. Even micronutrient deficiencies can also occur with overnutrition in case where the persons take excessive calorie but not get enough vitamins and minerals at the same time.

Both types of malnutrition (undernutrition and overnutrition) can lead to health problems and nutrient deficiencies, if not addressed.

Signs and Symptoms of Malnutrition

The signs and symptoms of malnutrition depend on the type of nutrition.

Undernutrition results from insufficient intake of nutrients in diet. Main symptoms of undernutrition are as follows:

1. Weight loss.
2. Loss of fat and muscle mass.
3. Hollow cheeks and sunken eyes.
4. A swollen stomach.
5. Dry hair and skin.
6. Delayed wound healing.
7. Fatigue.
8. Difficulty in concentrating.
9. Irritability.
10. Depression and anxiety.

Some of the most common nutrient deficiencies and their symptoms are given in Tables 1.16, 1.17 and 1.19.

Assessment of Malnutrition

Various parameters to assess malnutrition include weight changes, body mass index (BMI) charts, blood tests for micronutrient status and physical exams. BMI is a measure of body fat based on height and weight that applies to adult person. People with a BMI under 18.5 are at risk of being malnourished and over 30 are suffering from obesity.

Common Causes of Malnutrition

1. Lack of access to sufficient food.
2. Digestive problems.
3. Malabsorption of nutrients due to certain health conditions such as Crohn's disease, celiac disease and bacterial overgrowth in the intestine.
4. Excessive alcohol consumption.
5. Mental health disorders.
6. Poor mobility.

Prevention of Malnutrition

1. Take iron, zinc and iodine pills as supplements.
2. Eat healthy food rich in carbohydrates, proteins, fats, vitamins, minerals and water.
3. Exercise daily.

Treatments for Malnutrition

Treatment for malnutrition (undernutrition) depends on the underlying cause of malnutrition. Malnutrition can be treated at home with the support of dietitian or other qualified healthcare professional. In severe cases, treatment in hospital may be needed.

1. **Dietary changes and supplements:**
   a. Eating a healthy and balanced diet rich nutrients.
   b. Follow a tailored diet plan created with the help of dietitian.
   c. Eat 'fortified' foods that contain extra nutrients.
   d. Do snacking between meals.
   e. Take drinks full of calories are also helpful.
   f. Take extra nutrients in the form of supplements.
2. **Feeding tubes:** It is an alternative way of giving nutrients in case a person has dysphagia. In this case, feeding is done through nasogastric tube (tube passed through nose into stomach) or percutaneous endoscopic gastrostomy (PEG) tube (a tube placed directly into stomach or gut through the skin on tummy) or parenteral nutrition.
3. **Care and support services:** Some malnourished people with limited mobility need extra care and support that may be given by
   a. Home care visitors to shop for food or cook.
   b. Occupational therapy by an occupational therapist who can identify problems with daily activities and help to find solutions.

c. 'Meals on Wheels' or meals at home service by the local authority.
d. Speech and language therapy by a speech therapist who can teach exercises to help with swallowing problems and advice foods that are easy to swallow.

4. **Treating malnutrition in children:**
   a. Increased intake of foods high in energy and nutrients.
   b. Support for families to help them manage factors affecting the child's nutritional intake.
   c. Treatment for any underlying medical conditions causing malnutrition.
   d. Vitamin and mineral supplements.
   e. High-energy and protein nutritional supplements.
   f. Regular monitoring of treatment by keeping a watch over weight and height measurements of children.

BALANCED DIET

The main purpose of food consumed by man is to provide energy for growth, maintenance of body functions, and work. This energy is obtained from carbohydrates, fats and protein.

A **diet** is the kind of food on which a person or group lives. A **balanced diet** is one that contains a variety of foods in such quantity and proportion as to meet the need for energy, amino acids, vitamins, minerals, fats, carbohydrates and other nutrients; to maintain health, vitality and general well-being. It also makes a small provision for extra nutrients to withstand short duration of leanness. A balanced diet is a means of protecting the population from nutritional deficiencies.

Any balanced diet should meet (i) the daily requirement of proteins (equivalent to 15–20% of daily energy intake), (ii) fat requirement (equivalent to 20–30% of daily energy intake), (iii) carbohydrates rich in natural fiber to constitute remaining food energy, and (iv) the requirement of micronutrients.

Dietary preference of individuals, groups, communities, etc. are variable according to local economy, culture, taste, habits, religions, customs, climatic conditions, etc. Balanced diet formulated by Indian Council of Medical Research (ICMR) is given in Table 1.23.

In the wake of the COVID-19 pandemic, people are now increasingly becoming aware of the importance of healthy food to increase immunity and to keep communicable diseases at

TABLE 1.23: Balanced diet formulated by ICMR

Food item (g)	*Adult man (moderate work)*	*Adult woman (moderate work)*	*Boys (10–12 yr.)*	*Girls (10–12 yr.)*	*Children (1–3 yr.)*	*Children (10–12 yr.)*
Cereals	520	440	420	380	175	270
Pulses*	50	45	45	45	35	35
Leafy vegetables	70	40	50	50	20	30
Roots and Tubers	60	50	30	30	10	20
Milk	200	150	250	250	300	250
Oil and fat	45	25	40	35	15	25
Sugar or jaggery	35	20	45	45	30	40

*In case of non-vegetarians 50% of pulses can be substituted by (i) one egg or 30 g of meat or fish, (ii) additional 5 g of fat or oil; 100% of pulses can be substituted by (i) two eggs or 50 g of meat or fish, (ii) additional 10 g of fat or oil.

bay. A balanced diet is considered as the key to prevent most of the nutritional deficiency diseases and viral/other infections (communicable diseases). In this context a community pharmacist can play a key role in educating the general public about different aspects of nutrition and health.

SOCIOLOGY AND HEALTH

Social life affects morbidity and mortality rate, and vice versa. **Health sociology** examines the interaction between society and health. It discusses health and illness in relation to social institutions such as family, employment, and school. It limits its concern to the patient–practitioner relationship and the role of health professionals in society. The sociology of health and illness covers sociological pathology (causes of disease and illness), reasons for seeking particular types of medical aid, and patient compliance or noncompliance with medical regimes. There is a relationship between health and social factors as environmental conditions surrounding man and affects his health, traditions, lifestyle behaviors, self-treatment, values, customs and cultures. It

is concerned also with the distribution of healthcare services and in particular the inequalities in healthcare (health disparities).

Sociocultural Factors Related to Health and Disease

Sociologists have demonstrated that social life has an impact on health, morbidity and mortality rate, and vice versa. There has been a long-term decline in mortality within industrialized societies, and on average, mortality rates are considerably higher in undeveloped societies than developed and developing. Spread of diseases is heavily influenced by the socioeconomic status of individuals, ethnic, traditions or beliefs, and other cultural factors. There are evident differences in patterns of health and illness across societies, over time, and within particular society types. Important socio-cultural factors are discussed below.

1. **Family:** Family has the greatest influence on a person's attitude towards health, and also influences a person's behavior choices relating to food and health. For example, in a house where parents eat fast food frequently their children are more likely to eat it even if they know it is not healthy. On the other hand, if a family is health conscious, then their children are more likely to prioritize healthy eating and exercise.
2. **Peers:** Human beings need each other for survival and attainment of both positive and negative aspects of life. The status of health in particular is usually a reflection of the effects of peers particularly in teenagers as they spend more of their free time with friends. Peer pressure can have negative and positive effects on health of a person. For example, if a person spends time with friends and peers who pay no attention to hygiene practices and have unhealthy habits like smoking, then the person is most likely to have negative outlook on the issue of cleanliness and healthy lifestyles. On the other hand, peers can improve health if your groups have lots of protective behaviors.
3. **Media:** The media is one of the sociocultural factors that determine health. The media plays a significant role in shaping health. This can be done through marketing campaigns or advertising through news articles or TV shows.
4. **Religion:** Religion influences our health more often in a positive manner. It can provide greater social support, enhanced self-esteem, and can reduce the negative effects of stress on health. Most religions also have rules, such as no intake of alcohol, no cigarette smoking and drug abuse, no premarital sex, no extramarital affairs that boost protective behaviors in

individuals and promote health. Conversely, religion can also be limiting. Certain religions put restrictions on clothes and social interactions, which can have negative effects on the health of the individual, e.g. a monk who takes a vow of silence and lives in isolation will lack social interaction. Religion can also limit one's choices in relation to healthcare, e.g. choice of vegetarian or non-vegetarian food.

5. **Culture:** Culture refers to an integrated pattern of belief, traditions, values, and behavior including traditional foods or social activities. It is the family, which passes the culture to next generations. A sense of connection and belonging to our culture may have a positive influence in improving the social dimension of health. Many cultures have traditional food that may affect health. The Mediterranean cultures have a diet rich in healthy fats and vegetables leading to lower rates of cardiovascular diseases. They have a high value for family and community increasing social health. The Japanese have good combination of very low intake of meat and high intake of fresh vegetables that impacts health positively.

   Each culture has its own preferred method of treating disease and fixing the body. For examples, traditional Chinese medicine uses herbs and acupuncture as their main medicinal treatments, while many western countries like Australia and America utilize the pharmacological (drug) method.
6. **Race and ethnicity:** There is strong connection between socio-cultural and socioeconomic factors that may influence health status. Racial discrimination leads to disparities in income, education, neighborhood poverty and access to healthcare. Racial and ethnic minority groups experience more problems in gaining access to health service and have poorer health and shorter life expectancy compared to the others.

Impact of Urbanization on Health and Disease

Urbanization refers to the population shift from rural areas to urban areas. More than 50% of the world's population lives in urban area. The world is rapidly urbanizing with significant changes in living standards, lifestyles, social behavior and health. Although, urban living continues to offer many opportunities, including potential access to better healthcare, yet it introduces new hazards and worsens the health status of the populations. Health challenges that are mainly evident in cities relate to water, air, environment, social violence, substandard housing, crowding, inadequate sanitation

and solid waste disposal services, vector-borne diseases, industrial waste, increased motor vehicle traffic, stress associated with poverty and unemployment, lifestyles including unhealthy diets and physical inactivity, harmful use of alcohol. They all directly place human health at risk.

Emerging Health Problems

Various emerging health problems associated with urbanization are discussed below:

1. **Environmental:** Rapid urban growth is often associated with environmental degradation, e.g. air, noise, and water pollution; food safety; ozone depletion; natural resource depletion; and climate changes. These environmental problems can cause or exacerbate many other problems such as:
   a. Climate changes can cause deaths from extreme heat or cold.
   b. Lead poisoning lead to developmental and behavior problems.
   c. Noise can cause sleep disturbances and hence poor performance at work and in school.
   d. Poor air quality can trigger allergies, emphysema, asthma, heart disease, chronic respiratory disease, lung cancer, and even damage to other vital organs.
   e. Second-hand smoke and exposure to carcinogens may cause cancer.
   f. Unclean water supply can cause and transmit waterborne diseases, e.g. diarrhea.
2. **Housing:** Rapid growth of urban centers has led to substandard housing, overcrowding, insufficient and poor water supply and poor sanitation systems. The physical, mental, and social health is mainly affected by living conditions, e.g. allergies, outbreaks of diseases transmitted through respiratory and feco-oral route, respiratory diseases, cardiovascular effects, injuries, depression, anxiety, stress, etc.
3. **Social:** With social issues such as lack of resources, poverty, unemployment, and lack of education and social services, many social problems can evolve, e.g. crime, violence, drug abuse, accidents, high school drop-out rates. Social problems have an impact on the health also. Health problems caused due to the social problems include cirrhosis of the liver caused by alcohol consumption, malnutrition caused by poverty, suicide

caused by lack of mental health services, injury caused by drugs or stress.

4. **Lifestyle:** Many of the health problems like cardiovascular diseases, respiratory diseases, cancer, stroke, obesity, and diabetes today are related to lifestyle factors like decrease in activity, intake of processed food high in calories and low in nutrition. The rising trends of non-communicable diseases are a consequence of the several factors such as illiteracy, lack of access to healthcare, or to social services, poverty, overcrowding, and stress. Many of the health problems can be prevented by education, social services programs, by dietary transitions and exercise.

POVERTY AND HEALTH

The prevalence of poverty is an important public health issue worldwide. Poverty is general scarcity or lack of a certain amount of material belongings or money. Basically, it is the incapability to acquire the basic goods like food and clothes, to go to a school or clinic, and not having the assets to support one's living.

Poverty is a major cause of ill health. Poor people have low levels of health and education and die younger than those who have more money. They have inadequate physical security, higher than average child and maternal mortality, higher levels of disease, more limited access to healthcare, more susceptibility to violence and social protection. They live in environments with poor hygiene and unsafe water. Due to low level of education, they lack information on appropriate health-promoting practices and lack basic capacity to participate effectively in society.

Poor people have low body resistance. They are more prone to diseases, whether the benchmark is mortality, the prevalence of acute or chronic diseases or mental health. They normally suffer from nutritional deficiency diseases as they cannot afford to buy sufficient quantities of quality food. Due to the financial crisis the poor cannot afford the costs of seeking healthcare, which include consultations, diagnostic tests, medicine, etc. Sometimes, poor families borrow money at high interest rates, sell their assets to cover medical expenses or become indebted to the community.

Disability, chronic diseases such as arthritis, rheumatism, diabetes, heart problems, cancer, and hypertension are much more prevalent among individuals with low income. Similarly, income-based disparities are found among children and mothers. Almost

half of children who live in poverty have mothers with symptoms of depression, because of the stresses of raising a family. Most of the children living in poverty have cavities. This high rate of cavities may be due to parents' lack of awareness about oral healthcare as well as high cost of dental care for their children.

For poor people especially, health is also a crucially important economic asset. Their livelihoods depend on it. When a poor or socially vulnerable person becomes ill or injured, the entire household is trapped in a downward spiral of lost income. This is due to the considerable loss of income both of the breadwinner and of family members who stop working or attending school to take care of sick relative.

Poverty alleviation: WHO supports countries to design and implement 'pro-poor' health policies, that is, health policies that prioritize and respond to the needs of poor people. Health and poverty issues differ markedly from country to country. WHO ensures that the health perspective is reflected in poverty reduction strategies, medium-term expenditure frameworks, and helps to develop sector-wide approaches. Various sets of the following measures have been taken to permanently raise people out of poverty in India.

1. **Income assistance:**
   - Mahatma Gandhi National Rural Employment
   - The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)
   - National Rural Livelihood Mission (NRLM)
   - Swarna Jayanti Sahri Rojgar Yojana (SJSRY).
2. **Food assistance:**
   - National Food for Work Programme
   - Antyodaya Anna Yojana
   - Annapurna Scheme for aged
   - National School Lunch Program (NSLP).
3. **Social security assistance:**
   - Rashtriya Swasthya Bima Yojana (RSBY)
   - Indira Gandhi National Old Age Pension Scheme (IGNOAPS).
4. **Housing assistance:**
   - Indira Awas Yojana.
5. **Universal healthcare:**
   - Rashtriya Swasthya Bima Yojana (RSBY)
   - Indira Gandhi National Old Age Pension Scheme (IGNOAPS)
   - Jan Dhan Yojana.

HYGIENE AND HEALTH

The world 'hygiene' is derived from **Hygeia,** the goddess of health, cleanliness and sanitation**.** In Greek mythology, she is represented as a beautiful woman holding a bowl in her hand from which a serpent is drinking. The serpent testifies the art of healing, which symbol is retained even today.

Hygiene may be defined as 'the science of health and embraces all factors, which contribute to healthful living'. It refers to conditions and practices that help in maintaining good health and in preventing the spread of the diseases.

As hygiene and health go hand in hand and are interrelated, so it becomes vital to be careful about hygiene to keep ourselves free from diseases. There are various terms used in context with the public health like personal hygiene, sleep hygiene, mental hygiene, dental hygiene, and occupational hygiene.

In fact, most of the new-world communicable diseases like dengue, bird flu and swine flu have been attributed to lack of hygiene and healthy environment. Person to person transmission of these diseases can be prevented by various measures like covering dustbins and all the drains, preventing water to stagnate to prevent breeding of vectors like flies and mosquitoes. Sewer lines should be properly connected with sewage treatment plants so as to prevent contamination of drinking water with feces as it may cause number of diseases.

Person-to-person transmission of most of the virus infections like COVID-19 (coronavirus disease) takes place both directly and indirectly through hands. Transmission can be prevented by practicing good personal hygiene such as covering the face with mask, washing hands frequently with soap for 20 seconds especially before preparing or eating food, after cleaning vegetables or fruits, stroking pet/animals, covering mouth with a tissue or cloth while coughing or sneezing. People with diabetes or other chronic illnesses are more prone to infections, hence they should follow personal hygiene very strictly.

Personal Hygiene and Healthcare

Personal hygiene is an essential part of maintaining good health. One should adopt the following measures to maintain good personal hygiene:

1. Take bath regularly once or twice everyday.
2. Brush the teeth after each meal as dental hygiene prevents gum disease and tooth decay.

3. Wash the hair with soap or shampoo at least once a week. Regular cleaning and combing keeps hair free from lice.
4. Regularly trim the nails.
5. Wash hands with soap after going to the toilet to make them germ free.
6. Wash hands with soap before preparing and/or eating food. Disease-causing germs may get onto the hands and under the nails during normal daily activities. These germs are to be washed off before preparing food or eating as they may get onto the food and may cause sickness.
7. Change into clean clothes as often as possible. Dirty clothes should be washed with laundry soap before wearing them again as they may cause very serious skin disorders.
8. Dry washed clothes in the sun. The sun's ultraviolet rays will kill some disease-causing germs and parasites.
9. Cover the nose and mouth with a tissue when coughing or sneezing. Otherwise, droplets of liquid containing germs from the nose and mouth will spread in the air and will transmit the infection.
10. Wash eyes daily with tap water.
11. Clean nose at regular intervals.
12. Genital areas are most prone to infections and bacterial attacks. These areas should always be kept extremely clean.

Avoidable Habits

Bad habits affect mental, physical, and social health. Following are some bad habits to quit right away:

1. Avoid nail biting as it is unhygienic and leads to dental problems like malocclusion of the anterior teeth, and stomach problems.
2. Quit smoking as it causes premature skin ageing, respiratory problems, lung cancer, yellowing of teeth, and bad breath.
3. Avoid intake of alcohol as it may cause brain problems, cardiomyopathy, high blood pressure, arrhythmias, stroke, fatty liver, hepatitis, fibrosis, cirrhosis, pancreatitis, cancer, etc.
4. Avoid eating *junk food*.
5. Avoid self-medication.

A community pharmacist having adequate knowledge of concepts of health and disease would be useful to the country.

UNIT
2

Preventive Medicine

INTRODUCTION

In Unit 1 we learnt about the concepts of health and disease. With this background now let us learn about the general principles of prevention and control of some important communicable and non-communicable diseases.

Disease is 'a pathological condition of the body that presents a group of symptoms peculiar to it and which sets the condition apart as an abnormal entity differing from other normal or pathological body states'.

Communicable diseases **(CD)** are those diseases, which are transmitted directly or indirectly from one person to another. Communicable diseases are also known as *contagious* or *transmissible diseases*. These diseases result from infection of pathogens including some viruses, bacteria, fungi, protozoa, multi-cellular parasites and even from contagion of peculiar proteins, i.e. prions. Practicing hygiene and improving the living standard of the general public can prevent these diseases. Cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chikungunya, dengue, lymphatic filariasis, pneumonia; all are communicable diseases. A ptharmacist, being in direct contact with the general public, is in a better position to educate the people about the general aspects of communicable diseases, their causes, modes of spread of these diseases, their prevention and control.

Non-communicable diseases **(NCD)** are the diseases, which are non-infectious. Examples of non-communicable diseases include hypertension, diabetes mellitus, cancer, blindness, cardiovascular diseases, stroke, asthma, chronic kidney diseases, Alzheimer's disease, etc.

On the basis of infection causing organisms, communicable diseases have been classified in Table 2.1.

TABLE 2.1: Classification of communicable diseases

Viral diseases	*Bacterial diseases*	*Nematodes diseases*	*Protozoan parasites diseases*
a. Ebola b. Influenza c. Poliomyelitis d. SARS e. Rabies f. AIDS g. Chikungunya	a. Cholera b. Diphtheria c. Leprosy d. Syphilis e. Gonorrhea f. Whooping cough (Pertussis) g. Tuberculosis h. Typhoid i. Tetanus j. Trachoma k. Food poisoning l. Plague	a. Hookworm infestation b. Filariasis	a. Malaria b. Dengue

1. CHOLERA

Introduction

Cholera is derived from the Greek word *Khole* means flow of bile. In Latin, the word Cholera means bilious diarrhea. Cholera is an acute infection of the intestine caused by the toxigenic bacterium *Vibrio cholerae* present in water or food contaminated by feces from an infected person. The infection is mild or asymptomatic in most cases but can be severe in some (approximately 10%) cases. Cholera is an extremely virulent disease that affects all the ages and both sexes. In endemic areas, the majority of cases occur among children and in women in reproductive age. Persons with lower immunity, such as malnourished children or people living with HIV, are at greater risk of death, if infected by cholera.

Cholera is common in areas with poor sanitation. Cholera can be endemic or epidemic. A cholera-endemic area is an area where confirmed cholera cases were detected during the last 3 years with proof of local transmission, i.e. the cases are not imported from elsewhere. A cholera outbreak/epidemic can occur in both endemic countries and in countries where cholera does not regularly occur. The epidemicity and endemicity of a disease depend on the characteristics of the agent, and those of the environment. During the 19th century, cholera spread across the world from its original

reservoir in the *Ganges* delta in India. Six subsequent pandemics killed millions of people across all continents. The seventh pandemic started in South Asia in 1961, and reached Africa in 1971 and the Americas in 1991. Cholera is now endemic in many countries.

Cholera transmission is associated with climate, temperature, rainfall and salinity. In India, cholera cases are high in April, May, and June. The incidences of cholera outbreak are rare during the winter as the temperature is low and there is little rainfall. The incidences of cholera are low in the actual monsoon period as compared to pre-monsoon period. This lower prevalence in the actual monsoon period is due to the dilution effect reducing the amount of bacteria in the aquatic environment. However, postmonsoon epidemics are much larger than the premonsoon epidemics.

Causative Agent

The causative agent of cholera is *Vibrio cholerae*. It is a comma-shaped, Gram (–) ve, flagellated, actively motile, aerobic, non-spore forming bacterium. There are many serogroups of *V. cholerae*, but only two—O1 and O139 are known to cause outbreaks. There is no difference in the illness caused by the two serogroups. *V. cholerae* O1 is the most common serogroup in India and has caused all recent outbreaks. *V. cholerae* O139, first identified in Bangladesh in 1992, caused outbreaks in the past, but has declined considerably over the past few years. It has never been identified outside Asia. The organism can be grown easily on a variety of simple media over a broad pH range and can tolerate temperatures up to 43°C. They remain alive at 0°C for 4–6 weeks or longer. They are susceptible to heat at 56°C, boiling, acids, desiccation, and disinfectants like bleaching powder, cresol and $KMnO_4$.

Mode of Transmission

Cholera is most likely to be found and spread rapidly in places with inadequate and insufficient access to safe water, poor sanitation, and inadequate hygiene. Human being is the only known reservoir of cholera infection. Human reservoir may be a case (active clinical case or a subclinical case) or carrier. The carriers are normally temporary, rarely chronic. The subclinical cases and carriers make significant contribution to the spread of infection. The disease is not likely to spread directly from one person to another. Therefore, casual contact with an infected person is not a risk for becoming ill. The bacteria are transmitted from one person to another through

the fecal-oral route as the pathogens stay in cholera patients' feces for 7 to 14 days and are shed back into the environment, possibly infecting other individuals. Therefore, human waste should be appropriately disposed off to prevent the spread of cholera. It can spread through ingestion of polluted water or contaminated food. It can also spread through clothes and linen soaked with discharges of infected persons. Flies also spread the infection. Persons attending on cholera patients must wash their hands properly to avoid infecting the food, drink or themselves.

Incubation period: Few hours to 5 days (usually 1–2 days).

Clinical Features

The infection is often mild or without symptoms, but sometimes it can be severe and life threatening characterized by a sudden onset of profuse watery diarrhea, vomiting, and leg cramps. Approximately 5–10% of infected persons will have severe cholera characterized by following symptoms in the early stages:

- Profuse watery diarrhea, sometimes described as 'rice-water stools'
- Vomiting
- Rapid heart rate
- Loss of skin elasticity
- Dry mucous membranes
- Low blood pressure
- Thirst
- Muscle cramps
- Restlessness or irritability.

Persons with severe cholera can develop acute renal failure, severe electrolyte imbalances and coma. If untreated, severe dehydration can rapidly lead to shock and death in hours.

Diagnosis

The presence of *V. cholerae* is confirmed through laboratory investigations of culture of stool specimen or rectal swab of cholera patient. For transport of specimen, Cary Blair media is the most appropriate, and for isolation and identification of the organism, the selective thiosulfate–citrate–bile salts (TCBS) agar is the ideal choice.

Now available, new rapid diagnostic test (RDT), allows quick testing at the patient's bedside. However, the sensitivity and specificity of this test is not ideal. These kits cannot determine the

subtypes and are not able to isolate the antimicrobial susceptibility. These kits should not be used for routine diagnosis, however, they can be useful during epidemics. WHO suggests that all samples tested positive with the RDT are re-tested using classic laboratory procedures for confirmation.

Prevention and Control

A multifaceted approach is the key to control cholera, and to reduce deaths.

1. Provision of safe drinking water, proper sanitation, appropriate waste management, anti-fly measures, and food safety are critical for preventing occurrence of cholera.
2. Health education and good food hygiene are equally important. Communities should be reminded of basic hygienic behaviors, including safe preparation and conservation of food, proper cleaning up of places used for bathing and washing clothes, washing hands with soap after defecation, after taking care of someone ill with diarrhea and before handling food. People should be encouraged to use latrines or other sanitation systems, like chemical toilets, to dispose of feces. Latrines and surfaces contaminated with feces should be cleaned using a solution of 1 : 9 parts of household bleach with water.
3. Appropriate media, such as radio, television or newspapers should be involved in disseminating health education messages. Community and religious leaders should also be associated to social mobilization campaigns.
4. Strengthening disease surveillance and national preparedness to rapidly detect and respond to outbreaks is important.
5. Routine treatment of a community with antibiotics, or *mass chemoprophylaxis*, has no effect on the spread of cholera. Can have adverse effects by increasing antimicrobial resistance and provides a false sense of security.
6. Compulsory and prompt management of cases, isolation of patients, sprinkling of lime water on the floor of patient's room, disinfection of patient's excreta and linen are useful methods.
7. Cholera vaccine (Vaxchora, Dukoral, ShanChol) can be used for immunisation.

Treatment

Cholera is an easily treatable disease. The majority of people can be treated successfully through prompt administration of oral rehydration solution (ORS) to replace fluid and electrolytes lost

through diarrhea and vomiting. Depending on the condition of patient, fluids may be given orally or intravenously. WHO/UNICEF has developed an oral rehydration solution (ORS) that is cheaper and easier to use than the typical intravenous fluid. This solution of sugar and electrolytes is now being used internationally. The WHO/UNICEF ORS standard sachet is dissolved in 1 litre (L) of clean water. Adult patients may require up to 6 L of ORS to treat moderate dehydration on the first day. Severely dehydrated patients are at risk of shock and are given appropriate antibiotics like Tetracycline, Chloramphenicol, Doxycycline, Furazolidone, Erythromycin, Ciprofloxacin and Septran to diminish the duration of diarrhea, reduce the volume of rehydration fluids needed, and shorten the amount and duration of *V. cholerae* excretion in their stool. National Cholera Control Programme is also aimed at gradual elimination of endemic foci by anticipatory preventive measures and surveillance activities for containment of cholera. Mass administration of antibiotics is not recommended as it has no proven effect on the spread of cholera and also contributes to increasing antimicrobial resistance. Zinc is a vital adjunctive therapy for children under 5, which also decreases the duration of diarrhea. Breastfeeding should also be promoted.

2. SEVERE ACUTE RESPIRATORY SYNDROME

Introduction

Severe acute respiratory syndrome (SARS) is a communicable viral respiratory illness caused by a coronavirus, called SARS-associated coronavirus (SARS-CoV). It is a contagious and potentially fatal respiratory illness. It first appeared in China in November 2002 and was identified in February 2003. SARS spreads to over 24 countries before it was contained. No new cases were reported since May 2004, except the recent outbreak of COVID-19. The overall mortality rate of SARS is about 14% and mortality is age-related.

Causative agent: SARS is caused by Coronavirus, called SARS-associated Coronavirus (SARS-CoV).

Mode of Transmission

The SARS virus is transmitted through droplets from coughing and sneezing and close human contact. The respiratory droplets are probably absorbed into the body through the mucous membranes of the mouth, nose, and eyes. This could be through hugging

and kissing, sharing utensils for eating and drinking, speaking to someone within a distance of 3 feet, or touching someone directly. Person with the virus can spread the infection by leaving respiratory droplets on objects, such as door handles, doorbells, and telephones. These are then picked up by someone else. The virus is likely to remain active in the environment for several days.

Incubation period: 2–7 days.

Clinical Features

Symptoms normally appear within 3 to 5 days after exposure to the SARS virus, but they can develop after 2 to 7 days. The disease is not contagious during the incubation period, before symptoms appear. Most cases of SARS begin with a high fever above 38°C. Other early symptoms include those common to flu, such as muscle pain, aches, chills, headache, diarrhea, sore throat, cough, running nose, difficulty in breathing and shortness of breath. These will develop over the course of a week. SARS may eventually lead to pneumonia. Serious complications, such as respiratory failure, heart failure, and liver failure may occur in people aged over 60 years, and those with pre-existing comorbidities, such as diabetes or hepatitis.

Diagnosis

SARS is very rare, and the symptoms overlap with those of flu and pneumonia. The WHO recommends that a person having all of the following symptoms must be diagnosed for SARS:

i. Fever of at least 38°C (100.4° F).
ii. Cough, difficulty in breathing, shortness of breath.
iii. Radiographic evidence to suggest a diagnosis of pneumonia.
iv. No alternative diagnosis to fully explain the illness.

Following laboratory tests can help to confirm a diagnosis of SARS by detecting the virus and antibodies.

1. Reverse transcription-polymerase chain reaction (RT-PCR) testing can detect the virus in blood, stool, and nasal secretions.
2. Serologic testing including enzyme-linked immunosorbent assay (ELISA) and immunofluorescent assay can detect SARS-CoV antibodies in the serum. If a person has antibodies, they are also likely to have the infection.

Prevention and Control

Similar to other infectious diseases, some simple steps can be taken to prevent the spread of SARS virus:

1. Early identification and quarantization of SARS cases and their contacts.
2. Proper exit screening of travellers at airports, bus stands and stations.
3. Effective personal hygiene practices can help restrict the spread of the virus. These include:
   a. Frequent handwashing.
   b. Avoid touching the eyes, mouth or nose with unclean hands.
   c. Cover the mouth and nose with a tissue when coughing or sneezing.
   d. Use of appropriate masks.

Treatment

1. Isolating patients and using barrier techniques including filter masks and goggles to prevent the spread of the virus.
2. No drug, including antibiotics, appears to be effective against SARS. Supportive drug therapy is recommended to relieve symptoms such as fever and a cough.

3. EBOLA VIRUS DISEASE

Introduction

Ebola virus disease (EVD) (formerly known as Ebola hemorrhagic fever), is a rare but serious disease with 50% average fatality rate. Ebola appeared for the first time in Zaire and Sudan in 1976. The Ebola outbreak in West Africa in 2014–2016 was a major one. The 2018–2019 outbreak in eastern Democratic Republic of the Congo (DRC) was very complex, with insecurity adversely affecting public health response activities.

EVD is most common in human beings and non-human primates (monkeys, gorillas, and chimpanzees). It is believed that the virus is animal-borne, and bats of the *Pteropodidae* family are being considered as the natural Ebola virus host. The bats carrying the virus can transmit it to other animals. Recovery from EVD depends on good supportive clinical care and the patient's immune response. Survivors of Ebola virus infection have antibodies (molecules that are made by the immune system to label invading pathogens for destruction) that can be detected in the blood up to 10 years after recovery.

Causative Agent

EVD is caused by a group of viruses of the genus *Ebolavirus* (*Filoviridae* family) including Ebola virus species *Zaire ebolavirus* (EBOV), Sudan virus (SUDV), Taï Forest virus (TAFV), Bundibugyo virus (BDBV), Reston virus Bombali virus (RESTV). Of these, only four (Ebola, Sudan, Taï Forest, and Bundibugyo viruses) are known to cause disease in people and EBOV species—*Zaire ebolavirus*, is the most dangerous of all EVD-causing viruses.

Mode of Transmission

Ebola is introduced into the human population through close contact with the blood, secretions, organs or other bodily fluids of infected animals such as fruit bats, chimpanzees, gorillas, monkeys, forest antelope or porcupines found ill or dead or in the rainforest. When a person gets infected with Ebola, he/she will not show signs or symptoms of illness immediately. Persons infected with Ebola cannot spread the disease to others until they develop signs or symptoms. After they develop symptoms of illness, they can spread Ebola to others via direct contact (through broken skin or mucous membranes in the eyes, nose, or mouth) with:

1. Blood or body fluids (urine, saliva, sweat, feces, vomit, breast milk, and semen) of a person who is sick with or has died from EVD.
2. Objects (such as needles and syringes) that have been contaminated with body fluids (like blood, feces, vomit) from a person sick with Ebola or the body of a person who died from Ebola.
3. Semen from a man who recovered from EVD. Semen of a person may carry the virus for several weeks to months after recovery from EVD.

Ebola virus usually is not transmitted by food. However, in certain parts of the world, Ebola virus may spread through the handling and consumption of bush meat (wild animals hunted for food). There is also no evidence that mosquitoes or other insects can transmit Ebola virus. During an Ebola outbreak, healthcare workers providing care have chances of getting infection if precautions are not strictly practiced. They should use dedicated medical equipment, preferably disposable needles and syringes. Medical equipment must be properly cleaned and sterilized before additional use. Burial ceremonies that involve direct contact with the body of the deceased can also contribute in the transmission of Ebola.

People remain infectious as long as their blood contains the virus. The virus can persist in semen, breast milk, ocular (eye) fluid, and spinal column fluid. Areas of the body that contain these fluids are known as *immunologically privileged sites*. These are sites of the body where viruses and pathogens, like Ebola virus, can remain undetected even after the immune system has cleared the virus from other sites of the body.

Incubation period: 2–21 days.

Clinical Features

Symptoms may appear from 2 to 21 days after contact with the virus, with an average of 8 to 10 days. Many common illnesses can have these same symptoms, including influenza (flu) or malaria. Symptoms of EVD can be sudden and include:

- Fever
- Fatigue
- Muscle pain
- Severe headache
- Sore throat
- Weakness.

This is followed by:

- Vomiting
- Diarrhea
- Rash
- Abdominal (stomach) pain
- Symptoms of impaired kidney and liver function
- Unexplained hemorrhage (bleeding or bruising)
- Laboratory findings include low WBC and platelet counts and elevated liver enzymes.

Diagnosis

It can be difficult to clinically distinguish EVD from other infectious diseases such as malaria, typhoid fever and meningitis as early symptoms of EVD such as fever, headache, and weakness are common in all these diseases. Confirmatory diagnostic methods for the detection of Ebola virus infection include:

a. Antibody-capture enzyme-linked immunosorbent assay (ELISA).
b. Antigen-capture detection tests.
c. Electron microscopy.
d. Serum neutralization test.

e. Reverse transcriptase polymerase chain reaction (RT-PCR) assay.
f. Virus isolation by cell culture.

WHO recommends the following tests:
- Automated or semi-automated nucleic acid tests (NAT) for routine diagnostic management.
- Rapid antigen detection tests for use in remote settings where NATs are not readily available. These tests are recommended for screening purposes as part of surveillance activities; however reactive tests should be confirmed with NATs.

The preferred specimens for diagnosis include:
- Whole blood samples collected in ethylenediamine tetraacetic acid (EDTA) from live patients after onset of symptoms, most notably fever.
- Oral fluid specimen stored in universal transport medium collected from deceased patients or when blood collection is not possible.

Samples collected from patients are an extreme biohazard risk. Laboratory testing on non-inactivated samples should be conducted under maximum biological containment conditions. All biological specimens should be packaged using the triple packaging system when transported nationally and internationally.

Prevention and Control

Various protective measures to reduce human transmission of Ebola infection include:

1. Avoid close contact with an infected person's blood and body fluids (such as urine, feces, saliva, sweat, vomit, breast milk, semen, and vaginal fluids).
2. Avoid direct or close contact with items that may have come in contact with an infected person's blood or body fluids.
3. Wear gloves and appropriate personal protective equipment while taking care of ill patients.
4. Wash hand regularly after visiting patients in hospital, as well as after taking care of patients at home.
5. Ensure safe and dignified burial of body of someone who died from EVD.
6. Avoid contact with bats and non-human primates or blood, fluids and raw meat prepared from these animals (bush meat) or meat from an unknown source.

7. Handle animals with gloves and other appropriate protective clothing.
8. Consume thoroughly cooked animal products (blood and meat).

Treatment

There is no licensed vaccine against Ebola virus disease and the treatment is only symptomatic. Following basic interventions can significantly improve the chances of survival, if given timely.

1. Provide fluids and electrolytes (body salts) intravenously or orally.
2. Offer oxygen therapy to maintain oxygen status.
3. Use medication to support blood pressure, reduce vomiting and diarrhea and to manage fever and pain.
4. Treat other infections, if they occur.

Recovery from EVD depends on good supportive care and the patient's immune response. Those who do recover develop antibodies that can last for 10 years or longer. Some survivors may have long-term complications, such as joint and vision problems. There is currently no antiviral drug licensed by the US Food and Drug Administration (FDA) to treat EVD in people. Drugs that are being developed to treat EVD work by stopping the virus from making copies of itself. Blood transfusions from survivors, mechanical filtering of blood from patients, immune therapies and drug therapies are currently being evaluated as possible treatments for EVD.

4. INFLUENZA

Introduction

Influenza (flu) is an acute, contagious, febrile infection of respiratory tract caused by influenza virus (A, B, C and D) that infect the nose, throat, and sometimes the lungs. It can cause mild to severe illness, and at times can lead to death. Most common dreadful complication is pneumonia. Major epidemics occur at intervals of 2–3 years in case of influenza A and 3–6 years in case of influenza B.

Influenza viruses are highly resilient in the environment. In temperate climates low temperature and low humidity favor active aerosol transmission. In tropical climates influenza infections are associated with increased rainfall. The best environment is a population without pre-existing immunity to it, enabling it to

spread pandemically. The attack rates are high in crowded places like schools, cinemas, hostels, hospitals, etc. and in population without pre-existing immunity to it can affect every age group and both sexes. Mortality is high in the elderly (65 years of age and older), children and persons with asthma, diabetes, cardiac, renal and respiratory disease.

Causative Agent

Influenza is caused by spherical-shaped single stranded RNA viruses belonging to the family *Orthomyxoviridae* (the influenza viruses). There are four strains of influenza viruses: A, B, C and D. Human influenza A and B viruses cause a majority of human infections. Type A viruses have been associated with widespread epidemics and pandemics, while type B viruses have been known to cause regional epidemics. Influenza C viruses do not cause epidemics and cause only a mild respiratory illness. Type D viruses mainly affect cattle and do not infect human. The internal ribonucleoprotein of the virus determines the type specificity. Current subtypes of influenza A viruses found in people are influenza A (H1N1) and influenza A (H3N2).

Mode of Transmission

Influenza viruses are typically host specific; aquatic birds, pigs, swine, horses, dogs are considered the major reservoirs of infection. The virus may survive for some time in human also.

Source of infection is usually case or subclinical case. Viruses are present in respiratory secretions of infected persons and spread from person to person mainly by droplets created by coughing, sneezing or talking. The portal of entry of virus is the respiratory tract. Influenza virus may also be transmitted by direct contact with infected person or with objects having influenza virus on it.

Incubation period : 1 to 3 days.

Clinical Features

- Sudden onset of fever that lasts 3 days
- Headache
- Runny or stuffy nose
- Body aches and discomfort
- Chills
- Fatigue
- Loss of appetite

- Weakness
- Diarrhea and vomiting (occasionally)
- Conjunctival congestion.

Diagnosis

Influenza can be diagnosed on the basis of:

a. **Virus isolation:** Virus is most frequently isolated from nasopharyngeal or throat swabs, nasal washings or sputum obtained within three days of onset of illness. Antigen in nasal secretions can be detected by Rapid test, Immunofluorescence test, Antigen capture ELISA with monoclonal antibody to the nucleoprotein, RT-PCR. However, Cell line Madin-Darby Canine Kidney cells (MDCK) and egg inoculation are required for virus isolation.

b. **Serology:** Serological test in paired serum samples can be done on hemagglutination inhibition (HI) and ELISA. Human sera often contain non-specific mucoprotein inhibitors that must be destroyed before testing by HI. The ELISA test is more sensitive than other assays.

Prevention and Control

1. **Health promotion**
   a. Cover mouth with handkerchief and nose while coughing or sneezing.
   b. Frequently wash hands with soap and water or alcohol-based hand cleaners.
   c. Disinfect patient's excreta, saliva and linen.
   d. Good ventilation of houses and public buildings.
   e. Sanitize rooms with diluted chlorine bleach.
   f. Practice good health habits (including adequate sleep, nutritious food, and physical exercise).
   g. Avoid touching the eyes, nose, or mouth to stop spread of germs.
2. **Isolation and social distancing**
   a. Compulsory and prompt notification of cases and isolation of patients.
   b. Avoidance of overcrowded places during epidemics.
3. **Chemoprophylaxis:** Amantadine, rimantadine, oseltamivir or zanamivir may be used for prophylaxis of influenza. Antiviral drugs, particularly neuraminidase inhibitors such as Tamiflu and Relenza have been found effective in the treatment of influenza.

4. **Vaccination:** Vaccines against the influenza virus are available, e.g. (a) trivalent inactivated influenza vaccine (e.g. Agriflu, Fluzone), (b) Quadrivalent inactivated influenza vaccine (Flulaval tetra), and (c) live attenuated influenza vaccines (FluMist).

Treatment

Persons suffering from influenza infections should be advised to:

a. Take bedrest.
b. Drink plenty of liquids.
c. Avoid smoking or drinking alcohol.
d. Take medications to relieve flu symptoms like antipyretics (Paracetamol or Acetaminophen) for fever or pain and cough suppressants.
e. Stay alert for emergency warning signs like shortness of breath, chest pain, dizziness, confusion, vomiting.
f. Take antiviral medications (Amantadine, Rimantadine, Z, and Oseltamivir) to reduce the severity and duration of the illness.

5. ACUTE RESPIRATORY INFECTIONS

Introduction

Acute respiratory infections (ARIs) indicate infections of any part of the respiratory tract (upper/lower respiratory tract) of less than 30 days and otitis media of less than 14 days that interfere with normal breathing. Upper respiratory tract starts at sinuses and ends at vocal chords in larynx while lower respiratory system covers the continuation of the airways from the trachea and bronchi to the bronchioles and the alveoli. Upper respiratory tract infections (AURI) include pharyngitis, laryngitis, common cold, tracheitis, and otitis media. Lower respiratory tract infections (ALRI) include, bronchiolitis, bronchitis and pneumonia. In less developed countries, measles and whooping cough are important causes of severe respiratory tract infection. Acute respiratory infection prevents the body from getting oxygen. ARIs are the most common cause of illness and death in infants, children, old aged, cigarette smokers and people with impaired respiratory tract reserves. Anyone whose immune system might be weakened by another disease is at risk. People with heart diseases or other lung problems are more likely to contract an acute respiratory infection.

Causative Agent

ARI may be caused by a variety of microbial agents including bacteria and viruses (Table 2.2).

TABLE 2.2: Pathogens causing acute respiratory infections

Viruses	***Bacteria***	***Others***
Adenovirus	*Sreptococcus pyogenes*	*Plasmodium*
Rhinovirus	*Bordetella pertussis*	Chlamydia type B
Coronavirus	*Corynebacterium diphtheria*	
Influenza virus	*Haemophilus influenzae*	
Enterovirus	*Klebsiella pneumoniae Legionel*	
Respiratory syncytial virus	*Streptococcus aureus*	
Measles	*Mycobacterium tuberculosis*	

In fact many viruses and bacteria infect the respiratory tract but do not always produce ARI. Large number of risk factors including environment (e.g. air pollution, passive smoking), family circumstances (poverty, poor access to medical care) and medical (malnutrition, prematurity, measles, chronic lung disease, HIV/AIDS, diarrhea, malaria) increase the possibility of developing acute respiratory infection.

Mode of Transmission

Acute respiratory infections causing pathogens can spread from person to person by the airborne route. Pathogens may also be transmitted by direct contact with infected person or with objects having pathogens on it. Children are especially at higher risk because of their regular contact with other kids who could be virus carriers. Children often do not wash their hands regularly, rub their eyes, and put their fingers in their mouths, resulting in the spread of viruses.

Incubation period: 2–20 days.

Clinical Features

The early symptoms of acute respiratory infection usually appear in the nose and upper lungs. Main symptoms include:

- Congestion, either in the nasal sinuses or lungs
- Running nose

- Cough
- Sore throat
- Body aches
- Fatigue
- High fever and chills
- Difficulty in breathing
- Dizziness
- Low blood oxygen level
- Loss of consciousness
- Ear problems.

Most children with ARI have only mild symptoms such as cold, cough or fever. However, some children may have pneumonia, which is a major cause of death.

Diagnosis

In a respiratory exam, the doctor focuses on the patient's breathing rate and lower chest in drawings during breathing. Breathing sounds (stridor or coups, wheezing, grunting) in the lungs are also checked for fluid and inflammation. The doctor may peer into the nose and check the throat. If diagnosed early, over-the-counter medications can help alleviate symptoms while the virus runs its course. However, if the infection is advanced, an X-ray or CT scan (computer tomography) may be needed to check the condition of the lungs. Lung function tests have shown to be useful as diagnostic tools and for prognosis purposes. Pulse oximetry may be used to check how much oxygen gets into the lungs. A physician may also need a sputum (material coughed up from the lungs) sample to check for the type of virus causing the disease.

Prevention and Control

Most causes of an acute respiratory infection are not treatable. Therefore, prevention is the best method to ward off harmful respiratory infections. Good hygiene should be practiced by doing the following:

a. Wash hands regularly.
b. Always sneeze in a tissue.
c. Avoid touching one's face, especially eyes, nose and mouth, to prevent introducing germs into one's system.
d. Avoid smoking.
e. Take good nutrition especially vitamins rich diet.

f. Immunisation.
g. With MMR (measles, mumps, and rubella) pertussis vaccine and conjugate vaccines against *Haemophilus influenzae* type B, lower the risk of acute respiratory infection.

Treatment

1. Early recognition of cases of ARI is very important.
2. Appropriate use of antibiotics against the major causes of bacterial infections, prompt referral of cases of severe infections and providing pre-referral treatment.
3. Providing good supportive care including appropriate and effective use of oxygen to treat hypoxia.
4. Use of bronchodilators in children with wheeze at health facility.

6. MALARIA

Introduction

Malaria is a communicable protozoal infection. It is one of the most important health problems in India. The entire population is deemed to be under malarial risk. People of all ages and both sexes are affected by malaria. Practically all races are susceptible except the Negroes who are immune.

Causative Organism

It is caused by the malarial parasites (*Plasmodium*) of the following types: *Plasmodium vivax, P. falciparum, P. malariae, and P. ovale.*

Mode of Transmission

Malaria is mainly transmitted through the bite of infected *Anopheles* mosquitoes. Mosquitoes become infected after feeding on a person harboring malarial parasites in the blood. The sexual cycle of the parasite takes place in the mosquito and the parasite develops into the infective stages (sporozoites) within 2–3 weeks. The sporozoites are injected in the new susceptible host when the mosquito feeds on him. After circulating for a short time in the blood of the human being the parasites enter the liver and develop into form, which are able to invade the red blood cells and develop into gametes. This completes the asexual cycle of the parasite. The mosquito feeding on the man sucks the gametes and thus the cycle of transmission

continues. Malaria may also be transmitted through transfusion of blood containing malarial parasites.

Incubation period : 10 to 30 days.

Clinical Features

Malaria is characterized by:

i. Cold stage, i.e. sudden onset of fever with sensation of extreme cold, lasting for 15 to 60 minutes.
ii. Hot stage, i.e. temperature shooting up to 106ºC, patient feeling burning hot and intense headache.
iii. Sweating stage, i.e. profuse sweating and fall in temperature, lasting from 2 to 6 hours.

If the infection persists, gradual anemia develops and the liver and spleen are enlarged. Typical attacks of malaria fever may not be observed sometimes due to maturation of generations of the parasite at different times. The attacks occur regularly every alternate day or every fourth day. The interval between the fever attacks depends on the erythrocytic cycle length. The patient is free from the symptoms in between the attacks. The type of fever in different types of malaria for every plasmodium species varies as shown below:

a. In *benign tertian malaria* caused by *P. vivax*—febrile paroxysms occur every 48 hours.
b. In *malignant tertian malaria* caused by *P. falciparum*—febrile paroxysms occur every 48 hours.
c. In *quartan malaria* caused by *P. malariae*—febrile paroxysms occur every 72 hours.
d. In *quotidian malaria* caused by *P. knowlesi*—febrile paroxysms occur everyday.

Severe malaria occurs when infection persists and is complicated by serious organ failures or abnormalities in the patient's blood or metabolism. Severe malaria is a medical emergency and should be treated immediately.

Diagnosis

Early and accurate diagnosis of malaria is essential for both effective disease management and surveillance. High-quality diagnosis is important in all settings as misdiagnosis can result in significant morbidity and mortality. Laboratory diagnosis of malaria requires the identification of the parasite or its antigens/products in the patient's blood.

Currently available techniques can be separated in three categories:

1. Microscopy.
2. Immunological techniques.
3. Molecular techniques.

Malaria rapid diagnostic tests have the potential to significantly improve management of malaria infections, especially in remote areas with limited access to good quality microscopy services.

Prevention and Control

WHO has recommended the following anti-malarial measures (Table 2.3):

TABLE 2.3: Anti-malarial measures recommended by WHO

Measures to be applied by individuals	***Measures to be applied by the community***
Prevention of man/vector contact using mosquito repellants, protective clothing, bed nets, screening of houses	Prevention of man/vector contact through selection of proper site and screening of houses
Destruction of adult mosquitoes through the use of domestic space sprays including aerosols	Destruction of adult mosquitoes through insecticidal sprays
Destruction of mosquito larvae	Destruction of mosquito larvae
Source reduction of mosquitoes like filling small scale drains, etc.	Source reduction through effective sanitation, water management and drainage schemes
Chemoprophylaxis and chemo-therapy against malaria parasite	Measures against malaria parasites such as presumptive treatment, radical treatment and mass drug treatment

Community participation and health education are crucial for any successful malaria control campaign. National Malaria Eradication Programme was initiated in 1968 and a modified operation plan was started in 1977. India has pledged to eliminate malaria by 2027. The complexity of the malaria parasite makes development of a malaria vaccine a very difficult task. *Commercially available malaria vaccine is not available yet*. Attempts to develop anti-malarial vaccine are going on in India and abroad.

Treatment

1. Malaria (particularly *Falciparum malaria*) is a medical emergency that requires a hospital stay. The choice of medication depends in part on where the patient is infected.
2. Chloroquine is often used as an anti-malarial medication, though chloroquine-resistant infections are common in some parts of the world.
3. Chloroquine-resistant infections are treated by following drugs:
   a. The combination of Quinidine or Quinine + Doxycycline/ Tetracycline/Clindamycin.
   b. Atovaquone plus Proguanil (Malarone).
   c. Mefloquine or Artesunate.
   d. The combination of Pyrimethamine + sulfadoxine (Fansidar).
4. Medical care, including fluids through a vein (IV) and other medications and breathing (respiratory) support may be needed.

7. CHIKUNGUNYA

Introduction

Chikungunya is a mosquito borne viral disease. Chikungunya is a local word meaning 'to become contorted'. The person affected with Chikungunya walks in a stooped posture because of joint pain. The virus occurs widely in sub-Saharan Africa, India and in many areas in Asia. The disease occurs mostly in the rainy season. There was a large outbreak of chikungunya in India during 2006. The affected states were Andhra Pradesh, Kerala, Tamil Nadu. Karnataka, Maharashtra, Gujarat, Madhya Pradesh, Delhi, Rajasthan, Goa, Odisha, Uttar Pradesh, Pondicherry, West Bengal, Andaman and Nicobar Islands.

Causative Agent

Chikungunya is caused by the Chikungunya virus (CHIKV). CHIKV is an arthropod-borne RNA virus (genus *Alphavirus*; family *Togaviridae*) that is transmitted to humans by infected mosquitoes. Most commonly, the mosquitoes involved are *Aedes aegypti* and *Aedes albopictus*. These two species can also transmit other mosquito-borne viruses, including dengue. The mosquitoes breed in stagnant water.

Mode of Transmission

Chikungunya spreads through bites of infected female mosquitoes. Mosquitoes become infected when they feed on a person already infected with the virus. Infected mosquitoes can then spread the virus to other healthy people through bites. Two important vectors are *Aedes aegypti* and *Aedes albopictus*, the same mosquitoes, which also transmit dengue virus. They bite during the day and at night with peak activity in the early morning and late afternoon. Both species are found biting outdoors but *Aedes aegypti* can also readily bite indoors. After the bite of an infected mosquito, onset of illness occurs usually between 4 and 8 days but can range from 2 to 12 days. There is no direct person-to-person transmission. Chikungunya virus is transmitted rarely from mother to newborn around the time of birth and through breastfeeding.

Incubation period : 2–12 days.

Clinical Features

Chikungunya shares some clinical symptoms with dengue and can be misdiagnosed in areas where dengue is common. Symptoms of Chikungunya disease include:

- Abrupt onset of high fever (40°C/104°F)
- Chills
- Anorexia
- Joint pain (lower back, ankle, knees, wrists or phalanges) that is often debilitating and vary in duration
- Joint swelling and stiffness
- Conjunctivitis
- Rashes
- Headache
- Muscle pain
- Nausea and vomiting
- Fatigue
- Leucopenia.

Diagnosis

The serological and virological methods used for rapid diagnosis of Chikungunya are as follows:

1. **Reverse transcriptase-polymerase chain reaction (RT-PCR):** This test detects viral RNA in serum specimens obtained from patients during the acute phase of infection.
2. **Serological tests:** Serological tests like enzyme-linked immunosorbent assays (ELISA), detect both anti-chikungunya

antibodies IgM and IgG antibodies from either acute- or convalescent-phase samples. Levels of IgM antibody are highest in the body 3 to 5 weeks after the onset of illness and persist for almost 2 months.

3. **Plaque reduction neutralization tests (PRNT):** PRNT are specific tests for α-viruses and are best suited for confirmation of serologic test results. The major drawback of this method is that it requires the use of live virus and need Biosafety Level-3 laboratories (BSL-3).

Prevention and Control

In areas where the vector of Chikungunya is either *Ae. aegypti* or *Ae. albopictus*, vector prevention and control can be combined with following control efforts:

1. Reduce the number of natural and artificial water-filled container that support the breeding of the mosquitoes.
2. Proper disposal of solid waste.
3. Cover, empty and clean domestic water storage containers on a weekly basis.
4. Use personal household protection measures, such as window screens.
5. Apply mosquitoes repellents containing DEET (N, N-diethyl-3-methylbenzamide), IR3535 (3-[N-acetyl-N-butyl]-aminopropionic acid ethyl ester) or icaridin (1-piperidinecarboxylic acid, 2-(2-hydroxyethyl)-1-methylpropylester) on skin or clothes.
6. Use insecticide treated materials, coils and vaporizers in homes.
7. Spray Malathion or Sumithion to kill mosquitoes.
8. Improve community participation for sustained vector control.
9. Active monitoring and surveillance of vectors to determine effectiveness of control interventions.
10. Early clinical detection and management of patients to reduce mortality rates from severe dengue.

Treatment

There is no specific treatment of Chikungunya infection. It is cured by immune system by its own. Symptomatic treatment with analgesics, antipyretics like Paracetamol, Ibuprofen, Naproxen, Diclofenac sodium, Chloroquine along with fluid supplementation is recommended to relieve fever, joint pains and swelling. Drugs like aspirin and steroids must be avoided.

There is no commercial Chikungunya vaccine. A safe and effective vaccine against Chikungunya could go a long way toward preventing the suffering caused by this disabling disease and could potentially be useful in limiting or mitigating outbreaks.

8. DENGUE

Introduction

Dengue is a mosquito-borne viral disease caused by a dengue virus. It is an arbovirus transmitted by the bite of infective female *Aedes* mosquitoes. The infection causes dengue fever (DF) which is a severe flu-like illness, and sometimes develops into a potentially lethal complication called dengue hemorrhagic fever (DHF). The global incidence of dengue has increased dramatically in recent decades. An estimated 50–100 million dengue infections occur annually mainly in urban and semi-urban areas in tropical and subtropical countries. Local variations in risk are influenced by rainfall, temperature and unplanned rapid urbanization.

Causative Agent

The dengue virus (DEN) is a small single-stranded, spherical RNA virus. It has four distinct serotypes (DEN-1, DEN-2, DEN-3 and DEN-4), which belong to the genus *Flavivirus,* family *Flaviviridae.* 'Asian' genotypes of DEN-2 and DEN-3 are commonly associated with severe disease accompanying secondary dengue infections. The virus is easily destroyed by heat and chemicals but it survives for several years at 70°C.

The vectors: The infected *Aedes* mosquitoes, mainly *Aedes aegypti* is the primary vector that transmits various serotypes of the dengue. The virus is transmitted to humans through the bites of infected female mosquitoes, which mainly acquires the virus while feeding on the blood of an infected person. After virus incubation for 4–10 days, an infected mosquito is capable of transmitting the virus for the rest of its life. This mosquito is a tropical and subtropical species commonly distributed around the world. The virus may spend their lifetime in or around the human habitation and breeds in water-filled in artificial containers closely associated with human dwellings and often indoors like flower pots, air coolers. Unlike other mosquitoes, *Ae. aegypti* is a daytime feeder and bites many people during each feeding period. Its peak biting periods are early in the morning and in the evening before dusk. Dengue outbreaks

have also been attributed to other less efficient secondary vectors *Aedes albopictus*, *Aedes polynesiensis* and several species of the *Aedes scutellaris* complex.

Carriers: Infected symptomatic or asymptomatic humans are the main host of the virus and serve as a source of the virus for uninfected mosquitoes. Dengue virus enters the humans via the skin when an infected mosquito bites for taking a blood meal. The virus circulates in the blood of an infected person for 2–7 days, at about the same time that the person develops a fever. Humoral and cellular immune responses contribute to virus clearance through the generation of neutralizing antibodies and the activation of CD4+ and CD8+ T lymphocytes. Patients who are already infected with the dengue virus can transmit the infection to other humans via *Aedes* mosquitoes after the first symptoms appear (during 4–5 days; maximum 12). Dengue virus circulating in the blood of infected humans is ingested by female mosquitoes during feeding. The virus then infects the mosquito midgut. After the incubation period of 3–14 days, the virus from the infected humans can be transmitted to other healthy humans during subsequent probing or feeding. Individual risk factors including age, sex, ethnicity and possibly chronic diseases like bronchial asthma, sickle cell anemia and diabetes mellitus determine the severity of disease.

Incubation Period : 3–14 days (usually 4–7 days).

Mode of Transmission

1. **Through mosquito bites:** Dengue viruses spread to people through the bites of infected *Aedes* species mosquitoes (*Ae. aegypti* or *Ae. albopictus*). These mosquitoes typically lay eggs near standing water in containers like buckets, bowls, animal dishes, flower pots, and vases. These mosquitoes prefer to bite people, and live both indoors and outdoors near people. Mosquitoes that spread dengue, Chikungunya, and Zika bite during the day and night. Mosquitoes become infected when they bite a person infected with the virus. Infected mosquitoes can then spread the virus to other people through bites.
2. **From mother to child:** A pregnant woman already infected with dengue can pass the virus to her fetus during pregnancy or around the time of birth. Because of the benefits of breastfeeding, mothers are encouraged to breastfeed even in areas with risk of dengue.

3. **Through infected blood, laboratory, or healthcare setting exposures:** Rarely, dengue can also spread through blood transfusion, organ transplant, or through a needle stick injury.

Clinical Features

A person infected by the dengue virus develops severe flu-like symptoms. The disease, also called 'break-bone' fever, affects infants, children and adults alike and could be fatal. The clinical features of dengue fever (DF) are:

- High fever (40°C/104°F)
- Muscle and joint pain
- Headache
- Nausea/vomiting
- Rashes hemorrhagic
- Swollen glands
- Hemorrhagic manifestations.

Symptoms of dengue usually last for 2–7 days. Most people recover after about a week. Severe DHF dengue is a potentially deadly complication that can result in shock, respiratory distress, internal bleeding, organ impairment, and even death. People who have had a dengue infection before are likely to develop severe dengue. Infants and pregnant women are at increased risk for developing severe dengue. The warning signs of dengue are:

- A decrease in temperature (below 38°C/100°F)
- Severe abdominal pain or tenderness
- Persistent vomiting
- Rapid breathing
- Bleeding from nose or gums
- Blood in vomit or in stools
- Fatigue, restlessness or irritability.

Diagnosis

The diagnosis of dengue is typically made clinically, on the basis of reported symptoms and physical examination. Early disease can be difficult to differentiate from other viral infections. Laboratory diagnosis methods for confirming dengue virus infection may involve detection of the dengue virus, viral nucleic acid, viral antigens or anti-dengue antibodies (IgM), or a combination of these techniques.

Prevention and Control

The main method to control or prevent the transmission of dengue virus is to combat vector mosquitoes. Various measures for prevention and control of dengue are as follows:

1. Environment management and modification to remove natural and artificial man-made habitats that support the breeding of the mosquitoes.
2. Proper disposal of solid waste.
3. Properly covering and clean domestic water storage containers.
4. Use of personal household protection measures, such as window screens, long-sleeved clothes, repellents, insecticide treated materials, coils and vaporizers.
5. Improve community participation and mobilization for sustained vector control.
6. Apply creams, lotions or sprays containing mosquitoes repellents.
7. Active monitoring and surveillance of vectors to determine effectiveness of control interventions.
8. Careful clinical detection and management of dengue patients.

Treatment

There is no specific treatment for dengue fever. Patients should seek medical advice, rest and drink plenty of fluids. Paracetamol can be taken to bring down fever and reduce joint pains. However, Aspirin or Ibuprofen should not be taken since they can increase the risk of bleeding.

Drinking plenty of fluids such as water or drinks with added electrolytes keeps hydrated. For severe dengue, medical care by physicians and nurses experienced with the effects and progression of the disease can frequently decrease mortality. Maintenance of the patient's circulating fluid volume is the central feature of such care.

Immunisation

The first live attenuated dengue vaccine, Dengvaxia® (CYD-TDV) developed by Sanofi Pasteur was licensed in December 2015 and has now been approved by regulatory authorities in 20 countries for use in endemic areas in persons ranging from 9–45 years of age. For countries considering vaccination as part of their dengue control programme, pre-vaccination screening is the recommended strategy. With this strategy, only persons with evidence of a past

dengue infection would be vaccinated (based on an antibody test, or on a documented laboratory confirmed dengue infection in the past).

9. LYMPHATIC FILARIASIS

Introduction

Lymphatic filariasis, commonly known as elephantiasis, is a major public health problem in India. It is a parasitic disease caused by three species of microscopic, thread-like worms. The adult worms live in the lymphatic vessels and lymph nodes of a human host. The lymph system maintains the body's fluid balance and fights infections. It spreads from person to person by mosquitoes through mosquito bites. Lymphatic filariasis affects over 120 million people in 72 countries throughout the tropics and sub-tropics of Asia, Africa, the Western Pacific, and parts of the Caribbean and South America. It is endemic all over India except in Jammu and Kashmir. Filariasis mainly affects the lymphatic system. Heavily infected areas exist in Uttar Pradesh, Bihar, Andhra Pradesh, Odisha, Tamil Nadu, Kerala and Gujarat. People of all ages and both sexes are susceptible. Filariasis is not fatal but it disables and deforms a person especially due to swelling of the legs and the external genitalia, a condition called *elephantiasis*. The consequences of infection may cause significant personal and socioeconomic hardship for those who are affected.

Causative Agent

Lymphatic filariasis is caused by three nematodes (roundworms) *Wucherria bancrofti, Brugiamalayi and Brugiatimori.* These parasites are long, thread-like worms with tapering ends, easily visible with naked eyes.

Mode of Transmission

The infection spreads from person to person by mosquito bites. The larvae migrate to lymphatic vessels and lymph nodes, where they develop into microscopic worms (microfilariae) producing adults. The male and female worms together form 'nests' in the human lymphatic system, the network of nodes and vessels that maintain the delicate fluid balance between blood and body tissues. The adult worm mates, and produces millions of microfilariae. People with microfilariae circulating in their blood can serve as a source of

infection to others and infect the biting mosquitoes. Microfilariae grow and develop in 1–2 weeks into infective filariform (third-stage) larvae in the mosquito. When the mosquito bites another person, the larval worms infect the human host. They pass from the mosquito into the human skin, and migrate to the lymphatic vessels and lymph nodes of human host, where they grow into adult worms in a process that takes 6 months or more. An adult worm lives for about 5–7 years. The disease is transmitted from an infected person to a new host through the bite of a mosquito. The main vectors are *Culex fatigans* and *Mansonides mosquitoes*.

Incubation period: 6 months–1 year.

Clinical Features

i. Fever.
ii. Inguinal or auxiliary lymphadenopathy.
iii. Testicular and/or inguinal pain.
iv. Skin exfoliation.
v. **Limb or genital swelling:** Repeated episodes of inflammation and lymphedema lead to lymphatic damage, chronic swelling, and elephantiasis, i.e. hardening and thickening of the skin of the legs, arms, scrotum, vulva, and breasts.
vi. **Acute adenolymphangitis (ADL):** Sudden fever with lymphadenopathy caused by fluid collection resulting in swelling.
vii. **Filarial fever**: Fever without associated adenitis.
viii. **Tropical pulmonary eosinophilia (TPE) syndrome**: Dry nocturnal cough, shortness of breath, and wheezing.
ix. Ocular lesions usually related to the duration and severity of infection and are caused by an abnormal host immune response to microfilariae; loss of visual acuity may occur.

Prevention and Control

Protection from mosquito bites by using insect repellent, mosquito nets, sleeping in an air-conditioned room and wearing long sleeves and trousers are most important. Diethylcarbamazine (*Hetran*) is the only drug available against filariasis. The drug should be given in doses of 6 mg/kg body weight per day orally for 12 days, preferably in divided doses, after meals. National Filariasis Control Programme was started in 1955 but in 1978 its operational components have been merged with Urban Malaria Scheme.

Adult mosquito control (vector control) can be achieved by insecticidal spray, larvicidal measures, removal of aquatic plants

and improvement of environmental sanitation. Health education of the people is most important in dealing with the problem of filariasis. Programs to eliminate lymphatic filariasis are under-way in more than 66 countries. These programs are reducing transmission of the filarial parasites and decreasing the risk of infection for people living in or visiting these communities.

Treatment

i. Albendazole (a broad spectrum anthelmintic) combined with Ivermectin is the treatment of choice.
ii. A combination of Diethylcarbamazine (DEC) and Albendazole is also effective. All of these treatments are *micro*filaricides; they have no effect on the adult worms.

10. PNEUMONIA

Introduction

Pneumonia is a common infection of the lungs that may be caused by bacteria, virus or fungi. In this the air sacs in one or both lungs get inflamed and may get filled with fluid or pus, causing cough with phlegm or pus, fever, chills, and difficulty in breathing. It can cause mild to severe illness in people of all ages and is still the leading infectious cause of death in children younger than 5 years old worldwide. It is often spread via coughing, sneezing, touching or even breathing. Unfortunately, those who do not exhibit symptoms can also spread the illness.

Causative Agent

Pneumonia can be caused by a wide variety of bacteria (*Mycoplasma pneumoniae*), viruses and fungi in the air. The most common are *Streptococcus pneumoniae* (bacteria), *Haemophilus influenzae* type b (Hib) (bacteria), respiratory syncytial virus, and *Pneumocystis jiroveci*. Bacterial pneumonia caused by *Mycoplasma pneumoniae* is the most common form, which tends to be more serious than other types of pneumonia. It causes illness by damaging the lining of the respiratory system (throat, lungs, windpipe) and tends to cause milder illness that is likely to last longer.

Mode of Transmission

Pneumonia can be spread in a number of ways including airborne droplets from cough or sneeze, through blood especially during and

shortly after birth. The viruses and bacteria that cause pneumonia are commonly found in nose or throat of infected people. People spread *M. pnuemoniae* by coughing or sneezing, which creates small respiratory droplets in the air that contain the bacteria. *M. pneumoniae* infections usually have long incubation periods (the time between breathing in the bacteria and developing symptoms). *M. pneumoniae* outbreaks occur mostly in crowded places like schools, college residence halls, military barracks, nursing homes, and hospitals.

Incubation period : 1 to 4 weeks.

Clinical Features

The signs and symptoms of pneumonia vary from mild to severe, depending on factors such as the type of germ causing the infection, age and overall health. Common signs and symptoms of pneumonia may include:

i. Persistent cough with greenish, yellow or even bloody mucus.
ii. High fever with profuse sweating and chills.
iii. Shortness of breath.
iv. Rapid shallow breathing.
v. Sharp or stabbing chest pain that gets worse on breathing deeply.
vi. Loss of appetite and fatigue.
vii. Nausea, vomiting or diarrhea.
viii. Confusion, especially in older people.
ix. Headache, muscle pain, and weakness.

Diagnostic Tests

Various tests to diagnose and confirm pneumonia include:

a. **Blood tests:** These confirm the infection and identify the causative germ.
b. **Chest X-ray:** It is done to check the location and extent of inflammation in lungs.
c. **Pulse oximetry:** It is done to measure the oxygen level in blood.
d. **Sputum test:** It is done on a sample of mucus (sputum) taken after a deep cough, to look for the source of the infection.
e. **CT scan:** CT scan of the chest is done to get a better view of the lungs and to look abscesses or other complications.
f. **Arterial blood gas test:** It is more reliable than the simpler pulse oximetry. It measures the amount of oxygen in a blood sample taken from an artery, usually in wrist.

g. **Pleural fluid culture:** In this test a small amount of fluid is removed from around tissues that surround the lung, to analyze and identify bacteria causing the pneumonia.
h. **Bronchoscopy:** It is done to check blockage into the lungs airways.

Prevention and Control

1. Cover mouth and nose with a tissue while coughing or sneezing.
2. Put used tissue in a wastebasket.
3. Cough or sneeze into your upper sleeve or elbow in case of non-availability of tissue.
4. Frequently wash hands with soap and water for at least 20 seconds, especially after blowing nose, going to the bathroom, diapering, and before eating or preparing foods.
5. Avoid smoking.
6. Eat healthy food, get enough sleep, and exercise regularly.
7. Get vaccinated.

Treatment

Mycoplasma pnuemoniae infections are generally mild and most people recover without medicine. Some people may need care in a hospital. Antibiotics are normally given to patients to recover faster. There are several types of antibiotics available to treat pneumonia caused by *M. pneumoniae*. The antibiotic of choice is Amoxicillin dispersible tablets. Hospitalization is recommended only in case of severe cases of pneumonia. Typical antibiotics do not work against viruses. Antiviral drugs are needed in case of viral pneumonia. In most of the cases, symptoms such as fever and cough can be managed at home by following these steps:

1. Control fever with Aspirin, non-steroidal anti-inflammatory drugs (NSAIDs, such as Ibuprofen or Naproxen), or Acetaminophen. Aspirin should not be given to children.
2. Drink plenty of warm fluids to help loosen secretions and bring up phlegm.
3. Take steam baths and use a humidifier to help open airways and ease breathing.
4. Avoid smoking, second hand smoke and wood smoke.
5. Take lots of rest.

TABLE 2.4: Summary of communicable diseases

Disease	*Causative organisms*	*Symptoms*	*Incubation period*	*Mode of transmission*	*Prevention*	*Treatment*
Cholera	*Vibrio cholerae*	Severe watery diarrhea, vomiting, leg cramps, thirst	1–5 days	Food and water	Disinfection and proper sanitation	Management of dehydration by plenty of fluids and oral rehydration solution
SARS	*SARS-CoV*	Muscle pain, chills, headache, diarrhea, sore throat, cough, running nose, difficulty in breathing and shortness of breath	2–7 days	Droplet infection	Isolation and quarantine of infected person; prophylactic immunisation with influenza vaccine	Symptomatic treatment with supportive drug therapy
Ebola virus	*Zaire ebolavirus* (EBOV), Sudan virus (SUDV), Taï Forest virus (TAFV), Bundibugyo virus (BDBV)	Fever, fatigue, sore throat, weakness, vomiting, rash, stomach pain, impaired kidney and liver function, bleeding or bruising	2–21 days	Close contact with blood or body fluids	Isolation and quarantine of infected person, avoid contact with infected person	Symptomatic treatment with supportive drug therapy

Contd.

TABLE 2.4: Summary of communicable diseases *(Contd.)*

Disease	*Causative organisms*	*Symptoms*	*Incubation period*	*Mode of transmission*	*Prevention*	*Treatment*
Influenza	*Myxo viruses*	Fever, headache, chills, sore throat, cough, weakness and severe aches	18–72 hours	Droplet infection	Isolation and quarantine of infected person; prophylactic immunisation with influenza vaccine	Antiviral drugs, particularly neuraminidase inhibitors (Tamiflu and Relenza)
Acute respiratory infections	Microbial agents including bacteria and viruses	Congestion, running nose, fever, difficulty in breathing	2–20 days	Airborne route, direct contact	Immunisation with MMR rubella-pertussis conjugate vaccines against *Haemophilus influenzae* type b	Antibiotics and antiviral drugs
Malaria	*Plasmodium vivax* P. *falciparum; P. malariae; and P. ovale*	Cold stage, hot stage, sweating stage	10–30 days	Bite of infected anopheles mosquitoes	Anti-mosquito measures and protection from mosquito bites	Anti-malarial drugs (Chloroquine, Quinine, Mefloquine, Halofantrine, etc.)

Contd.

TABLE 2.4: Summary of communicable diseases *(Contd.)*

Disease	*Causative organisms*	*Symptoms*	*Incubation period*	*Mode of transmission*	*Prevention*	*Treatment*
Chikungunya	Chikungunya virus (CHIKV)	Chills, anorexia, leucopenia, fatigue, joint pain.	2–6 days	Bite of *Aedes aegypti* and *Aedes albopictus mosquitoes*	Anti-mosquito measures and protection from mosquito bites	Symptomatic treatment with supportive drug therapy
Dengue	*Dengue virus (DEN-1, DEN-2, DEN-3 and DEN-4)*	Severe flu-like symptoms	4–5 days	Bite of infected anopheles mosquitoes	Anti-mosquito measures and protection from mosquito bites	Symptomatic treatment with fluid replacement
Lymphatic filariasis	*Wucherria bancrofti and W. malayi*	Elephantiasis	6 months-1 year	*Culex fatigans* and Mansonides mosquitoes bite	Anti-mosquito measures and protection from mosquito bites	Diethyl-carbamazine
Pneumonia	*Streptococcus pneumoniae* (bacteria), *Haemophilus influenzae* type b (Hib) (bacteria), respiratory syncytial virus, *Pneumocystis jiroveci*	Persistent cough with mucus, sore throat, body ache,	1–4 weeks	Droplet infection	Isolation of infected person, avoid contact with infected person	NSAID, Amoxicillin

11. HYPERTENSION

Introduction

Hypertension, also known as high blood pressure (HBP), is a major health problem throughout the world because of its high prevalence. HBP is associated with increased risk of coronary artery diseases, stroke, myocardial infarction, atrial fibrillation, peripheral vascular diseases, vision loss, chronic kidney disease, and dementia. It is a chronic medical condition in which the blood pressure in the arteries is persistently elevated that requires the heart to work harder than normal to circulate blood through the blood vessels. It is called the 'silent and invisible killer' because initially the disease is asymptomatic but consequently a person can have hypertension without realizing it. Therefore, it is essential to check blood pressure regularly.

Blood pressure is expressed using (i) the systolic blood pressure that measures the pressure in blood vessels when heart beats, and (ii) diastolic pressures, which measures the pressure in the blood vessels when the heart rests between beats. If the measurement reads 120 systolic and 80 diastolic, we would say '120 over 80' or simply '120/80 mmHg.'

Blood pressure 120/80 mmHg or less is considered as normal. Blood pressure between 120/80 mmHg and 138/89 mmHg is considered as pre-hypertension, which denotes increased risk of hypertension, whereas a blood pressure of 140/90 mmHg and above is considered to be hypertension. So hypertension can be defined as persistent elevation of systolic BP of 140 mmHg or greater and/or diastolic BP of 90 mmHg or greater.

Diagnosis

The diagnosis of hypertension in adults is made when the average of two or more diastolic blood pressure measurements on at least two subsequent visits is ≥90 mmHg, or when the average of multiple systolic blood pressure readings on two or more subsequent visits is ≥140 mmHg. A single elevated reading does not confirm hypertension but is a sign that further investigation is required. In case systolic and diastolic blood pressure falls into different categories, the higher category should be selected to classify the individual's blood pressure. Sphygmomanometer and a mercury or mechanical manometer are used to measure blood pressure.

Classification of Hypertension

Hypertension is classified as primary (essential) hypertension or secondary hypertension.

a. **Primary hypertension:** Primary hypertension is hypertension in which the exact cause is unknown. It is mainly due to genetic factors and non-specific lifestyle factors including excess intake of salt, smoking, and alcohol use. It is the most common form of hypertension that accounts for nearly 90% of cases and is associated with the several recognizable risk factors.
b. **Secondary hypertension:** Secondary hypertension is the hypertension that is caused by another disease present in the body such as chronic kidney disease, toxemias of pregnancy, tumors of adrenal gland, narrowing of aorta, sleep apnea, thyroid dysfunction, etc. Once the root cause is treated, blood pressure usually returns to normal or is significantly lowered.

Risk Factors

Although the exact cause of primary hypertension is unknown, there are several risk factors that have been associated with the condition. These risk factors are also associated with other non-communicable diseases such as asthma, cancers, diabetes mellitus, cardiovascular diseases, chronic respiratory disease, musculoskeletal disorders, etc. The risk factors can be categorized into modifiable and non-modifiable risk factors.

Non-modifiable risk factors: The non-modifiable risk factors are characteristics in the person that cannot be controlled or changed. Such factors include : (i) age, (ii) sex, race, family history, and (iii) genetic composition.

Modifiable risk factors: On the other hand, modifiable risk factors of hypertension are characteristics or lifestyle patterns that can be adjusted or changed to prevent the development of the disease. The modifiable risk factors include healthy behaviors that can lower risk for high blood pressure, are (i) obesity, (ii) excessive salt intake, (iii) an unhealthy diet, (iv) inactivity or lack of exercise, (v) unhealthy high fat diet, (vi) tobacco use, (vii) alcohol consumption, (viii) sleep apnea, and (ix) stress.

Prevention of Hypertension

Primary prevention

It refers to the steps taken by an individual to prevent the onset of the disease. This is achieved by maintaining a healthy lifestyle

such as healthy diet and exercise. Lifestyle interventions are more successful in reducing risk of hypertension when targeted in older persons who have a higher risk of developing hypertension compared with their counterparts who are younger or have a lower risk. Two strategies have been recommended for the prevention of essential hypertension. These includes:

1. **Population-based strategy:** A population-based approach aimed at achieving a downward shift in the distribution of blood pressure in the general population. Even a small reduction in the distribution of systolic blood pressure is likely to result in a substantial decrease in the prevalence of hypertension and blood pressure related illness such as stroke, transient ischemic attacks, and coronary heart disease. Various population-based strategies for primary prevention of essential hypertension include decreasing sodium content in diet, decreasing caloric density in processed food, and providing safe and convenient opportunities for exercise. Enhancing access to appropriate facilities (parks, walking trails, bike paths) and to effective behavior change models is a useful strategy for increasing physical activity in the general population. Following lifestyle changes can lower blood pressure and decrease the risk of health complications like heart diseases and stroke.
   a. *Healthy diet:* Intake of food low in salt (sodium) and high in potassium, healthy meals including vegetables, fresh fruits, whole grains, fat-free or low-fat dairy products and limiting sweets can lower the risk of hypertension.
   b. *Weight management:* There is a strong relation between obesity and hypertension. Being overweight or obese (body mass index greater than 25) increases risk for high blood pressure. Weight loss is an effective approach for the prevention of hypertension.
   c. *Physical activity:* Regular aerobic physical activity regulates blood lipid level, lowers blood pressure and reduces risk of cardiovascular disease.
   d. *Behvioural changes:* Cigarette smoking and alcohol intake increase blood pressure and increase the risk for heart attack and stroke. Discarding harmful behaviors like smoking and avoiding alcohol consumption can lower risk for hypertension and heart disease.
2. **Intensive targeted strategy:** More intensive targeted approaches are aimed at achieving a greater reduction in blood pressure in those who are at high-risk for hypertension including those with

high normal blood pressure, a family history of hypertension, overweight or obesity, a sedentary lifestyle, excess intake of dietary sodium, insufficient intake of potassium, or excess consumption of alcohol.

Secondary prevention

Secondary prevention plays a vital role in reducing the impact of the hypertension and preventing life-threatening situations from coronary, cerebrovascular and kidney diseases. Main drawback of primary prevention is that it only focuses on adjusting modifiable risk factors including lifestyle changes such as diets and regular exercise, discarding harmful behaviors such as smoking to prevent the onset of disease. This drawback of primary prevention is addressed by secondary prevention which focuses on following parameters:

1. Early case detection using indicators like family history of the patient, lifestyle, age, blood sugar levels, and lipids levels.
2. Screening of population in the absence of symptoms.
3. Conducting necessary interventions to reverse the effects of the disease.
4. Control of diseases by use of appropriate antihypertensive drugs prior to critical and permanent damage and consequently reducing the risk of morbidity and mortality.

Tertiary prevention

Tertiary prevention aims to treat patients when the symptoms have been set and critical damage has already occurred. This, in general, aims to increase the life expectancy and quality of life of the patient via intensive procedures such as coronary angioplasty, defibrillators, stents, pacemaker placement and bypass surgery. Main drawbacks of tertiary prevention in relation to primary and secondary prevention are:

i. Discomfort to the patient.
ii. Disruption of daily activities of the patient.
iii. High cost.

Treatment

a. **Lifestyle measures:** Major lifestyle measures effective in lowering BP include:
   1. Weight management.
   2. Adoption of Dietary Approaches to Stop Hypertension (DASH) eating plan which is rich in potassium and calcium, low in dietary sodium, low in fat, rich in fibres.

3. Do physical activity and get regular aerobic physical exercise
4. Moderation of alcohol consumption.
5. Quit smoking.
6. Drug treatment with thiazides or thiazide-like diuretics.

b. **Drug therapy:** There are several types of drugs used to treat high blood pressure, including:
   1. Angiotensin-converting enzyme (ACE) inhibitors: Benazepril (Lotensin), Captopril (Capoten).
   2. Angiotensin II receptor blockers (ARBs), e.g. Telmisartan (Micardis),Valsartan (Diovan).
   3. Diuretics: Chlorthalidone (Hygroton); Chlorothiazide: (Diuril).
   4. Beta-blockers: Acebutolol (Sectral), Metoprolol Succinate (Toprol-XL).
   5. Calcium channel blockers: Diltiazem (Cardizem CD).

12. DIABETES

Introduction

Diabetes mellitus is a chronic metabolic disease characterized by hyperglycemia (high blood sugar concentration) and glucosuria (excretion of sugar in urine). It is due to deficiency or lack of insulin secretion (pancreatic hormone) that regulates blood sugar and results in impaired metabolism of the nutrients, especially that of carbohydrates. Diabetes is essentially the disease of old and middle age, about 70–80% diabetes patients being above 50 years of age. The estimated prevalence in India is 1%. Uncontrolled diabetes over time can damage nerves, eyes, kidneys, and other organs causing serious health complications including heart disease, blindness, kidney failure, and lower-extremity amputations.

Causes and Risk Factors

The causes and risk factors of diabetes are discussed below:

1. There is defective secretion of insulin and its utilization.
2. Insulin is a hormone that controls blood sugar and is secreted by pancreas. Insulin moves the glucose from blood stream into muscle, fat and liver cells where it serves as a source of energy for the body.
3. People suffering with diabetes have high blood sugar level due to insufficient or no secretion of insulin from pancreas or cells; do not respond to insulin, or both.

4. Diabetes mellitus is predominantly derangement of carbohydrates metabolism and to a lesser extent that of fat and proteins.
5. Diabetes is hereditary disorder.
6. Obesity is important in diabetes.
7. Diet rich in carbohydrates and fats aggravates diabetes.
8. Fast urbanization increasing stress and strain in life and sedentary habits contribute to increase in incident of diabetes. Death rate in diabetes increases with age.

Types of Diabetes

Diabetes can be classified into the following general categories (Table 2.5):

TABLE 2.5: Types of diabetes

Type of diabetes	*Characteristics*
Type 1 Insulin-Dependent Diabetes Mellitus (IDDM)	1. Body makes little or no insulin due to destruction of insulin producing β-cell in the pancreas 2. Most often diagnosed in children, teens or young adults although can occur at any age 3. Exact cause is unknown 4. Patients need daily injection of insulin 5. Sudden onset 6. Family history is usually absent 7. Diabetic nephropathy, heart disease and stroke are major complications
Type 2 Non-insulin dependent diabetes mellitus (NIDDM)	1. Fat, liver and muscle cells do not respond correctly to insulin 2. Most common form of diabetes with gradual onset 3. Family history is usually present 4. Most often occurs in adulthood 5. Therapy aims at first lowering high blood glucose level 6. Irreversible medical complications may occur gradually leading to disability and death 7. Associated with obesity and underactivity
Gestational diabetes	1. Includes pregnant women who do not have diabetes but develop high blood sugar at any time 2. May precede development of type 2 diabetes
Malnutrition-related diabetes mellitus (MRDM)	1. It is associated with long-term malnutrition 2. It is characterized by insulinopenia, insulin resistance, hyperglycemia and failure of the β-cells in the pancreas

Clinical Features

- Blurred vision
- Fatigue
- Excessive thirst (polydipsia)
- Frequent urination (polyurea)
- Weight loss
- Hunger
- Genital itchiness.

Diagnosis

1. **Urine test:** It is a simple, easy and economical test done on urine passed 2 hours after meal. This test is not reliable; if blood sugar level is higher than 200 mg/dL, then one or more of the following tests must be done for the confirmation of diabetes.
2. **Fasting plasma glucose (FPG) test:** The FPG blood test measures blood glucose level at a single point in time. For the most reliable results, it is best to have this test in the morning, after fast for at least 8 hours.
   Fasting blood glucose level:

Sugar level	:	Condition
> 126 mg/dL	:	Diabetes
100–126 mg/dL	:	Impaired fasting glucose or pre-diabetes

   (These levels are risk factor for *Type 2* diabetes)
3. **Hemoglobin A1c test (Glycosylated hemoglobin):** This is a laboratory test that shows the average amount of sugar in blood over 3 months and is used as a screening test for undiagnosed *type 2* diabetes. An HbA1c of 6% or less is normal.

Condition	:	**Level**
Normal	:	<5.7 %
Pre-diabetes	:	5.7–6.4%
Diabetes	:	Equal to or more than 6.5%

4. **Oral glucose tolerance test (OGTT):** It is the gold standard test for diabetes diagnosis. In this a standard dose of glucose (75 gm) is given to patient orally and blood levels are checked after two hours. If glucose level is higher than 200 mg/dL after 2 hours, then diabetes is diagnosed.
5. **Gestational diabetes** is diagnosed through prenatal screening, rather than through reported symptoms.

Epidemiological Determinants

1. **Host factors:**
   a. *Age:* Diabetes can occur at any age, but the incidence of *Type 1* diabetes is highest between birth and 14 years old and *Type 2* is common among adults and elderly. Generally, the prevalence increases steadily with age in both sexes.
   b. *Sex: Type 1* diabetes is common among men and *Type 2* among women.
2. **Genetic factors:** Genetic susceptibility is important. The concordance is identical in:
   - Obesity
   - Maternal diabetes.
3. **Environmental factors:** These include**:**
   - Viral infection
   - Diet
   - Malnutrition
   - Alcohol consumption
   - Lifestyle
   - Immunological factors
   - Stress and strain
   - Socioeconomic class.

Prevention and Control

The diabetes prevention and care can be divided into primary, secondary and tertiary prevention. Primary prevention is the delaying of the onset or prevention of NIDDM, secondary prevention is the prevention of diabetic complications while tertiary prevention is the treatment of specific diabetic complications. The objectives of prevention are to lessen diabetes-related morbidity and mortality. If these goals are to be realized, then a combination of all three preventative strategies is needed.

A. Primary prevention

It includes activities aimed at preventing diabetes from occurring in susceptible individuals. For primary prevention of NIDDM to be successful, we need to address the causative factor or factors in its aetiology. The primary prevention of NIDDM could theoretically be achieved by genetic or environmental manipulation. The two strategies suggested for the primary prevention are:

a. **Population-based strategy:** The development of prevention programmes for diabetes based on the elimination of environmental risk factors is possible. The prevention of

development of even the risk factors so called, primordial prevention, should be implied. A much more likely approach to the primary prevention of NIDDM is through lifestyle changes that favorably influence insulin sensitivity and insulin secretory capacity. These changes would include:

i. *Maintenance of normal body weight:* The avoidance of obesity is an important primary preventive measure for reducing the prevalence and delaying the onset of NIDDM within the general population. Pre-diabetics should be advised to keep their weight about 10% less than optimum for their age and sex.
ii. *Increased physical activity:* Increasing physical activity in both men and women reduces the incidence of impaired glucose tolerance (IGT) and NIDDM in both individuals at low- and high-risk of NIDDM.
iii. *Dietary modification:* The prevalence of NIDDM is influenced by both the energy content and the composition of the diet. An adequate intake of proteins, dietary fibers, avoidance of sweets, refined grains such as white bread and white rice reduces the incidence of NIDDM in both individuals at low- and high-risk of NIDDM. The dietary inclusion of anti-oxidants such as vitamin E may also improve insulin sensitivity and provide extra cardioprotection in NIDDM by reducing free radical activity.
iv. *Optimization of the intrauterine environment:* The intrauterine environment influences the incidence of future NIDDM in the fetus. Low birth weight is associated with an increased risk of future diabetes. Adequate maternal nutrition and avoiding maternal hyperglycemia have a primary preventative role in NIDDM.
v. *Marriage counselling:* One diabetic should not marry another diabetic. If they are already married, then they should not have children.
vi. Prevention of obesity with emphasis on pre-diabetics keeping their weight about 10% less than optimum for their age and sex.
vii. Early diagnosis through regular checkups especially any persons with sedentary habits and family traits. Such screening tests include urine examination two hours after meals and blood sugar estimation 2 hours after 50 g of glucose orally.

viii. For control of diabetes the important steps are diet control, physical exercise, anti-diabetic drugs and personal hygiene including care of feet and skin.

b. **High-risk strategy:** It targets the high-risk target population. In high-risk individuals with IGT, progression to *Type 2* diabetes can be reduced by correction of risk factors like sedentary lifestyle, over-nutrition, obesity, smoking, high blood pressure and elevated cholesterol or with drug therapy using glucose-lowering agents such as Metformin. The challenges that remain are to determine how high-risk individuals should be identified, and how lifestyle changes of healthier diet and regular physical activity can be sustained.

B. Secondary prevention

This implies the adequate treatment of diabetes once detected. It targets at the prevention of diabetic complications (e.g. prevention of neuropathy) through the early diagnosis, adequate treatment, of diabetes, and the coexisting risk factors. Treatment can be based on diet alone, diet and anti-diabetic drugs or diet and insulin. The treatment and avoidance of hypertension, microalbuminuria, dyslipidemia and cigarette smoking, alcohol intake are important secondary preventative strategies to effectively reduce complications. Routine checkup of blood sugar, body weight, urine for proteins and ketones and visual acuity should be done.

C. Tertiary prevention

It refers to prevention of worsening complications (e.g. amputation resulting from injury to a neuropathic foot) or death. It includes measures taken to prevent complications and disabilities due to diabetes. At the tertiary level the special diabetes clinics should be organised and establishment of units capable of providing diagnostic and management skills of high order should be done. All the ways of prevention can work in unison to reduce the mortality and morbidity associated with diabetes. Furthermore, in the coming times the stress should be on the primordial and the primary prevention.

Treatment

For the management of Type 1 diabetes following measures must be undertaken:

1. People who have just been diagnosed may need to stay in the hospital.

2. Everyone with *Type 1* diabetes must take insulin everyday.
3. People with *Type 1* diabetes should eat at about the same times each day and try to eat the same kinds of foods.
4. Management of blood sugar level.
5. Foot care: Check and care for feet everyday.
6. Prevention of complications like heart attack and stroke.
7. Stop smoking.

Treatment of ***Type 2*** diabetes includes the following measures:

1. The main treatment is exercise and diet.
2. If diet and exercise do not help to keep blood sugar at normal or near-normal levels, then doctor may prescribe medication, which include one or more of the following drugs:
   - *Sulfonylureas:* Glimepiride, Glyburide and Tolazamide
   - *Alpha-glucosidase inhibitors:* Acarbose
   - *Biguanides:* Metformin
   - *Injectable medicines:* Exenatide, Mitiglinide, Pramlinide, Sitagliptin, and Saxagliptin
   - *Meglitinides:* Repaglinide and Nateglinide
   - *Thiazolidinediones:* Rosiglitazone and Pioglitazone

These drugs may be given with insulin, or insulin may be used alone.

13. CANCER

Introduction

Next to cardiovascular disease, cancer is the second leading cause of death in developed countries and fourth cause in developing countries. It is one of the 10 leading causes of death in India and its rank is advancing year to year.

Cancer (malignancy) can be regarded as a group of diseases characterized by (i) an abnormal growth of cells, (ii) ability to invade adjacent tissues and even distant organs; and finally (iii) the death of the affected patient if the tumor has prolonged beyond that stage when it can be successfully removed. The increasing number of cases of cancer is due to the ageing population, environment changes, and better diagnostic facilities.

Cancer can occur at any site of the body and may involve any type of the cells.

Etiology

The etiology of cancer is not exactly understood. Basically it is a disease of the cells. The contributing agents leading to cancer vary

in different types of cancers. Such external agents are known as carcinogens.

A **carcinogen** may be defined as an agent or substance that can transform normal cells into nepotistic ones.

Tumor and cancer: A mass of tissue formed as a result of abnormal, excessive, uncoordinated, autonomous and purposeless proliferation of cells is called **tumor**. Tumors may be of two types:

1. *Benign:* Slow-growing and localized without causing much difficulty to host.
2. *Malignant:* Proliferates rapidly, spreads throughout the body and may eventually cause death of the host; commonly termed cancer.

The term primary cancer is used to indicate the cancer in the organ of origin. Sometimes cancer cells continue to grow and spread by direct extension or through a process called metastasis in another part of the body. This new cancer growth is called secondary cancer.

Types of Cancer

The major types of cancer are:

1. **Carcinoma:** It is the most commonly diagnosed cancers that originate in the skin, lungs, breasts, pancreas, and other organs and glands. Carcinomas usually form solid tumors.
2. **Sarcoma:** Sarcomas grow in bones, muscles, fat, blood vessels, lymph vessels, nerves, tendons, joints, cartilage, or other connective tissues of the body. They are relatively uncommon.
3. **Melanoma:** Melanomas are cancers that arise in the cells that make the pigment in skin.
4. **Lymphoma:** Lymphoma is cancer of lymphocytes that begins in the lymphatic system. There are mainly two types of lymphomas: Hodgkin lymphoma and non-Hodgkin lymphoma.
5. **Leukemia:** Leukemia is cancer of the blood. It does not usually form solid tumors. The four main types of leukemia are acute lymphocytic leukemia, chronic lymphocytic leukemia, acute myeloid leukemia, and chronic myeloid leukemia.

Causes of Cancer

a. **Environmental factors:** Tobacco smoking/chewing is largely responsible for the cancer of lungs, larynx, mouth, pharynx, esophagus, bladder, pancreas and probably kidney. Excessive use of alcoholic beverages is associated with esophageal and liver cancer. Dietary factors are also related to cancer, e.g. smoked fish—stomach cancer, dietary fibers—intestinal

cancer, beef consumption—bowel cancer, high fat diet—breast cancer. Occupational exposure to benzene, arsenic, cadmium, chromium, vinyl chloride, asbestos, poly-acrylic hydrocarbons may lead to cancer. Some viruses are also suspected to be carcinogenic. Parasitic infection may increase the risk of cancer, e.g. schistosomiasis may result into carcinoma of the bladder. Other factors include sunlight, radiation, air and water pollution, medication (e.g. estrogens) and pesticides. Some customs, habits and lifestyles are also related to cancer, e.g. smoking—lung cancer, tobacco and betel chewing—oral cancer, etc.

b. **Genetic factors:** These are less conspicuous and more difficult to identify, e.g. retinoblastoma occurs in children of the same parent. Mongols are more likely to develop leukemia than normal children.

Clinical Features

Although symptoms of cancer depend on the type and location of cancer yet following symptoms occur commonly with most cancers: (i) Chills, (ii) fatigue, (iii) fever, (iv) loss of appetite, (v) malaise, (vi) night sweats, and (vii) weight loss.

Diagnosis

Cancer is most frequently diagnosed by following techniques:

- Blood tests for detecting chemicals such as tumor markers
- Biopsy of tumor
- Bone marrow biopsy for lymphoma or leukemia
- Chest X-ray
- Complete blood count (CBC)
- Computed tomography (CT) scan
- Magnetic resonance imaging (MRI).

Prevention and Control

Prevention of cancer is now divided into primary prevention and secondary prevention.

Primary prevention

It is the set of interventions that aims to prevent or reduce the burden of cancer before it ever occurs by modifying or avoiding key risk factors. These include:

1. Give up the habit of tobacco chewing, cigarette smoking and alcohol consumption.

2. Weight management to avoid obesity.
3. Avoid unhealthy diet with increased intake of fruit and vegetable.
4. Increase physical activity and avoid sedentary life.
5. Vaccinate against HPV and hepatitis B virus to prevent sexually transmitted HPV-infection and hepatitis B.
6. Avoid direct exposure to ionizing and ultraviolet radiation.
7. Take environmental measures to control chemical carcinogens.
8. Use chimneys to decrease indoor smoke from household use of solid fuels.
9. Improve personal hygiene.
10. Control of occupational hazards.
11. Health counselling and educating people about warning signs of cancer.

Secondary prevention

It is that set of interventions leading to early diagnosis, screening and effective treatment of precancerous lesions to reduce the morbidity and mortality. Early diagnosis involves the recognition of possible warning signs of cancer including lumps, sores, abnormal bleeding, persistent indigestion, chronic hoarseness. If patients are diagnosed at late stages, then curative treatment may no longer be an option.

Screening tests: Screening refers to the use of simple tests to identify individuals having cancer at a pre-malignant stage, but do not yet have symptoms. There are two methods of cancer screening:

a. Mass population screening, and
b. Diagnostic screening.

Mass population screening for breast and cervical cancer by using mammography screening and cytology screening, respectively is done to detect lesions in women without any symptoms. Diagnostic screening is done when a woman presents with symptoms. Various screening methods are:

a. Colposcopic examination with acetic acid for cervical cancer.
b. Human Papillomavirus (HPV) test for cervical cancer.
c. Pap smear (cervical smear) test for cervical cancer.
d. Mammography screening for breast cancer.

Treatment of Cancer

Treatment of cancer depends on its type and stage:

i. Surgery is the most common approach for treatment of cancers, which are confined to one location and have not spread, e.g. skin cancers, lung cancer, breast cancer, cancer of colon.

ii. Radiation and/or chemotherapy are used in combination with surgery when surgery alone cannot remove all of the cancer. The cancer of lymph gland, lymphoma is treated most commonly with chemotherapy and radiation therapy while surgery is rarely used.
iii. Cancer Control Programme was undertaken in 1965 through six regional centers in the country (i) Tata Memorial Cancer Hospital, Mumbai; (ii) Radiation Institute, Patna; (iii) Chittranjan National Cancer Research Center, Kolkata; (iv) M.P. Shah Cancer Hospital, Ahmedabad; (v) Missionary Cancer Institute, Vellore; and (vi) Barnard Institute of Radiology, Madras.

14. DRUG ADDICTION–DRUG SUBSTANCE ABUSE

Introduction

Drug is a natural or synthetic substance other than food, which, when taken, affects the functioning or structure of the body or mind and is used in the diagnosis, mitigation, treatment, or prevention of a disease or relief of discomfort.

Drug Addiction

Drug addiction is a chronic disease characterized by an overwhelming and compulsive desire to obtain and use the drug, despite harmful consequences. It negatively affects a person's brain and behavior. Some people get addicted to certain medications. This addiction gradually starts developing when the individual continues to consume the drug despite the impairment it causes. Nicotine, marijuana and alcohol are commonly misused drugs in today's world. Individuals struggling with drug addiction often feel as though they cannot function normally without their drug of choice. This can lead to a wide range of issues that impact professional goals, personal relationships, and overall health. Over time, these serious side effects can be progressive, and if left untreated, fatal. About 190 million people all over the world consume one drug or the other. India too is caught in this vicious circle of drug abuse, and the numbers of drug addicts are increasing day by day. According to a UN report, one million heroin addicts are registered in India, and unofficially there are as many as five million.

Drug Abuse (Substance Abuse)

It is excessive, self-administration of the habit forming drugs or substances in amount, strength, frequency and manner that causes serious physical, social, psychological (e.g. dysfunctional behavior patterns, hallucinations, memory loss), physiological (e.g. kidneys damage, liver damage, heart failure) harm or death. June 26 is celebrated as International Day against Drug Abuse and Illicit Trafficking every year. The ultimate result of drug abuse is drug addiction.

Types of drug abuse

1. Wrong use of drug.
2. Intake of too much quantity of drug at the same time, e.g. sleeping pills.
3. Wrong combination of drugs.
4. Prolonged use of drug, e.g. Pethidine.
5. Use of drugs having no legitimate claim.

Reasons of drug abuse

Main reasons that lead to drug abuse are:

- Easy availability
- Curiosity
- Emotional pleasure
- Social pressure
- Unemployment
- Family disputes
- Genetic predisposition.

Identification of abusers

Following changes are observed in drug abusers and at their home, workplace, etc.

1. Academic changes
   - Poor attendance at school/college.
   - Decline in academic performance.
2. Physical changes
   - Slurred speech, sweating, loss of appetite, red eyes, unsteady gait, puffiness under eyes.
3. Other changes:
   - Blood stain on clothes, disappearance of articles from home, odor on breath and clothes, presence of needles, syringes.

Withdrawal symptoms

Tremors, gastrointestinal symptoms, pain, sweating, depression.

DRUG DEPENDENCE

Drug or substance dependence is an adaptive state in which individual seeks an urges to take the drug continuously or intermittently to experience its psychic effects and to prevent the distress, anxiety that develops due to specific withdrawal symptoms upon cessation of drug use. The person cannot live normal life and experience withdrawal symptoms such as sweating, vomiting or diarrhea, depression or anxiety as the person abstains from taking the drug.

Types of Drug Dependence

a. **Physical dependence:** It is a physiological state in which the body develops a physiological dependence on a drug, and need more of it to achieve a certain effect (tolerance). The withdrawal of drug elicits unpleasant drug specific *physical or mental* symptoms and signs of withdrawal. It is likely to be physically dependent on a drug without being addicted to it but mostly physical dependence often accompanies drug addiction. Physical dependence is caused by chronic use of many drugs including many prescription drugs (opiates like heroin), benzodiazepines, barbiturates, alcohol and nicotine), even if taken as instructed. It is the result of physical changes in the brain.
b. **Psychological dependence:** It is a state in which the person becomes mentally dependent on certain drugs (usually mind altering like cocaine and amphetamines) and continues to use them even though the person realizes the harm that these drugs are causing. Psychological dependence often affects a person emotionally and mentally and person develops emotional-motivational withdrawal symptoms such as irritability, cravings, insomnia, anxiety, depression, anorexia, etc. upon cessation of drug use. To overcome psychological dependence, will power alone is often not enough.

Drugs of Misuse and Abuse

Drugs mainly reported to be connected with drug misuse and abuse include:

- Alcohol
- Caffeine
- Inhalants
- Sedatives

- Hypnotics and anxiolytics
- Stimulants
- Barbiturates
- Benzodiazepines
- Cannabis
- Cocaine
- Methaqualone
- Opioids/narcotics
- Tobacco and substituted amphetamines.

PSYCHOACTIVE SUBSTANCES

Psychoactive substances or drugs are the agents that act mainly upon the central nervous system where they change brain function, resulting in temporary changes in mood, perception, and behavior. These agents may be used recreationally, to purposefully alter one's consciousness, or as entheogens, for ritual, spiritual, or shamanic purposes. Some people use it as a tool for studying or augmenting the mind. Some categories of psychoactive drugs have therapeutic value like anesthetics, analgesics, hypnotics, anxiolytic, central nervous system stimulants, hormonal preparations, anti-convulsant and anti-parkinsonian drugs.

Types of Psychoactive Substances

Table 2.6 depicts the four main classes of psychoactive substances and the frequently experienced effects from their use.

TABLE 2.6: Psychoactive substances and their main effects

Class of substance	*Main effects*	*Examples*
Depressants	Relaxation, anxiety reduction, sleep	Alcohol, valium, barbiturates (seconal, nembutal)
Stimulants	Alertness or arousal, euphoria	Amphetamines, benzadrine, dexedrine
	Alertness or euphoria	Cocaine
	Alertness	Caffeine
	Alertness	Nicotine
	Hallucinations	Ecstasy (MDMA)
Opiates/narcotics	Pain control, euphoria	Heroin, morphine percodan, demorol
	Euphoria	Opium
Psychedelics	Altered perceptions, hallucinations	LSD, PCP

1. Depressants

A depressant, or central depressant, is a drug that depresses or reduces arousal or stimulation, in various areas of the brain. Depressants are also occasionally referred to as 'downers' as they lower the level of arousal when taken. Depressants are widely used throughout the world as prescription medicines and as illicit substances. They exert their effects through a number of different pharmacological mechanisms, the most prominent of which include facilitation of GABA, and inhibition of glutamatergic or monoaminergic activity. When depressants are used, effects often include ataxia, anxiolysis, pain relief, sedation, cognitive/memory impairment, and in some cases euphoria, dissociation, muscle relaxation, hypotension, respiratory depression, anticonvulsant effects, even complete anesthesia or death at high doses. Other examples are chemicals that modify the electrical signaling inside the body. The most important are bromides and channel blockers. Depressants are used medicinally to relieve anxiety (generalized anxiety, social anxiety, and panic attacks), depression, obsessive—compulsive disorder insomnia, convulsions, seizures.

Alcohol: Alcohol is a very prominent depressant. Alcohol is creating a large problem among teenagers and young adults. Depending upon the quantity consumed, alcohol is considered as a sedative, tranquilizer, hypnotic, or anaesthetic. It has marked effect on central nervous system. Alcohol abuse or alcoholism is a worldwide psychiatric problem in which there is recurring harmful use of alcohol despite its negative consequences. There are two types of alcohol abuse:

i. Those who have anti-social and pleasure-seeking tendencies.
ii. Those who are anxiety-ridden/people who are able to go without drinking for long periods of time but are unable to control themselves once they start.

Risky situations include drinking and driving. Alcohol use can affect all parts of the body but particularly affects the brain, heart, liver, pancreas, and immune system. This can result in mental illness, peripheral neuropathy, Wernicke-Korsakoff syndrome, cardiomyopathy, liver cirrhosis, pancreatitis, gastritis, and an increase in the risk of cancer, among other diseases. Drinking during pregnancy can cause damage to the baby resulting in fetal alcohol syndrome (retarded growth, mental retardation, abortion). Generally women are more sensitive to alcohol's harmful physical and mental effects than men.

2. Stimulants

Stimulants are psychoactive substances, which stimulate the central nervous system and are likely to give the user a feeling of increased alertness or arousal, an increased perception of energy, and improved sense of well-being. Physiological reactions include:

- An increased heart rate
- Increased blood pressure
- Increased breathing frequency
- Flushed skin, and perspiration.

Excessive use of stimulants may result in psychic dependence and may cause:

- Dizziness
- Mood swings
- Headache
- Irritability
- Heart palpitations
- Chest pain, hallucinations, and death.

The most commonly used stimulants are amphetamines, nicotine—present in tobacco, and caffeine—present in coffee, tea, and other beverages and foods.

Tobacco: Tobacco is legally used throughout the world for its stimulating and calming effects even though it is causing more deaths as compared to all other psychoactive drugs. Nicotine is the active and addictive chemical component in tobacco that is available in various forms, including cigars, cigarettes, chewing tobacco, and smoking cessation aids like nicotine patches, nicotine gum, and electronic cigarettes. Nicotine is quickly absorbed into the bloodstream and immediately stimulates the release of the hormone adrenaline. Adrenaline stimulates the CNS and increases blood pressure, respiration, and heart rate. Nicotine also triggers an increase in levels of neurotransmitter dopamine, which stimulates the brain pathways linked with pleasure and reward. Like any other drug, use of tobacco over time can cause a physical and psychological addiction. Tobacco use can cause cancers of the lungs, mouth, throat, and stroke, cardiovascular diseases, chronic lung diseases like chronic bronchitis and emphysema. Any one of these conditions can be fatal. Even once the disease has been diagnosed, stopping tobacco use can improve treatment efforts. This is also true for smokeless forms of tobacco like snuff and chewing tobacco. Women who smoke have even more risk than men. The increased undesirable effects of oral contraceptives, miscarriages, low birth

weight babies, intrauterine growth retardation, osteoporosis, are known outcomes of smoking during pregnancy.

Symptoms of tobacco & nicotine addiction: Nicotine dependence is characterized by cravings and tolerance.

Withdrawal symptoms: Attention difficulties, anxiety, irritability, frustration, sleep disturbances, headache, increased appetite, tremors, lethargy, restlessness and powerful cravings for tobacco. Treatments can help smokers manage these symptoms and improve the likelihood of successful quitting.

Treatments for tobacco & nicotine addiction: Tobacco addiction can be one of the most difficult addictions to manage, despite the wealth of available treatment options. Many users find that even after nicotine cravings have passed, the ritual of smoking can lead to a relapse.

There are several different treatment options for those battling a tobacco addiction.

a. *The patch:* The patch is known as a nicotine replacement therapy (NRT). It is a small, bandage-like sticker that the user applies to the arm or back. The patch delivers low levels of nicotine to the body. This helps wean the body gradually.
b. *Nicotine gum:* Another form of NRT, nicotine gum can help users who need the oral fixation of smoking or chewing. This is common, as the addict may have the urge to put something into his or her mouth. The gum also delivers small doses of nicotine to help the user manage cravings.
c. *Spray or inhaler:* Nicotine sprays and inhalers can also help by giving low doses of nicotine without tobacco use. These are sold over the counter and are widely available. The spray is inhaled, sending nicotine into the lungs.
d. *Medications:* Certain antidepressants or high blood pressure drugs might be able to help manage cravings.
e. *Psychological and behavioral treatments:* Some tobacco users have success with methods like hypnotherapy, cognitive-behavioral therapy, or neuro-linguistic programming (NLP). These help the user change their thoughts about addiction and work to alter feelings or behaviors the brain associates with tobacco use.

In most cases, treatment for tobacco addition requires a combination of methods and will vary from one person to the next.

3. Opiates/Narcotics

The term 'narcotic' comes from the Greek word 'stupor' and originally referred to a variety of substances that dulled the senses, induce sleep and relieve pain. Today 'narcotic' refers to opium, opium derivatives, and their semi-synthetic substitutes. Examples include heroin, codeine, morphine, methadone, and fentanyl.

Origin: The poppy *Papaver somniferum* is the source for all natural opioids, like morphine, codeine, and thebaine, whereas synthetic opioids are made entirely in a lab and include fentanyl, pethidine, mepiridine, levorphanol, methadone, tramadol and dextropropoxyphene. Semi-synthetic opioids are synthesized from naturally occurring opium products, such as heroin, hydromorphone, hydrocodone, oxycodone, oxymorphone, ethylmorphine and buprenorphine.

Narcotics/opioids come in various forms, including: tablets, capsules, skin patches, powder, chunks in varying colours (from white to shades of brown and black), liquid form for oral use and injection, syrups, suppositories, and lollipops. Narcotics/opioids can be swallowed, smoked, sniffed, or injected. These opioids result in psychic dependence.

Effects: Narcotics/opioids are prescribed by doctors to treat pain, suppress cough, cure diarrhea, and put people to sleep. Besides their medical use, narcotics/opioids produce a general sense of well-being by reducing tension, anxiety, and aggression. These effects are helpful in a therapeutic setting but contribute to the drugs' abuse. Narcotic/opioid use comes with a variety of unwanted effects, including drowsiness, confusion, inability to concentrate, and apathy, constriction of the pupils, flushing of the face and neck, constipation, nausea, vomiting, cold clammy skin, convulsions.

Drug dependence: Physical and psychological dependence is a consequence of chronic opioid use. Withdrawal symptoms come when drug use is discontinued.

Withdrawal symptoms: The level and type of the withdrawal symptoms are directly connected with the specific drug used, the total daily dose, and the time period between doses, the extent of use and the health condition of the user. These symptoms generally appear soon before the time of the subsequent scheduled dose. Withdrawal symptoms include: Watery eyes, yawning, runny nose, sweating, restlessness, loss of appetite, irritability, nausea, vomiting, drug craving, severe tremors, depression, increased heart rate, high blood pressure, and chills.

☛ Heroin

Heroin is a highly addictive drug and the most rapidly acting opiates.

- *Origin:* Heroin is processed from morphine, a naturally occurring substance extracted from the seed pod of poppy plants.
- *Common street names:* Big H, black tar, chiva, hell dust, horse, egra, smack, thunder.
- *Appearance:* A white or brownish powder, or as the black sticky (black tar heroin).
- *Medicinal uses:* Heroin is prescribed as a strong pain medication in some countries via subcutaneous, intramuscular, intrathecal or intravenous route. Its use includes treatment for acute pain, such as in myocardial infarction, severe physical trauma, post-surgical pain, and chronic pain, including end-stage cancer and other terminal illnesses.
- *Heroin abuse:* Heroin can be injected, smoked, or sniffed/snorted. High purity heroin is usually snorted or smoked.
- *Effect on the mind:* Because it enters the brain so rapidly, heroin is particularly addictive, both psychologically and physically. Heroin abusers experience unexplained periods of euphoria. Other effects include confusion, disorientation, odd sleeping patterns, thefts, criminal activity.
- *Effect on the body:* The most noteworthy effects of heroin use are addiction and tolerance. Once the tolerance develops, the abusers use more heroin to achieve the same intensity. Physical symptoms of heroin use are drowsiness, slurred speech, respiratory depression, constricted pupils, a warm flushing of the skin, nausea, runny or itchy nose, dry mouth, heavy extremities, scabs and sores from picking at skin, and weight loss.
- *Overdose effects:* Slow and shallow breathing, clammy skin, blue lips and fingernails, convulsions, coma, and possible death.

☛ Hydromorphone

Hydromorphone is a derivative of morphine (semi-synthetic drug). It has two to eight times more potent analgesic property than morphine, but has a shorter duration of action and greater sedative properties.

- *Common names:* D, Dillies, Dust, Footballs, Juice, Smack.
- *Appearance:* Tablets, oral solutions, rectal suppositories, and injectable formulations
- *Hydromorphone abuse:* Drug users may abuse hydromorphone tablets, injectable solutions.

- *Effect on the mind:* It works centrally (in the brain) to reduce pain and suppress cough. Its use is connected with both physiological and psychological dependence. When used as a drug of abuse, it is used to produce feelings of euphoria, sedation, relaxation, and reduced anxiety. It may cause mental clouding, mood swings, dizziness, hallucinations, nervousness, and restlessness.
- *Effect on the body:* Respiratory depression, constipation, nausea, vomiting, itching, pupillary constriction, bronchospasm, urinary retention, sweating, dizziness, impaired coordination, loss of appetite, rash, slow or rapid heartbeat, and changes in blood pressure
- *Overdose effects:* Severe respiratory depression, drowsiness, lack of skeletal muscle tone, cold and clammy skin, constricted pupils, slow heart rate and blood pressure. Severe overdose may result in death.

☛ Methadone

Methadone is a synthetic narcotic.

- *Common street names:* Dolophine, amidone, fizzies, pastora, maria, salvia, wafer, chocolate, chip cookies.
- *Appearance:* Methadone is available as a tablet (5 mg or 10 mg), disc, oral solution, or injectable liquid.
- *Methadone abuse:* Methodone can be swallowed or injected.
- *Effect on the mind:* Abuse of methadone can lead to psychological dependence.
- *Effect on the body:* Sweating, itchy skin, or sleepiness. Withdrawal symptoms include anxiety, muscle tremors, nausea, vomiting.
- Overdose effects: Slow and shallow breathing, stomach spasms, blue fingernails and lips, clammy skin, convulsions, weak pulse, coma, and possible death.

☛ Morphine

Morphine is a non-synthetic narcotic with a high potential for abuse and is the main constituent of opium. It is one of the most effective medications for pain management.

- *Common street names:* Dreamer, emsel, first line, God's drug, morpho, and unkie.
- *Morphine abuse:* Oral solutions, immediate and sustained-release tablets and capsules, suppositories, and injectable preparations.
- *Effect on the mind:* Euphoria and relief of pain. Chronic use results in tolerance, physical and psychological dependence.
- *Effect on the body:* Morphine use results in relief from physical pain, decrease in hunger, and inhibition of the cough reflex.

- *Overdose effects:* Cold, clammy skin, lowered blood pressure, sleepiness, slowed breathing, slow pulse rate, coma, and possible death.

☛ Opium

Opium is a highly addictive non-synthetic narcotic extracted from the poppy plant, *Papaver somniferum*. The milky fluid that seeps from its incisions in the unripe seed pod of poppy has been scraped by hand and air-dried to produce opium. A more modern method of harvesting for pharmaceutical use is by the industrial poppy straw process of extracting alkaloids from the mature dried plant (concentrate of poppy straw).

- *Common name:* Chandoo, black pill, Chinese tobacco, Chinese molasses.
- *Appearance:* Liquid, solid, or powder, but largely poppy straw concentrate is accessible commercially as a fine brownish powder.
- *Opium abuse:* Opium can be smoked, intravenously injected, or taken in pill form. Opium is also abused in combination with other drugs like methamphetamine and marijuana.
- *Effect on the mind:* Euphoria followed by relaxation and the relief of physical pain.
- *Effect on the body:* Nausea, vomiting, upset stomach, diarrhea, anxiety or insomnia. It also can dry out the mouth and mucous membranes in the nose. Opium use generally leads to physical and psychological dependence.
- *Overdose effects:* Hallucinations, slow breathing, vomiting, seizures, confusion, dizziness, weakness, loss of consciousness, coma and possible death.

☛ Oxycodone

Oxycodone is a semi-synthetic moderately potent opioid analgesic synthesized from thebaine, an opioid alkaloid constituent of Persian poppy. It has been a popular habit forming drug among the narcotic abusing population. It is a generally indicated for relief of moderate to severe pain.

- *Common names:* Heroin, Roxy, OC, Kicker, Percs, 512s, Hillbilly heroin.
- *Appearance:* Oxycodone is available in liquid or solid form (as tablets and immediate-release capsules).
- *Oxycodone abuse:* Oxycodone has high potential for abuse. It is abused orally or intravenously. The tablets are either crushed and sniffed or dissolved in water and injected. It can be taken by heating a tablet and then inhaling the vapors.

- *Effect on the mind:* Euphoria, feelings of extreme relaxation, reduced anxiety, sedation.
- *Effect on the body:* Pain relief, respiratory depression, sleepiness, constipation, papillary constriction, slow heart beat and cough suppression.
- *Overdose effects:* Extreme sleepiness, dizziness, muscle weakness, cold and clammy skin, cyanosis confusion, pinpoint pupils, breathing difficulty, slow heart rate, loss of consciousness or coma and possible death.

4. Psychedelics

Psychedelics (also known as serotonergic hallucinogens) are a class of psychoactive substances that produce alteration in perception, mood and various cognitive processes. Psychedelics affect all the senses, altering a person's thinking, sense of time and emotions. They cause hallucination in a person. There are many different kinds of psychedelics like natural and synthetic. Psychedelic drugs include Mescaline, LSD, Psilocybin, and DMT. They are considered physiologically safe and do not lead to dependence or addiction.

ROLE OF PHARMACIST IN REDUCING/ PREVENTING THE MENACE

Drug or substance abuse is a major problem of society. Pharmacists have the exclusive knowledge, aptitudes, and responsibilities for assuming an essential role in reducing and preventing the drug abuse. Pharmacists, as healthcare providers, must be enthusiastically involved in decreasing the harmful effects that substance abuse has on people. He/she must be adapted to the following tasks to meet local needs and circumstances.

A. Prevention

Pharmacists can involve in drug abuse prevention by actively performing the following duties:

1. Contributing to the development of drug abuse prevention programs inside healthcare organizations. Broadly program must be comprised of:
   - A written drug abuse policy
   - An employee awareness program
   - A supervisor guidance program
   - Workers
   - Drug testing.

2. Participating in community drug abuse education and prevention programs in schools, colleges, organizations and focusing on the possible undesirable health consequences of the misuse of permissible drugs and the use of prohibited drugs.
3. Restricting the sale of alcohol and tobacco products by pharmacists and in drug stores.
4. Setting up a multidisciplinary controlled-drug inventory system, in consistence with legal and administrative necessities that discourages diversion and increases responsibility.
5. Working with nearby state and government authorities in (i) controlling drug abuse, together with participation in state prescription drug monitoring programs, (ii) encouraging involvement in suitable prescription discarding programs, (iii) conforming to controlled-drug reporting regulations, and (iv) cooperating in investigations that entail the abuse of controlled drugs, particularly diversion from a healthcare organization.
6. Working with the medical laboratories to:
   a. Distinguish drugs of abuse by using drug and poison control information systems,
   b. Set up appropriate specimen collection methods by utilizing the knowledge of the pharmacokinetics of abused drugs, and
   c. Opt suitable laboratory tests to identify the suspected drugs of abuse and to identify tampering of samples.
7. Discouraging prescribing practices that encourage drug abuse behavior (e.g. prescribing a larger amount of analgesics than required for the clinical management of short-term pain).
8. Interacting with outpatient and ambulatory care providers to prevent drug abuse.

B. Education

Pharmacists can involve in drug abuse education by performing the following actions:

1. Giving information and recommendation to support groups appropriate to the requirements of individuals whose lives are influenced by drug abuse.
2. Giving proposals about the proper utilization of mood-altering drugs to healthcare providers and the general population, including persons recovering from drug abuse.
3. Promoting the expansion of pharmacy education on the topic of drug abuse prevention, education, and assistance.

4. Imparting drug abuse related education and learning to colleague pharmacists as well as other healthcare specialists of the healthcare society.
5. Advising drug abuse therapists regarding the pharmacology of abused drugs as well as drugs utilized for detoxification.
6. Promoting and offering alcohol risk-reduction related education and learning.
7. Offering postgraduate training in addiction, pain management, and palliative care wherever possible.
8. Carrying out research on drug abuse and dependency.
9. Educating patients regarding the proper storage, handling, as well as disposal of drugs.

Pharmacists working in medical stores and hospitals can also educate the patients and their attendees about the menace of drug abuse and the methods to fight with it. As a social obligation, the teachers and students in pharmacy colleges and universities can create the awareness about drug abuse in general public through rallies, particularly during National Pharmacy Week they celebrate every year, and other events of social interaction. Further, pharmacists can also create Drug Information Groups through networking, WhatsApp groups and other modern tools of information technology.

C. Assistance

Pharmacists can involve in drug abuse assistance by performing the following activities:

1. Assisting in the identification of patients, colleagues, and other individuals who may be having problems related to their drug abuse, and referring them to the appropriate people for evaluation and treatment.
2. Taking an interest in multidisciplinary endeavors to support and look after the healthcare organization's staff and patients who are getting better from drug dependency.
3. Supporting and encouraging the improvement of health experts with alcoholism or other drug addictions. Major fundamentals of an employer's support program might include:
   a. Being willing to hire or retain employees.
   b. Participating in monitoring and reporting requirements associated with recovery or disciplinary contracts.
   c. Maintaining an environment supportive of recovery.

   d. Establishing behavioral standards and norms among all employees that discourage the abuse of psychoactive drugs, including alcohol.
   e. Participating in peer-assistance programs.
4. Working together with other healthcare providers in the advancement of the pharmacotherapeutic basics of drug detoxification protocols.
5. Giving pharmaceutical care to patients being treated for drug abuse and dependency.
6. Maintaining the information of specialists along with other local, state, and nationwide drug therapy and patient care specific practice areas—organizations, programs, and resources readily available for preventing and treating drug abuse.

UNIT
3

National Health Programmes I

INTRODUCTION

After independence (1947), The Government of India has taken various steps to improve the health status of the people. Amongst the various actions, prominent action is the launching of National Health Programmes for the control/eradication of communicable and non-communicable diseases, control of population, improvement in sanitation of environment, standard of nutritional status, and rural health. Many International organizations such as UNICEF, WHO (World Health Organization), UNFPA (United Nations Fund for Population Activities), World Bank, and also foreign agencies like NORAD (North American Aerospace Defence Command), SIDA (Swedish International Development Cooperation Agency), DANIDA (Danish International Development Agency), USAID (United States Agency for International Development) are providing technical and material support in the effective implementation of these programs.

The National Health Programmes in India have been grouped as follows:

1. **Programmes for control of communicable diseases**
   a. National AIDS Control Programme (NACP)
   b. Integrated Disease Surveillance Programme (IDSP)
   c. National Leprosy Eradication Programme (NLEP)
   d. National Rabies Control Programme (NRCP)
   e. National Polio Eradication Programme (NPEP)
   f. National Programme on Containment of Anti-Microbial Resistance (AMR)
   g. National Vector Borne Disease Control Programme (NVBDCP)
   h. National Viral Hepatitis Control Programme (NVHCP)

i. Revised National Tuberculosis Control Programme (RNTCP)

2. **Programmes for control of non-communicable diseases**
   a. National Tobacco Control Programme (NTCP)
   b. National Programme for Prevention & Management of Burn Injuries (NPPMBI)
   c. National Programme for the Health Care for the Elderly (NPHCE)
   d. National Mental Health Programme (NMHP)
   e. National Programme for Control and Treatment of Occupational Diseases
   f. National Programme for Prevention and Control of Deafness (NPPCD)
   g. National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases & Stroke (NPCDCS)
   h. National Programme for Control of Blindness and Visual Impairment (NPCBVI)
   i. Pradhan Mantri National Dialysis Programme (PMNDP)
   j. National Oral Health Programme (NOHP)
3. **Programmes related to nutrition**
   a. Integrated Child Development Services (ICDS)
   b. Mid-Day Meal Programme (MDMP)
   c. MAA (Mothers' Absolute Affection) Programme for Infant and Young Child Feeding
   d. National Programme for Prevention and Control of Fluorosis (NPPCF)
   e. National Iron Plus Initiative for Anemia Control
   f. National Iodine Deficiency Disorders Control Programme (NIDDCP)
   g. National Vitamin A prophylaxis Programme
4. **Programmes related to health system strengthening**
   a. Ayushman Bharat Yojana (ABY)
   b. LaQshya' programme (Labor Room Quality Improvement Initiative)
   c. National Health Mission (NHM)
   d. Pradhan Mantri Swasthya Suraksha Yojana (PMSSY)
5. **Reproductive, maternal, neonatal, child and adolescent health**
   a. Janani Shishu Suraksha Karyakaram (JSSK)
   b. Janani Suraksha Yojana (JSY)
   c. Mission Indradhanush/Intensified Misson Indradhanush
   d. Navjaat Shishu Suraksha Karyakram (NSSK)

e. National Programme for Family Planning (NPFP)
f. Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA)
g. Rashtriya Kishor Swasthya Karyakram (RKSK)
h. Rashtriya Bal Swasthya Karyakram (RBSK)
i. Universal Immunisation Programme (UIP)

Vertical and Horizontal Health Programs

Health services (curative and preventive) can be provided using two types of health programs: Horizontal and vertical. The main differences between horizontal and vertical health programs are summarized in Table 3.1.

TABLE 3.1: Types of health programs

S.No.	*Vertical health program*	*Horizontal health program*
1.	These programs are for specific health conditions and are found more frequently where poverty prevails and epidemic flourish	These programs are for prevention and care of prevailing health problems
2.	These programs are run by Government of India	These programs are run by state health department
3.	These programs do get assistance from International Health Organizations	These programs do not get assistance from International Health Organizations
4.	These programs imply selective targeting of specific interventions	These are routine programs
5.	Expert training is given to doctors	Routine training is given to paramedical staff

A. NATIONAL AIDS CONTROL PROGRAMME (NACP)

India's AIDS (acquired immune deficiency syndrome) Control Programme is globally admired as a success story. In 1986, following the detection of the first AIDS case in the country, the National AIDS Committee was constituted by the Ministry of Health and Family Welfare. As the epidemic spread, need was felt for a nationwide programme and an organization to steer the programme. In 1992 India's first National AIDS Control Programme (NACP) was launched for prevention and control of Human Immune Deficiency Virus (HIV)/AIDS in India and National AIDS Control Organization (NACO) was constituted to implement this comprehensive

program. Over time, the focus has shifted from raising awareness to behaviour change, from a national response to a more decentralized response and increasing involvement of NGOs and networks of PLHIV (People Living with HIV/AIDS). NACP has moved through four phases as summarized in Fig. 3.1.

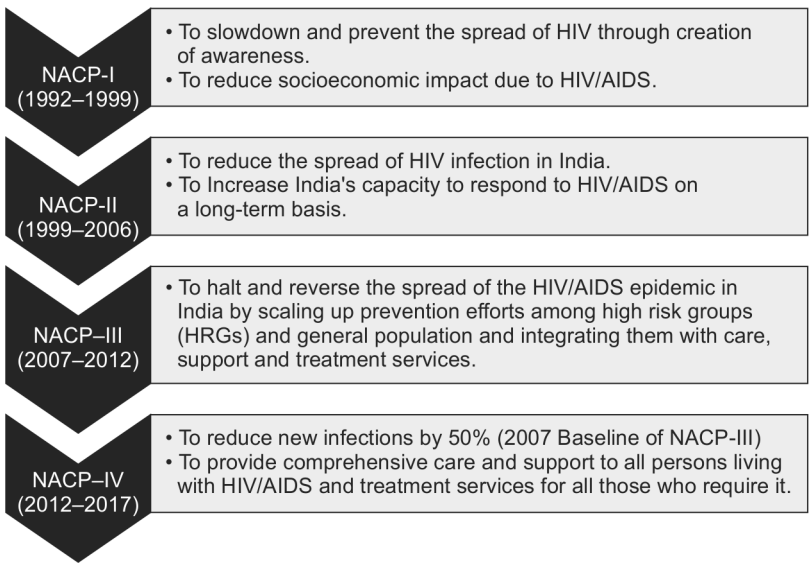


Fig. 3.1: Phases of NACP

BACKGROUND OF NACP-I, II, III AND IV

NACP-I (1992–1999)

The first National AIDS Control Programme (NACP-I) was launched in 1992.

Objectives

The main objectives of the NACP-I were:

1. To slowdown and prevent the spread of HIV infections so as to reduce morbidity, mortality.
2. To reduce socioeconomic impact of HIV/AIDS in country.

Key strategies

1. Focus on raising public awareness about HIV.
2. Improving surveillance systems for better monitoring of HIV epidemic.

3. Measures to ensure safe blood banks.
4. Prevention among high-risk groups (HRGs) population.

Key achievements

1. Creation of awareness in general public about HIV.
2. Constitution of National AIDS Control Organization (NACO) and National AIDS Control Board (NACB) to implement the project.
3. Establishment of State AIDS Control Cells to strengthen the response to the HIV epidemic.
4. Improved access to safe blood banks.
5. Better surveillance system for better monitoring of HIV epidemic data.
6. Better condom promotion activities.
7. Formation and adoption of National HIV testing policy.

NACP-II (1999–2006)

The second National AIDS Control Project (NACP-II) started in November 1999.

Key objectives

1. To decrease the spread of HIV infection through behavior changes.
2. To improve India's ability to respond to HIV epidemics on a long-term basis.

Key strategies

1. Implementation of National AIDS Prevention and Control Policy (NAPCP) 2002.
2. Focused attention on the HRGs (female sex workers, men who have sex with men, injecting drug users and bridge population (truckers and migrants)).
3. Launch of National Adolescent Education Program (NAEP).
4. Launch of Counselling, Testing and Prevention of Parent to Child Transmission (PPTCT) program.
5. Introduction of National Anti-Retroviral Treatment (ART) program.
6. Establishment of the National Council on AIDS.
7. Adoption of National Blood Policy.

Lessons learnt from NACP-II

In spite of the achievements of NACP-II, there were some areas that still required greater attention and stronger focus. Following are the lessons that had emerged from the implementation of NACP-II:

1. Complications and extents of the epidemic were still to be fully understood.
2. Capacity development and technical help of State AIDS Control Societies (SACS) was needed for decentralization to produce the preferred results.
3. Continuity of skilled staff was desirable to get proper implementation of programme.
4. Although targeted interventions (TIs) on the highly focused HRGs were proved to be effective strategy in preventing the spread of infection, yet weak systems for civil society partnership were main barriers in its implementation throughout nation. Interventions of Men having Sex with Men (MSM), unschooled youth, and rural population, Injecting Drug Users (IDU) were specifically low.
5. Advertisement and marketing of condoms on large scale was needed to make it availabile easily.
6. Involvement and mainstreaming of the private sector, rural communities, civil society organizations, youth organizations, etc. was needed for prevention of HIV and building discrimination free environment.
7. Strengthened convergence between NACP and National Rural Health Mission (NRHM) was needed.
8. Appropriate methodology was needed for complete reporting and interpretation of sero-surveillance data on AIDS mortality and under reporting issues. Likewise, almost 86% of transmission being sexual, it was essential to identify the causes of spread and understanding impact of factors like limited access to services on women.
9. Existing research wing within NACO was needed to be strengthened to deal with the emerging need for knowledge management.
10. A large amount of financial investments was needed to scale-up interventions in prevention, control, care and treatment.
11. Formulation of policies for mitigating the impact of the epidemic on women and children infected and affected by HIV/AIDS was required.

NACP-III (2007–2012)

Based on the experience and learning from the previous two phases of program, the Government of India designed and implemented the third phase of the national program NACP-III (2007–2012) with the goal of 'halting and reversing the HIV epidemic in India'.

Key objective

Halting and reversing the HIV epidemic in India over its five-year period by scaling-up prevention efforts between HRGs and general population and integrating them with care, support and treatment (CST) services.

Key strategies

1. Preventing new infections in HRGs and general population through:
   a. Saturation of coverage of HRGs with targeted interventions (TIs).
   b. Scaling up interventions in the general population.
2. Providing greater care, support and treatment to larger number of people living with HIV/ AIDS (PLHA).
3. Strengthening the infrastructure, systems and human resources for scaling-up prevention, care, support and treatment programs at the district, state and national levels.
4. Strengthening monitoring and evaluation of The Nationwide Strategic Information Management System.

NACP-III gave desired results and a steady decline in overall prevalence and decrease in new infections had been quoted.

NACP-IV (2012–2017)

NACP-IV was aimed to consolidate the gains of NACP-III.

Key objectives

1. To reduce new infections by 50% (2007 baseline of NACP-III).
2. To provide comprehensive care, support and treatment to all persons living with HIV/AIDS.

Key priorities

1. Preventing new infections by sustaining the reach of current interventions and effectively addressing emerging epidemics.
2. Prevention of Parent to Child Transmission (PTCT) by a course of antiretroviral drugs during pregnancy to antenatal mothers.

3. Focusing on IEC (Information, Education and Communication) strategies for behavior change in HRGs.
4. Creating awareness among general population and demand generation for HIV services.
   a. Providing comprehensive care, support and treatment to eligible PLHIV.
5. Reducing stigma and discrimination through involvement of PLHA (GIPA).
6. De-centralizing rollout of services including technical support.
7. Ensuring effective use of strategic information at all levels of program.
8. Building capacities of NGO and civil society partners especially in states with emerging epidemics.
9. Integrating HIV services with health systems in a phased manner.
10. Mainstreaming of HIV/AIDS activities with all key central/ state level ministries/departments will be given a high priority and resources of the respective departments will be leveraged. Social protection and insurance mechanisms for PLHIV will be strengthened.

Components

1. Intensifying and consolidating prevention services with focus on HRGs, vulnerable population and general population.
2. Expanding Information, Education and Communication (IEC) services for general population and (HRGS) to increase awareness and motivate people to practice safe sex.
3. Increasing access and promoting comprehensive Care, Support and Treatment (CST).
4. Building capacities at national, state, district levels.
5. Strengthening strategic information management systems.

Package of services provided under NACP-IV

1. Prevention services

1. Targeted Interventions for HRGs and bridge population including Female Sex Workers (FSW), Men who have Sex with Men (MSM), transgenders/hijras, Injecting Drug Users (IDU), truckers and migrants.
2. Needle-Syringe Exchange Program (NSEP) and Opioid Substitution Therapy (OST) for IDUs.

3. Prevention interventions for migrant population at source, transit and destination.
4. Link Worker Scheme (LWS) for HRGs and vulnerable population in rural areas.
5. Prevention and control of sexually transmitted infections/ reproductive tract infections (STI/RTI).
6. Blood safety.
7. HIV counselling and testing services.
8. Prevention of parent to child transmission.
9. Condom promotion.
10. Information, education and communication (IEC) and behavior change communication (BCC).
11. Social mobilization, youth interventions and adolescent education program.
12. Mainstreaming HIV/AIDS response.
13. Workplace interventions.

2. Care, support and treatment services

1. Laboratory services for CD4 testing and other investigations.
2. Free first line and second line Anti-Retroviral Treatment (ART) through ART centres and Link ART Centres (LACs), Centres of Excellence (COE) and ART plus Centres.
3. Pediatric ART for children.
4. Early infant diagnosis for HIV exposed infants and children below 18 months.
5. HIV-TB coordination (cross-referral, detection and treatment of coinfections).
6. Treatment of opportunistic infections.
7. Drop-in centres for PLHIV networks.

New initiatives under NACP-IV

1. Differential strategies for districts based on data triangulation with due weightage to vulnerabilities.
2. Scale-up of programs to target key vulnerabilities
   a. Scale-up of Opioid Substitution Therapy (OST) for IDUs.
   b. Scale-up and strengthening of migrant interventions at source, transit and destinations including roll out of Migrant Tracking System (MTS) for effective outreach.
   c. Establishment and scale-up of interventions for Transgenders (TGs) by bringing in community participation and focused strategies to address their vulnerabilities.

   d. Employer-led model for addressing vulnerabilities among migrant labor.
   e. Female condom program.
3. Scale-up of multi-drug regimen for prevention of parent to child transmission (PPTCT) in keeping with international protocols.
4. Social protection for marginalized populations through mainstreaming and earmarking budgets for HIV among concerned government departments.
5. Establishment of metro blood banks and plasma fractionation centre.
6. Launch of third Line ART and scale-up of first and second line ART.
7. Demand promotion strategies specially using media, e.g. national folk media campaign and red ribbon express and buses (in convergence with the National Health Mission).

B. REVISED NATIONAL TUBERCULOSIS CONTROL PROGRAMME (RNTCP): DOTS STRATEGY

The National Tuberculosis (TB) Programme (NTP) was started in 1962 with the aim to detect and treat the TB cases at the earliest. In the districts, the program was implemented through the District Tuberculosis Centre (DTC) and the Primary Health Institutions. The DTP was supported by the state level organization for the coordination and supervision of the program. In spite of the establishment of more than 440 district TB centres, the success rate of NTP was low and NTP suffered from several serious drawbacks:

1. Managerial weaknesses.
2. Inadequate funding.
3. Over-reliance on X-ray for diagnosis.
4. Lack of standardized treatment regimens.
5. Low rates of treatment completion.
6. Lack of systematic information on treatment outcomes.
7. Development of multi-drug resistance (MDT).

In order to overcome these drawbacks, the Government of India, in collaboration with the World Health Organization (WHO), formulated **The Revised National TB Control Programme (RNTCP)** for the control of tuberculosis in India. The Revised National Tuberculosis Control Programme (RNTCP) began as a pilot project in 1993 and was launched as a national program in 1997 but rapid RNTCP expansion began in late 1998. The RNTCP

was then expanded across India until the entire nation was covered by the RNTCP in March 2006. The Revised National TB Control Programme (RNTCP) adopted internationally recommended Directly Observed Treatment (DOTS) strategy. The DOTS strategy is cost-effective and is the international standard for TB control programs today. Under DOTS, the patients take the prescribed TB drugs in the presence of the trained health workers or other designated individual (excluding a family member). DOTS involved treatment with a four-drug regimen. These were Isoniazid (INH), Rifampicin (Rif), Prazinamide (PZA) and Ethambutol (EMB) for 6–9 months. DOTS-Plus works as a supplement to the standard DOTS strategy, and is a comprehensive management strategy to address both drug susceptible and multi-drug resistant tuberculosis (MDR-TB) diagnosis, management and treatment. Drug resistance arises due to improper use of anti-tuberculosis drugs during the treatment of tuberculosis patients. This improper use includes:

1. Administration of inadequate treatment regimens by various healthcare providers.
2. Wrong treatment categorization due to failure to elicit the history of previous anti-treatment by attending physician.
3. Poor treatment management, when the treatment is not directly observed.
4. Irregular and incomplete treatment due to lack of effective counselling of patients.

Regular chemotherapy under DOTS strategy can prevent the emergence of MDR-TB.

Components of DOTS

1. Obtaining political and administrative commitment for ensuring adequate funds, staff and other key inputs.
2. Establishment of good quality diagnosis mainly by sputum smear microscopy.
3. Regular and uninterrupted supply of anti-TB drugs in the form of a patient-specific box containing the medicines for the entire course of treatment.
4. Directly observed treatment (DOT).
5. Direct observation of every dose of treatment.
6. Systematic monitoring, supervision and cohort analysis.

Goals of RNTCP

1. To reduce mortality and morbidity from tuberculosis.
2. To interrupt chain of transmission of TB.

Objectives of RNTCP

1. To pursue quality DOTS expansion and enhancement by improving the case finding through an effective patient-centred approach to reach all patients, especially the poor.
2. To reduce the incidence of and mortality due to TB.
3. To prevent further emergence of drug resistance and effectively manage multi-drug-resistant tuberculosis (MDR-TB) cases by scaling up DOTS Plus, and other relevant approaches.
4. To improve outcomes among HIV-infected TB patients by scaling up TB-HIV joint activities.
5. To contribute to health system strengthening by collaborating with other health programs and general services.
6. To involve all healthcare providers, public, non-governmental and private, by scaling-up approaches based on a Public-Private Mix (PPM).
7. To enable and promote research for the development of new drugs, diagnosis, treatment and vaccines.
8. To achieve and maintain a cure rate of at least 85% among newly detected infectious cases (new sputum smear positive).
9. To achieve and maintain detection of at least 70% of such cases in the population.

Organization Structure

1. **Central level:** At the central level the Revised National TB Control Programme is managed by Central TB Division of Directorate General Health Services.
2. **State level:** At the state level the State Tuberculosis Officer (STO) is responsible for planning, training, supervising and monitoring the program as per the guidelines of the State TB Control Society or its equivalent.
3. **District level:** At the district level the District Tuberculosis Officer (DTO) at the District Tuberculosis Centre (DTC) has the overall responsibility of management of RNTCP at the district level as per the program guidelines.
4. **Sub-District level (Tuberculosis unit level):** At subdistrict level, tuberculosis unit (TU) are established. In tuberculosis unit (TU), there is a designated Medical Officer-Tuberculosis Control (MO-TC), a Senior Treatment Supervisor (STS) and a Senior Tuberculosis Laboratory Supervisor (STLS). TUs are generally based in a Community Health Center (CHC), Taluk Hospital (TH) or Block Primary Health Center (BPHC). TU has

one microscopy center known as the Designated Microscopy Center (DMC).

5. **Peripheral Health Institutions (PHIs):** PHI is a health facility which is manned by at least a medical officer (even if the post is currently vacant). The dispensaries, PHCs, CHCs, referral hospitals, major hospitals, specialty clinics/hospitals (including other health facilities)/TB hospitals/medical colleges within the district are considered as PHIs under the program. PHIs are responsible for accurate maintenance of TB register and timely submission of quarterly reports to the district level.

Laboratory Network of RNTCP

RNTCP has established a three-tier laboratory network and a central TB division.

i. **Designated microscopy centres (DMCs):** These centres provide sputum smear microscopy services.
ii. **Intermediate reference laboratories (IRLs):** IRLs supervise DMCs and undertake training, external quality assessment [EQA] of sputum smear microscopy network in the districts.
iii. **National reference laboratories (NRLs):** NRLs supervise IRLs and undertake training, EQA of sputum smear microscopy network in the states.

RNTCP Endorsed TB Diagnostics

a. Sputum smear microscopy (for AFB)
b. Culture
   - Sputum culture on solid (Löwenstein-Jensen) media or liquid media (Middlebrook) using manual, semi-automatic or automatic machines, e.g. bactec, MGIT, etc.
c. Rapid diagnostic molecular test
   - Conventional PCR-based Line Probe Assay for MTB complex or
   - Real-time PCR-based Nucleic Acid Amplification Test (NAAT) for MTB complex, e.g. GeneXpert.

NEWER INITIATIVES

a. RNTCP currently using CB-NAAT (Cartridge-based Nucleic Acid Amplification Test) for the diagnosis of TB, MDR-TB in high-risk population like HIV positive and pediatric group.
b. NIKSHAY: To facilitate TB notification, RNTCP initiated a web-enabled and case-based TB surveillance system called

'NIKSHAY' (*Hindi* words *NI* and *KSHAY* meaning eradication of tuberculosis) in 2012 for both government and private healthcare facilities. Nikshay is basically to monitor and track services and status related to screening, diagnosis, treatment and follow-up of tuberculosis cases. Apart from web-based technology, SMS services have been used effectively for giving follow-up alerts to the patients and providers, etc.

c. **Public–private partnership:** For promotion of public–private mix in TB prevention and care, private providers are given incentives for TB case notification and for ensuring treatment adherence and treatment completion. The incentives are provided through direct beneficiary transfer.

There have been a number of five year National Strategic Plans (NSPs) since the start of the RNTCP. The NSP 2012–2017 had the aim of achieving universal access to quality diagnosis and treatment. The National Strategic Plan (NSP) 2017–2025 has the national goal of elimination of TB in India by 2025. At the start of 2020, the RNTCP has been renamed the National Tuberculosis Elimination Programme (NTEP) by the Government of India with the goal of ending TB by 2025.

National Strategic Plan (NSP) 2017–2025

The Indian TB National Strategic Plan (NSP) 2017–2025 is the plan produced by the Government of India. According to the NSP, TB elimination has been integrated into the four strategic pillars of 'Detect–Treat–Prevent–Build' (DTPB). Early diagnosis and treatment of TB cases in the community is an important step in TB elimination and helps in decreasing the risk of transmission of disease to others. NSP describes the activities and interventions that will bring about significant change in the incidence, prevalence and mortality from TB. The vision is to achieve TB free India with zero deaths, disease and poverty due to tuberculosis.

Goals of NSP

To achieve a rapid decline in the burden of TB, mortality and morbidity.

Targets of NSP

1. Private sector engagement.
2. Plugging the 'leak' from the TB care cascade (i.e. people with TB going missing from care).

3. Active case finding among key populations.
4. Preventing the development of active TB in people with latent TB and high-risk groups.

Detection of TB Cases

For detection of drug sensitive TB cases and drug resistant TB, the emphasis is given on approaching TB patients seeking care from private providers and also on undiagnosed TB cases in 'high-risk' populations including prisoners, migrant workers, people living with HIV/AIDS, contacts, etc. This is done through:

1. Scaling-up free and high sensitivity TB diagnostic tests such as Cartridge-based Nucleic Acid Amplification Test (CB-NAAT).
2. Scaling-up private provider engagement approaches.
3. Universal testing for drug resistant TB.
4. Systematic screening of HRGs.
5. Programmatic Management of Drug Resistant TB (PMDT-TB).

Diagnosis

The Technical and Operational Guidelines for TB Control (TOG) describe various tests to diagnose TB including:

a. Sputum smear microscopy.
b. Chest X-ray and the new.
c. CB-NAAT test.

The CB-NAAT test is beginning to be made available throughout India.

Active Case Finding (ACF)

The main objective of ACF is to detect TB cases early and to initiate treatment promptly. The NSP emphasizes the need to shift from passive case finding, which is waiting for people to seek care, to ACF which involves seeking out people in targeted groups.

Treatment

1. Preventing the loss of TB cases in the cascade of care by providing support systems. The 'cascade of care' means every step in treatment, from when it is first started, to the point at which the patient finishes their treatment and is cured of TB.
2. Providing free TB drugs to all patients with TB.
3. Providing daily TB drugs to all TB patients and a rapid scale-up of short course regimens for drug resistant TB.

4. Providing patient-friendly adherence monitoring and social support in order to sustain TB treatment.
5. Elimination of catastrophic costs by linking eligible TB patients with social welfare schemes including providing nutritional support.

At present TB drugs are free at government centres. The aim is to make free of cost availability of TB drug at private centres and pharmacies as well. Currently, it is believed that only half of all TB patients make use of the free medicines.

Prevention

1. **Scaling-up airborne infection control measures:** TB infection control is a combination of measures aimed at minimizing the risk of TB transmission within population and hospital and other settings. Measures for infection control include:
   a. Early diagnosis, and proper management of TB patients.
   b. Health education about cough etiquettes (covering nose and mouth with tissue when coughing or sneezing) and proper disposal of sputum by patient. Houses should be adequately ventilated.
   c. Providing treatment to patients with latent TB infection and to the contacts of people with confirmed TB.
2. **Isoniazid preventive therapy (IPT):** IPT is recommended to children below age of 6 years, who are close contacts of a TB patient. Additionally IPT is considered in the following situations:
   - For all HIV-infected children who either had a exposure to an infectious TB case or are Tuberculin Skin Test (TST) positive but have no active TB disease.
   - All TST positive children who are receiving immuno-suppressive therapy.
   - A child born to mother having TB in pregnancy will receive prophylaxis for 6 months, if congenital TB has been ruled out. BCG vaccination can be given at birth even if IPT is planned.

   Close contacts of index cases with proven DR-TB (drug resistant-TB) will be monitored closely for signs and symptoms of active TB as isoniazid may not be given as prophylactic in these cases.
3. **BCG vaccination:** It is provided at birth or as early as possible till one year of age. BCG vaccine has a protective effect against meningitis and disseminated TB in children.

4. **Nutritional support:** Nutritional support to TB suspects is a useful strategy.

C. INTEGRATED DISEASE SURVEILLANCE PROJECT (IDSP)

Disease surveillance is the backbone of public health programmes in India. Integrated Disease Surveillance Project (IDSP) is a decentralized, state-based surveillance program in the country launched with World Bank assistance in November 2004. It is intended to detect early warning signals of impending outbreaks, identify its causes, and take timely preventive and responsive measures. It also provides essential data to monitor progress of ongoing disease control program and helps allocate health resources more efficiently and optimally. The IDSP proposes a comprehensive strategy for improving disease surveillance and response through an integrated approach. Surveillance activities carried out under various vertical diseases control program, viz, program on malaria, tuberculosis, and HIV/AIDS. Reproductive and Child Health (RCH) program as well as some state-specific diseases have been integrated under IDSP. This will be affected through data generation using uniform and common reporting formats, collection, compilation and analysis and using common IT network for transmission to state and central levels.

The data is collected and analyzed by Central Surveillance Unit (CSU) at Delhi, State Surveillance Units (SSU) at all state/UT headquarters and District Surveillance Units (DSU) at all districts in the country.

Goals of IDSP

To this end, an integrated disease surveillance program aims to provide:

1. Timely, complete, regular and high quality information to define, detect and respond to communicable public health threats.
2. Early detection and prediction of epidemics.
3. Objective assessment of interventions during epidemics.
4. Efficient monitoring of intervention programs.

Objectives of IDSP

1. To strengthen/establish decentralized laboratory-based Informa000tion Technology (IT) enabled disease surveillance system for communicable and non-communicable diseases.

2. To detect the early warning signals, monitor progress of ongoing disease trends and to detect and respond to outbreaks in early rising phase through trained Rapid Response Teams (RRTs) in the country at the districts, state and national levels.
3. To strengthen the disease surveillance and response system by placing one epidemiologist/microbiologist/entomologist each at state/district headquarters and one microbiologist and entomologist each at the state headquarters.

Key Features of IDSP

a. Surveillance units have been established in all states/districts (SSU/DSU).
b. Training of state/district surveillance teams and Rapid Response Teams (RRT) has been completed for all 35 states/UTs.
c. IT network connecting 776 sites in states/district HQ and premier institutes has been established with the help of National Informatics Centre (NIC) and Indian Space Research Organization (ISRO) for data entry, training, video conferencing and outbreak discussion.
d. Under the project weekly disease surveillance, data on epidemic prone disease are being collected from reporting units such as subcentres, primary health centres, community health centres, 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% districts report such weekly data through e-mail/portal. The weekly data are analyzed by SSU/DSU for disease trends. Whenever there is rising trend of illnesses, it is investigated by the RRT to diagnose and control the outbreak.
e. States/districts have to notify the outbreaks immediately to the system.
f. Establishment of media scanning and verification cell to detect and share media alerts with the concerned states/districts for verification and response.
g. Establishment of a 24 × 7 call center to receive disease alerts on a toll free telephone number (1075). The cell provides the collected information to the states/districts surveillance units for investigation and response.
h. Strengthening of district laboratories for diagnosis of epidemic prone diseases.

Program Components

a. Integration and decentralization of surveillance activities through establishment of surveillance units at centre, state and district levels.
b. Human Resource Development including training of State Surveillance Officers (SSO), District Surveillance Officers (DSO), Rapid Response Team and other medical and paramedical staff on principles of disease surveillance.
c. Use of Information Communication Technology for collection, collation, compilation, analysis and dissemination of data.
d. Strengthening of public health laboratories.
e. Intersectoral coordination for zoonotic diseases.

Organisation Structure

- **Central surveillance unit (CSU):** Integrated administratively and financially with National Centre for Disease Control (NCDC), Delhi.
- **State surveillance unit (SSU):** One in each state/UT with a regular officer identified as State Surveillance Officer (SSO).
- **District surveillance unit (DSU):** One in each district with a regular officer as District Surveillance Officer (DSO).

Types of Surveillance

Depending on the level of expertise and specificity, disease surveillance in IDSP is of following three categories:

A. Syndromic

The diagnosis is made on the basis of symptoms/clinical pattern by paramedical personnel and members of the community (Table 3.2). Syndromes under surveillance in IDSP include:

1. Fever
   a. Less than 7 days duration without any localizing signs.
   b. With rashes.
   c. With altered sensorium or convulsions.
   d. With bleeding from skin or mucus membrane.
   e. More than 7 days with or without localizing signs.
2. Cough more than 3 weeks duration.
3. Acute flaccid paralysis.
4. Diarrhea.
5. Jaundice.
6. Unusual events causing death or hospitalization.

TABLE 3.2: Clinical syndromes and diseases under each syndrome

S.No.	*Syndrome*	*Diseases*
1.	Fever with or without localizing signs	Malaria, typhoid, JE, dengue, measles
2.	Cough more than 3 weeks	Tuberculosis
3.	Acute flaccid paralysis	Polio
4.	Diarrhea	Cholera
5.	Jaundice	Hepatitis, laptospirosis, dengue, malaria
6.	Unusual syndromes	Anthrax, plague, emerging epidemics

B. Presumptive

The clinical diagnosis is made on the basis of typical history and clinical examination by medical officer, e.g. acute diarrheal disease (including acute gastroenteritis), bacillary dysentery, viral hepatitis, enteric fever, malaria, dengue, acute encephalitis syndrome, meningitis, measles, diphtheria, pertussis, chickenpox, fever of unknown origin , acute respiratory infection/influenza like illness, pneumonia, leptospirosis, acute flaccid paralysis <15 years of age, dogbite, snakebite, any other state-specific disease, unusual syndromes not mentioned above.

C. Confirmed

In this clinical diagnosis is made by medical officer and/or through positive laboratory identification, e.g. dengue/dengue hemorrhagic fever (DHF)/dengue shock syndrome (DSS), chikungunya, Japanese encephalitis (JE), meningococcal meningitis, typhoid fever, diphtheria, cholera, shigella dysentery, viral hepatitis, leptospirosis and malaria.

Methods of Surveillance

1. **Active surveillance:** Active search is carried out under some specific circumstances such as during outbreaks. In active surveillance health worker goes into the area or house to house and collects information.
2. **Passive surveillance:** It is universalized method of data collection. Health workers/ANMs report all patients fulfilling the clinical syndrome from area covered by the subcentre. Medical officers at Primary Health Centre (PHC) or Community

Health Centre (CHC) level will report cases as probable or confirmed cases. It is suggested that each of the units report at weekly intervals. The data is received from as many health workers or health facilities as possible.

3. **Sentinel surveillance:** This system is used to get high-quality data about a particular disease. Reporting units, with large number of cases of the disease in question, good diagnostic laboratory facilities and experienced well-qualified medical staff are considered as sentinel center. A sentinel system deliberately involves only a limited network of carefully selected reporting sites. Data collected in a well-designed sentinel system is used to signal trends, identify outbreaks and monitor the burden of disease in a community. Because sentinel surveillance is conducted only in selected locations, it may not be as effective for detecting rare diseases or diseases that occur outside the catchment areas of the sentinel sites. This form of surveillance is used for sexually transmitted diseases/ blood borne (HIV/HBV, HCV), water quality and air quality, etc.
4. **Laboratory surveillance:** The laboratory network report independently all confirmed cases. The data is used to find changes in pattern of syndromes and helps in diagnosis of new cases for case management. The data also help in identification of new agents and changes in the behavior of microorganisms especially in relation to susceptibility to anti-microbials.
5. **Sample surveys:** Sample surveys may be conducted to collect baseline data prior to the start of a large control program. In IDSP non-communicable diseases risk factors may be collected through regular surveys (3 to 5 yearly). Although surveys give reliable epidemiological information, yet are difficult to conduct and are relatively costly.
6. **Outbreak investigations:** Outbreak investigation is the basic method of confirming emerging infections. It provides information on magnitude, distribution and possible causes of outbreak.
7. **Special studies:** Special studies are sometimes required to study a specific problem (e.g. increased prevalence of disease cases due to environmental pollution, multi-drug resistant microorganisms).

IDSP Achievements

1. Central surveillance unit (CSU) is established and integrated in the National Centre for Disease Control.

2. Surveillance units have also been established at all states and district headquarters (SSUs, DSUs).
3. Training of state/district surveillance teams has been completed in all 36 states/UTs. The state level training focuses on the basics of disease surveillance, concepts of epidemiology and data management, whereas the district training focuses on correct procedures of data collection, compilation, reporting and outbreak response. The training in IDSP is three-tiered:
   - Training of master trainers (state and district surveillance officers) at identified national level institutes.
   - Training of the medical officers and district lab technicians by master trainers at state level.
   - Training of health workers and lab technician/assistants at peripheral institutions by district surveillance officers/ medical officers at district level.
   - A special two-week disease surveillance and field epidemiology training programme (FETP) has been initiated for the district surveillance officers.
4. Decentralization of recruitment of contractual manpower under IDSP to ensure their early recruitment by the state health societies.
5. Establishment of IT network connecting 776 sites at all states/ districts headquarters and premier institutes in the country for data entry training, videoconferencing and outbreak discussion.
6. Development of a portal under IDSP (www.idsp.nic.in) for data entry and analysis, in order to report outbreaks and to download reports, training modules and other material related to disease surveillance. Under IDSP data is collected on epidemic prone diseases on weekly basis. The information is collected on three specified reporting formats, namely 'S' (suspected cases), 'P' (presumptive cases) and 'L' (laboratory confirmed cases) filled by health workers, clinicians and laboratory staff, respectively.
7. Presently, about 90% districts in the country report weekly surveillance data through portal. The weekly data gives information on the disease trends and seasonality of diseases. Whenever there is raising trend of illness in any area, it is investigated by Rapid Response Team to diagnose and control the outbreak. Data analysis and actions are being undertaken by respective states/district surveillance units.

8. CSU, IDSP receives disease outbreak reports from the states/UTs on weekly basis. The weekly outbreak report generated by the CSU is shared with all key stakeholders including the Prime Minister's office. This is significant because it indicates the paradigm shift in the outbreak reporting attitude.
9. Media scanning and verification cell established under IDSP is an important component of surveillance to detect the early warning signals. It detects and shares media alert with concerned state /districts for verification and response.
10. A 24 × 7 call center was established in February 2008 to receive disease alerts all across the country on a toll free telephone number (1075). The information received is provided to the states/districts surveillance units through e-mail and telephone for investigation and response.
11. District laboratories are being strengthened for diagnosis of epidemic prone diseases in a phased manner.
12. A state-based referral laboratory network has been established by utilizing the existing functional labs in the identified medical colleges and other major centres in the states and linking them with adjoining districts for providing diagnostic services for epidemic prone diseases during outbreaks.
13. Laboratories have been strengthened and made functional under IDSP for avian/H1N1 influenza surveillance. The animal component of avian influenza is being looked after by ministry of agriculture.

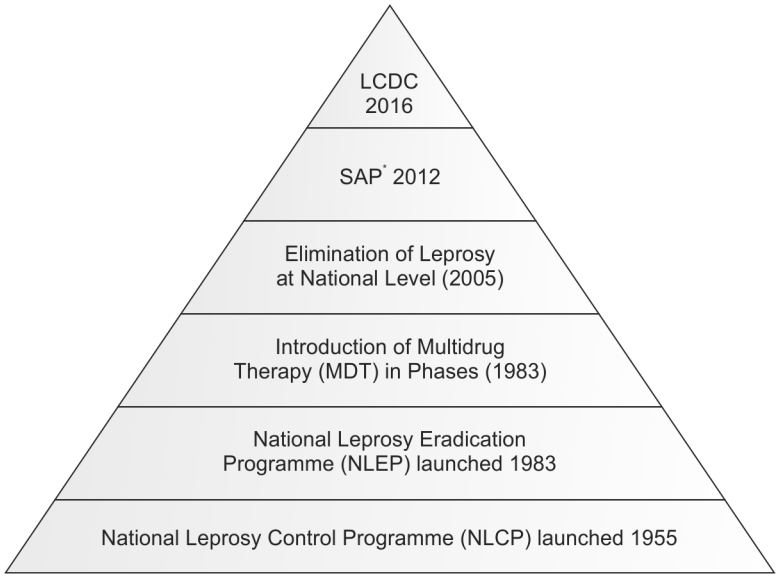
D. THE NATIONAL LEPROSY ERADICATION PROGRAMME (NLEP)

The National Leprosy Eradication Programme is a centrally sponsored health scheme of the Ministry of Health and Family Welfare, Government of India. The program is being headed by the deputy director of health services. The program is also supported as partners by the World Health Organization, The International Federation of Anti-leprosy Associations (ILEP) and few other Non-Government Organizations (NGOs).

Initially, National Leprosy Control programme was launched in 1955 as a centrally aided program with the main objective of controlling the magnitude of the leprosy through early detection of cases and domiciliary treatment with Dapsone by trained workers. Leprosy Control Units (LCU) and Survey, Education and Treatment (SET) centres were set up in each district starting from 1955.

The functions of these centers include:

a. Early detection of cases by conducting house-to-house survey,



*SAP: Special action plan for 209 high endemic districts in 16 states/UTs
*Leprosy Case Detection Campaign (LCDC)

Fig. 3.2: Milestones in National Leprosy Eradication Programme

b. Health education.
c. Free treatment to all cases.
d. Contact tracing.
e. Chemoprophylaxis of contacts.

Multidrug therapy (MDT) came into widespread use from 1982 and the National Leprosy Eradication Programme was introduced in 1983 with an aim to eliminate leprosy as a public health problem by the year 2000 AD. The project successfully completed on 31st Dec. 2004. Since then, The National Leprosy Eradication Programme is being continued with Government of India funds with additional technical support from the WHO and the International Federation of Anti-Leprosy Associations (ILEP) organizations. MDT is supplied free of cost as of now by NOVARTIS through WHO. Consequently, due to the hard work and precisely planned and executed activities, the country achieved the goal of elimination of leprosy as a public health problem, defined as less than 1 case per 10,000 population, at the national level in the month of December, 2005. As on 31st December 2005, prevalence rate recorded in the country was 0.95/10,000 population.

Although prevalence has come down at national and state levels, there were districts and blocks, which were still having prevalence rate >1 per 10,000 population and these cases need to be provided quality leprosy services. Further, the new cases would continue to occur for few more years due to long incubation period of the disease.

Thus, creating awareness for self-reporting, timely diagnosis and complete multidrug therapy treatment of leprosy cases was necessary for ultimate eradication of the disease. Since the program aims for eradication, i.e. zero case of leprosy as the ultimate goal, sustained control measures need to be continued during the 12th plan period.

Objectives of Program

1. Elimination of leprosy, i.e. prevalence of <1/10,000 population in all districts of the country.
2. Strengthen Disability Prevention and Medical Rehabilitation of persons affected by leprosy.
3. Reduction in the level of stigma associated with leprosy.

Strategies of Program

1. Decentralized integrated leprosy services through general healthcare system.
2. Early case detection by population survey, school survey, contact survey, etc. and complete treatment of new leprosy cases.
3. Carrying out household contact survey in detection of multibacillary and child cases.
4. Early diagnosis and prompt MDT through routine and special efforts.
5. Participation of Accredited Social Health Activists (ASHAs) in the detection and treatment of leprosy cases for leprosy work.
6. Strengthening of Disability Prevention and Medical Rehabilitation (DPMR) services.
7. Intensified Information, Education and Communication (IEC) activities in the community to increase self-reporting to Primary Health Centre (PHC) and decrease of stigma.
8. Thorough observation and supervision at Primary Health Centre and Community Health Centre.

Programme Components

1. Disability prevention and medical rehabilitation.
2. Intensified Information, Education and Communication (IEC) including Behavior Change Communication (BCC).
3. Decentralized integrated leprosy services through General Healthcare System.
4. Training in leprosy to all General Health Services functionaries.
5. Monitoring and supervision.

Activities under NLEP

1. **Diagnosis and treatment of leprosy:** Services for diagnosis and treatment (MDT) are provided free of cost by all primary health centres and Government dispensaries throughout the country. Cases that are difficult to diagnose, complicated cases and cases requiring reconstructive surgery are referred to district hospital for further management.
2. **Training:** Training of general health staff like medical officer, health workers, health supervisors, laboratory technicians and ASHAs are conducted every year to develop adequate skill in diagnosis and management of leprosy cases.
3. **Urban leprosy control:** Urban leprosy control activities are implemented in urban areas having population size of more than 1 lakh to address the complex problems in urban areas. These activities include MDT and supportive medicines delivery services, follow-up of patient for treatment completion, monitoring and supervision.
4. **Information, education and communication (IEC):** Intensive IEC activities campaign with a theme 'Towards Leprosy Free India' is conducted towards further reduction of leprosy burden in the community, early reporting of cases, awareness generation and reduction of stigma and discrimination against leprosy affected persons. These activities are carried through mass media, outdoor media, rural media and advocacy meetings. More focus is given on interpersonnel communication.
5. **NGO services under survey, education and treatment (SET) scheme:** NGOs are getting grants from Government of India under Survey, Education and Treatment (SET) scheme. The various activities undertaken by the NGOs are IEC, prevention of impairments and deformities, case detection and MDT delivery. From financial year 2006 onwards, grant-in-aid

is being disbursed to NGO through state health (leprosy) societies.

6. **Disability prevention and medical rehabilitation (DPMR):** For prevention of disability among leprosy affected persons with insensitive hands and feet, DPMR services are provided. Affected persons are given dressing material, supportive medicines and microcellular rubber footwear. The patients are also empowered with self-care procedure for taking care of themselves. Emphasis is given on correction of disability in leprosy affected persons through Reconstructive Surgery (RCS).
7. **Special activities in high endemic districts:** Special activities including capacity building and extensive IEC, adequate availability of MDT, regular monitoring and supervision, self-care practices, supply of microcellular rubber footwear in adequate quantity and improvement in RCS performance through camp approach are strengthened in high endemic districts for early case detection, treatment and to reduce the disease burden.
8. **Supervision and monitoring:** Program is monitored at different levels through analysis of monthly progress reports, through field visits by the supervisory officers. Program review meetings are held at central, state and district levels. Emphasis is given to assessment of new case detection and treatment completion rate and proportion of grade II disability among new cases for better epidemiological analysis of the disease situation.

Major Initiatives

1. **Involvement of accredited social health activists (ASHA):** ASHAs are involved to bring out suspected cases from their villages for diagnosis at PHC and follow-up cases for completion of treatment. Her duties are monitored by the concerned PHC medical officer. She is entitled to receive incentive as follows:
   a. An early case before onset of any visible deformity ₹250.
   b. A new case with visible deformity in hands, feet or eye ₹200.

   Activities performed by ASHA are as follows:
   a. Search for suspected cases of leprosy to prevent disability and to cut down transmission potential.
   b. Follow-up all cases for completion of treatment in scheduled time. During follow-up visit, she also looks for symptoms

of any reaction due to leprosy and refer them to the health workers/PHC for treatment. This helps in reducing the chances of occurrence of disability in cases under treatment.

c. Advise and motivate disabled cases for proper care of their hands and feet during the follow-up period. This helps in improving quality of life of the affected persons and prevents further deterioration of disabilities.
d. Spread awareness.

2. **e-Newsletter**: It is a quarterly publication from the house of Central Leprosy Division (CLD) that share guidelines, feedback, experiences and activities undertaken in the program. It serves as one of the important tools for communication to keep informed, update and educate the stakeholders as well as target groups.
3. **Leprosy case detection campaigns (LCDC):** LCDC is being implemented in high endemic districts of the country to detect the hidden leprosy cases. In this campaign each and every person in a house is examined to detect all hidden cases in the community to interrupt the transmission of the disease and expedite achievement of elimination status at district and subdistrict levels.

   The important activities under LCDC are as under:

   a. Scheduled meetings of various committees formed at national, state, district, and block levels to plan and implement the LCDC.
   b. Focused training of all health functionaries from district to village level.
   c. House to house visits by team encompassing one ASHA and male volunteer, i.e. Field Level Worker (FLW) as per micro-plans prepared for local areas.
   d. Intensive IEC activities through miking and display of banners/posters during and before the LCDC.
   e. Supervision of house to house search activities through identified field supervisors.
   f. Scheduled meetings with community leaders/representatives to resolve any issue came across during the campaign.
   g. Systematic collection and compilation of reports from field teams and supervisors through designed formats.
   h. Prompt analyses and feedback on data received from teams, supervisors, monitors, medical officers to plan corrective actions.

4. **GIS mapping:** In order to strengthen planning, implementation and monitoring of activities in Central Leprosy Division, GIS mapping has been initiated. GIS mapping has enabled visualization of district wise data pertaining to annual new case detection rate, prevalence of the disease spatially.

E. NATIONAL MENTAL HEALTH PROGRAMME

'Mental health is a state of well-being characterized by the absence of mental or behavioral disorder whereby the person has made a satisfactory adjustment as an individual and to the community, in relation to emotional, personal, social and spiritual aspects of their life'. Mental disorders are common in general population and account for approximately 15% of the global burden of disease (GBD). In view of the huge burden of mental disorders, Government of India has been implementing National Mental Health Programme (NMHP) since 1982.

A national advisory group on mental health was established for the effective implementation of the NMHP. The District Mental Health Programme was added to the program (DMHP) in 1996. The program was re-strategized in 2003 to include two schemes, *viz.* modernization of state mental hospitals and upgradation of psychiatric wings of medical colleges/general hospitals.

Aims of NMHP

1. Prevention and treatment of mental and neurological disorders and associated disabilities.
2. Use of mental health technology to improve general health services.
3. Application of mental health principles in total national development to improve quality of life.

Objectives of NMHP

1. To ensure the availability and accessibility of minimum mental healthcare for all individuals in the community, especially for the vulnerable and underprivileged sections of population.
2. To encourage the application of mental health knowledge in general healthcare and in social welfare.
3. To promote community participation in the mental health service development.

4. To increase human resource in mental health subspecialties.
5. To stimulate efforts towards self-help in the community.

Components of NMHP

1. Treatment of mentally ill.
2. Rehabilitation.
3. Prevention and promotion of positive mental health.

Main Strategies

1. Integrating mental health services with primary healthcare through the NMHP.
2. Establishment of tertiary care institutions for treatment of mental disorders.
3. Eradicating stigmatisation of mentally ill patients and protecting their rights through regulatory institutions like the central mental health authority, and state mental health authority.

Specific Approaches of NMHP

1. Diffusion of mental health skills to the periphery of health services.
2. Appropriate task oriented training to the existing health staff.
3. Equitable and balanced distribution of existing health services.
4. Integration of basic mental healthcare services with the existing general health services.
5. Linkage of mental health services with the existing community development programs.

District Mental Health Programme

The District Mental Health Programme (DMHP) was launched under NMHP in the year 1996 (in IX Five Year Plan). DMHP includes early identification and treatment of mentally ill, promotive and preventive activities for positive mental health. The main components of DMHP are:

1. Training programs of all the mental health team workers including psychiatrist, clinical psychologist, psychiatric nurse, psychiatric social worker and community nurse.
2. Education of public regarding mental health to increase awareness and to reduce stigma.
3. Early detection and treatment of mentally ill persons.

4. Providing valuable data and experience at the level of community to the state and centre for future planning, improvement in service and research.
5. Provision of school mental health services including life skills education in schools and counselling services.
6. College counselling services through trained teachers/ councellors.
7. Workplace stress management.
8. Suicide prevention services including counselling centre at district level, sensitization workshops, IEC, helplines, etc.
9. Sensitization and training of health personnel at the district and subdistrict levels.
10. Awareness camps for dissemination of awareness regarding mental illnesses and related stigma through involvement of faith healers, traditional medical healers, teachers, leaders, etc.
11. Community participation.
12. Association with self-help groups, family and caregiver groups and NGOs working in the field of mental health.

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.

F. NATIONAL PROGRAMME FOR PREVENTION AND CONTROL OF DEAFNESS (NPPCD)

Hearing loss or deafness is the most common sensory deficit in humans today. Deafness is defined as the inability to use hearing as a primary channel for receiving speech, even with amplification. Hearing loss is hearing impairment of various degrees.

In India, there are approximately 63 million people suffering from significant hearing impairment; of these, a significant percentage is children between the ages of 0 to 14 years. Majority of cases of hearing loss are mainly due to common ear diseases, which if diagnosed early and managed properly, can significantly reduce the burden of hearing impairment.

Thus, in an effort to tackle the high incidence of hearing loss and deafness in the country, National Programme for the Prevention and Control of Deafness (NPPCD) was launched by the Government of India in 2006 for early identification, diagnosis and treatment of ear problems. The NPPCD programme is implemented by Ministry of Health and Family Welfare with the technical support of Directorate

General of Health Services. At the state level the programme is being implemented by the Department of Health and Family Welfare, State Nodal Officer, preferably an ENT surgeon at the Directorate/ Secretariat level, and provides technical guidance and expertise to the State Health Society for the purpose of implementation of the program in the various districts of the state.

Objectives of the Program

1. To prevent the hearing loss on account of disease or injury.
2. Early identification, diagnosis and treatment of ear problems responsible for hearing loss.
3. To medically rehabilitate persons of all age groups suffering with deafness.
4. To strengthen the existing intersectoral linkages for continuity of the rehabilitation program, for persons with deafness.
5. To develop institutional capacity for ear care services by providing support for equipment, material and training personnel.
6. To prevent and control major causes of hearing impairment and deafness, so as to reduce the total disease burden.

Strategy of the Program

1. To strengthen the delivery of services for ear care.
2. To develop human resource for ear care services.
3. To promote public awareness through appropriate and effective IEC strategies with special emphasis on prevention of deafness.
4. To develop institutional capacity of the district hospitals, community health centres and primary health centres selected under the program.
5. To provide recurring grant-in-aid for conducting screening camp for the screening of deafness and speech related cases.

Components of the Program

a. Manpower training and development

Training and development of manpower including state medical college experts, audiologist, medical officers, obstetricians and pediatricians, multipurpose workers, functionaries at grass root level such as Anganwadi Workers (AW), Accredited Social Health Activist (ASHA), Trained Birth Attendants (TBA):

a. For early identification, rehabilitation and management of hearing impaired and deafness cases.
b. To make the personnel aware of the existing facilities available for deafness in order to facilitate appropriate referral.
c. To sensitize the healthcare personnel regarding their specific roles in the program.
d. To enable the health providers to provide a leadership role in creating awareness about hearing impairment.
e. To facilitate development of suitable manpower, in order to be able to implement this program in the entire nation, in a phased manner.

b. Capacity building

Capacity building at the district hospital, community health centres and primary health centres in respect of ENT/audiology infrastructure for screening of ear morbidity and detection of hearing loss.

c. Service provision including rehabilitation

Provision of service for early detection, ear screening camps, treatment, management and rehabilitation of hearing and speech impaired cases at different levels of healthcare delivery system.

d. Awareness creation among parents/community

Community level health workers and doctors form a part of the IEC activities at various levels to generate awareness for early identification of hearing impairment, especially among children so that such cases can be managed and the stigma attached to deafness can be removed.

Program Execution and Expansion

The Program was a 100% Centrally Sponsored Scheme during 11th Five Year Plan. However, in 12th Five Year Plan, the centre and the states governments have pooled in resources as per the financial norms of NRHM. The program was initiated in year 2006-2007 on pilot mode in 25 districts of 11 state/UTs and later expanded to 228 districts of 27 states/UTs.

Expected Benefits of the Program

The Program is expected to generate the following benefits:

1. Availability of various services like prevention, early identification, treatment, referral, rehabilitation, etc. for hearing

impairment and deafness as the primary health centre/ community health centres/district hospitals largely cater to their need.
2. Decrease in the magnitude of hearing impaired persons.
3. Decrease in the severity/extent of ear morbidity or hearing impairment.
4. Improved service network/referral system for the persons with ear morbidity/hearing impairment.
5. Creation of awareness among the health workers/grass root level workers through the primary health centre medical officers and district health officers.
6. Capacity building at the district hospitals to ensure better care.

G. UNIVERSAL IMMUNISATION PROGRAMME

History of Immunisation Programme in India

After the success of global smallpox eradication in the 70s, it was realized that immunisation is the most effective tool for the prevention, control and even eradication of a disease. Immunisation Programme in India was introduced in 1978 as Expanded Programme of Immunisation (EPI) for immunizing all children during the first year of life with DPT (diphtheria-pertussis-tetanus toxoid), OPV (Oral Polio Vaccine), BCG (Bacillus Calmette Guérin) and typhoid–paratyphoid fever vaccines with the objective of reducing mortality and morbidity. Immunisation of pregnant mothers with TT (tetanus toxoid) vaccine was introduced in 1983. The programme gained momentum in 1985 and was expanded as Universal Immunisation Programme (UIP) and implemented in phased manner to cover all corners of a country districts by 1989-90.

Objectives of UIP

1. To rapidly increase immunisation coverage.
2. To improve the quality of services.
3. To establish a reliable cold chain system to the health facility level.
4. To introduce a district-wise system for monitoring of performance.
5. To achieve self-sufficiency in vaccine production.

UIP has two vital components:

a. Immunisation of pregnant women against tetanus.

b. Immunisation of children in their first year of life against the six EPI target diseases.

In 1992, UIP became a part of Child Survival and Safe Motherhood (CSSM) Programme. Since 1997, immunisation activities have been an important component of National Reproductive and Child Health Programme. It was recommended to cover 100% among infant also. In 1995, Pulse Polio Immunisation Programs was launched as a strategy to eradicate poliomyelitis. Since 2005 immunisation has been one of the key areas under National Rural Health Mission (NRHM).

Diseases Protected by Vaccination under UIP

Under the Universal Immunisation Programme, Government of India is providing vaccination to prevent following vaccine preventable diseases:

- Diphtheria
- Pertussis
- Tetanus
- Polio
- Tuberculosis
- Measles
- Hepatitis B
- Japanese Encephalitis (commonly known as brain fever)
- Meningitis and pneumonia caused by *Haemophilus influenzae* type b.

Vaccines under UIP

Under UIP, following vaccines are provided:

- BCG (Bacillus Calmette-Guérin)
- DPT (diphtheria-pertussis-tetanus toxoid)
- OPV (oral polio vaccine)
- Measles
- Hepatitis B
- TT (tetanus toxoid)
- Japanese encephalitis (JE) vaccination (in selected high disease burden districts)
- Hib containing pentavalent vaccine (DPT+Hep B+Hib) (in selected states).

Guiding Principles of UIP

The services provided are guided by the following principles:

1. **Universal immunisation coverage:** Sustaining demand and ensuring that all pregnant mothers, children and adolescents are immunized as per national schedule in line with the principles of universal health coverage.
2. **Equitable access:** Ensuring that the immunisation services reach out to the underserved, needy and most vulnerable populations while addressing regional inequalities across states.
3. **High quality services and innovation:** Maintaining highest possible quality in vaccine procurement, storage, distribution and delivery services in an innovative and safe manner.
4. **Sustainability and partnerships:** Committing resources (financial, human and technical) that sustain immunisation benefits to the people at all times and promoting partnerships across different sectors and organizations, build synergies and expand the overall coverage of the program.
5. **Governance:** Decentralized planning through a bottom-up approach to improve operational efficiency.
6. **Management excellence and accountability:** Implementation, oversight and accountability of interventions that optimize efficient use of resources.

Vaccination schedule under the UIP is given in Table 3.3.

TABLE 3.3: Vaccination schedule under the UIP

National Immunisation Schedule				
Vaccine	***When to give***	***Dose***	***Route***	***Dose***
For Infants				
BCG	At birth or as early as possible till one year of age	0.1ml (0.05 ml until 1 month of age)	Intra-dermal	Left upper arm
Hepatitis B Birth dose	At birth or as early as possible within 24 hours	0.5 ml	Intra-muscular	Antero-lateral side of mid-thigh: Left

Contd.

TABLE 3.3: Vaccination Schedule under the UIP *(Contd.)*

National Immunisation Schedule				
Vaccine	***When to give***	***Dose***	***Route***	***Dose***
OPV Birth dose	At birth or as early as possible within the first 15 days	2 drops	Oral	-
OPV 1, 2 and 3	At 6, 10 and 14 weeks	2 drops	Oral	-
DPT 1, 2 and 3	At 6, 10 and 14 weeks	0.5 ml	Intra-muscular	Antero-lateral side of mid-thigh
Hepatitis B 1, 2 and 3	At 6, 10 and 14 weeks	0.5 ml	Intra-muscular	Antero-lateral side of mid-thigh
IPV (inactivated polio vaccine)	14 weeks	0.5 ml	Intra-muscular	Antero-lateral side of mid-thigh: Right
Hib containing Pentavelant 1, 2 and 3	At 6, 10 and 14 weeks	0.5 ml	Intra-muscular	Anterolateral side of mid-thigh: Left
Rota Virus Vaccine	At 6, 10 and 14 weeks	5 drops	Oral	-
Measles 1st Dose	9 completed months–12 months (give up to 5 years if not received at 9–12 months age)	0.5 ml	Subcuta-neous	Right upper arm
Vitamin A, 1st Dose	At 9 months with measles	1 ml (1 lakh IU)	Oral	-
For children				
DPT 1st booster	16–24 months	0.5 ml	Intra-muscular	Anterolateral side of mid-thigh: Left
OPV Booster	16–24 months	2 drops	Oral	

Contd.

TABLE 3.3: Vaccination Schedule under the UIP *(Contd.)*

National Immunisation Schedule				
Vaccine	***When to give***	***Dose***	***Route***	***Dose***
Measles 2nd dose	16–24 months	0.5 ml	Subcutaneous	Right upper arm
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	-
DPT 2nd Booster	5–6 years	0.5 ml.	Intramuscular	Left upper arm
TT	10 years and 16 years	0.5 ml	Intramuscular	Upper arm
For pregnant women				
TT-1	Early in pregnancy	0.5 ml	Intramuscular	Upper arm
TT-2	4 weeks after TT-1	0.5 ml	Intramuscular	Upper arm
TT-Booster	If received 2 TT doses in a pregnancy within the last 3 years	0.5 ml	Intramuscular	Upper arm

Give TT-2 or Booster doses before 36 weeks of pregnancy. However, give these even if more than 36 weeks have passed. Give TT to a woman in labor, if she has not previously received TT.
Pentavalent vaccine contains a combination of DPT, Hep B and Hib. In the states where it has been introduced, it will replace DPT 1,2 and 3 and Hepatitis B 1, 2 and 3. Hepatitis B birth dose and booster doses of DPT will continue as before.
JE Vaccine (SA 14-14-2) is given in select endemic districts, after the campaign is over in that district.
The 2nd to 9th doses of Vitamin A can be administered to children 1–5 years old during biannual rounds, in collaboration with ICDS.

H. NATIONAL PROGRAMME FOR CONTROL OF BLINDNESS AND VISUAL IMPAIRMENT (NPCB & VI)

Introduction

National Programme for Control of Blindness and Visual Impairment (NPCB & VI) was launched in the year 1976 as a 100% centrally sponsored scheme (now 60 : 40 in all states and

90 : 10 in NE states) with the goal of reducing the prevalence of blindness to 0.3% by 2020. Rapid survey on avoidable blindness conducted under NPCB during 2006-07 showed reduction in the prevalence of blindness from 1.1% in 2001-02 to 1% in 2006-07. Prevalence rate of blindness and targets are as follows:

1. Prevalence of blindness—1.1%. (Survey 2001-02).
2. Prevalence of blindness—1%. (Survey 2006-07).
3. Prevalence of blindness target—0.3% (by the year 2020).

Main causes of blindness include cataract (62.6%), refractive error (19.70%), corneal blindness (0.90%), glaucoma (5.80%), surgical complication (1.20%), posterior capsular opacification (0.90%), posterior segment disorder (4.70%), others (4.19%).

Estimated national prevalence of childhood blindness/low vision is 0.80 per thousand. The five diseases identified for global elimination include cataract blindness, trachoma blindness and transmission, onchocerciasis, avoidable causes of childhood blindness, refractive errors and low vision.

Main Objectives

1. 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.
2. To 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.
3. Strengthening and upgradation of Regional Institutes of Ophthalmology (RIOs) to become centre of excellence in various sub-specialties of ophthalmology and also other partners like medical colleges, district hospitals, subdistrict hospitals, vision centres, NGO eye hospitals.
4. Strengthening the existing infrastructure, equipment and developing additional human resources for providing high quality comprehensive eye care in all districts of the country.
5. To enhance community awareness on eye care and especially preventive measures.
6. To increase and expand research for prevention of blindness and visual impairment.
7. To provide assistance to voluntary organizations/private practitioners for delivering eye care services including cataract operations and eye banking.

Strategies

1. Information Education Communication (IEC) activities for creating awareness on eye care within the community.
2. Active screening of population and referral of operable cases to fixed eye care facilities.
3. Effective implementation of school screening program for all children aged 10 to 14 years for identification and treatment of refractive errors and provision of free spectacles to those affected and belonging to poor socioeconomic strata.
4. Capacity building of health workers for improving their knowledge and skill in delivery of high quality eye care services.
5. Provision of eye care services, and multipurpose district mobile ophthalmic units in the district hospitals throughout the country.
6. Emphasis on the comprehensive eye care coverage by covering emerging diseases other than cataract like diabetic retinopathy, glaucoma, corneal transplantation, vitreoretinal surgery, treatment of childhood blindness, retinopathy of pre-maturity (ROP), etc.
7. Funding of tertiary eye care centre for purchase of sophisticated modern ophthalmic equipment.
8. Ensure setting up of superspecialty clinics for all major eye diseases including diabetic retinopathy, glaucoma, retinopathy of prematurity, etc. in state level hospitals and medical colleges all over the country.
9. Integration of teleophthalmology centres at PHC/Vision Centres with superspecialty eye hospitals to broaden access of people to best possible facility for diagnosis and treatment of eye diseases, especially in hilly terrains and difficult areas.
10. Development of a network of eye banks and eye donation centres linked with medical colleges and Regional Institute of Ophthalmology (RIO) to promote collection and timely utilization of donated eyes in a transparent manner.
11. Provision of eye care services and free cataract surgery through the healthcare delivery system, by the involvement of NGO sector and public–private partnership.

Future Plan

1. Setting up of more PHC/Vision Centres to broaden access of people to eye care facilities.

2. To extend financial support to NGOs for treatment of other eye diseases like diabetic retinopathy, glaucoma management, laser techniques, corneal transplantation, vitreoretinal surgery, treatment of childhood blindness, free of cost to poor people.
3. Integration of existing ophthalmic surgical/non-surgical facilities in each district by associating few units to next higher unit.
4. Inclusion of modern ophthalmic equipment in eye care facilities to make it more versatile to meet modern day requirement.
5. Upgradation of software for management information system for better implementation and monitoring.
6. Digitalization of eye care services—IEC messages, WhatsApp groups for stakeholders, etc.
7. Provision for setting up multipurpose district mobile ophthalmic units in district hospitals for better coverage.

I. PULSE POLIO IMMUNISATION PROGRAMME

Introduction

In India, vaccination against polio was started in 1978 under Expanded Programme on Immunisation but it failed to eradicate poliomyelitis. In 1985, the Universal Immunisation Programme (UIP) was launched to cover all the districts of the country. In December 1995, Government of India launched Pulse Polio immunisation (PPI) programme, also known as National Immunisation Days (NIDs) along with Universal Immunisation Programme with the goal to completely eliminate poliomyelitis from India. The program was launched under the World Health Organization's (WHO) Global Polio Eradication Initiative and is conducted twice in early part of each year.

The main aim of PPI was to immunize every child under the age of 5 years through an improved social mobilization and setting up of large networks of booths throughout the country. Under this program all children in the age group of 0–5 years are given two doses of Oral Polio Vaccine (OPV) in the month of January and December every year. Additionally, multiple rounds (at least two) of Sub-National Immunisation Days (SNIDs) have been conducted over the years in high-risk areas. Over 170 million children are immunized during each NID and 77 million in SNID. The last reported cases of wild polio in India were in West Bengal and Gujarat on 13 January 2011. On 27 March 2014, WHO declared India

a polio-free country, since no cases of wild polio were reported in for five years. At present in routine immunisation, bivalent OPV drops are given to all children under the age of 5 years and Inactivated Polio Vaccine (IPV) to children less than one year of age.

Strategies of polio eradication are as follows:

1. **Pulse polio immunisation (PPI):** It aims at reaching and immunizing every child in the country through an improved social mobilization and setting up of vast networks of booths in all parts of the country leaving no chance of polio occurrence.
2. **Mop-up immunisation:** Performance of good mop-up operations in areas where polio has almost disappeared, and maintain high level of morale among the public.
3. **Acute flaccid paralysis (AFP) surveillance:** Acute flaccid paralysis (AFP) is defined as a sudden onset of paralysis/ weakness in any part of the body of a child less than 15 years of age. AFP surveillance allows detecting paralytic poliomyelitis due to wild poliovirus transmission in the population. Maintaining a high level of surveillance for AFP is critical for documenting the absence of poliovirus circulation for poliomyelitis eradication. Cases of AFP are to be immediately reported in time and stool specimens of them are to be collected within 14 days. Outbreak Response Immunisation (ORI) is to be conducted as early as possible.
4. **Publicity:** Extensive publicity by replacing the national telecoms' authority ringtone with a vaccination day awareness message, posters, TV and cinema spots, parades, rallies, and one-to-one communication from volunteers.

UNIT
4

National Health Programmes II

MOTHER AND CHILD HEALTH (MCH) SERVICES

In any society, mothers as well as children constitute a major group of the population. Collectively, they also comprise a susceptible or special risk group. Although the morbidity and fatality rates are higher amongst them yet a lot of conditions and causalities are normally avoidable. The safety as well as promotion connected with the health of the mother and child is of prime importance in creating a healthy as well as sound country. The main objective associated with mother's healthcare is to possess a successful and risk-free pregnancy. Unfortunately, there are several women who have pregnancy associated problems, which are detrimental to her health or the fetal health.

Maternal death or maternal mortality pertains to the death of a woman during pregnancy or within 42 days of termination of pregnancy (stillbirth, abortion or even term delivery). The main causes of maternal mortality can be categorized as follows:

1. **Obstetric causes:** These account for more than 50% of deaths.
   - Puerperal sepsis
   - PET (pre-eclamptic toxemia)
   - Hemorrhage
   - Rupture of uterus
   - Placenta previa
   - Accidents during labor
   - History of past stillbirths/neonatal deaths.
2. **Non-obstetric causes**
   - Anemia
   - Systemic diseases including hypertension, heart diseases, diabetes, kidney disease, etc.
   - Malignancies

- Tuberculosis
- Accidents, etc.

3. **Other causes**
   - Early marriage
   - Early childbirth
   - Large number of previous pregnancies
   - Frequent pregnancies
   - Malnutrition
   - Poverty
   - Illiteracy, etc.

Child health commonly involves the actual physical, psychological, emotional, as well as social well-being involving little ones from infancy through age of puberty. Although associated with children from infancy through adolescence yet by definition child health can be limited up to age 5.

These considerations have triggered the development of special mother and child health (MCH) services focused on promotive, preventive, curative and rehabilitative healthcare for mothers and children in our country. It includes the sub-areas of maternal health (i.e. the health of women during pre-pregnancy, childbirth and postpartum), family planning, child health, school health, and care of handicapped children in special setting such as day care, etc.

Mother and Child—One Unit

Mother and child are generally considered as one unit because of the following reasons:

1. During the antenatal period (approximately 280 days), the fetus is part of the mother and obtains all the nutrition and oxygen from the mother's blood.
2. The health of the newborn is directly connected with the health of the mother. A normal healthy mother delivers a healthy baby and there is less risk of premature birth, stillbirth or abortion.
3. After birth, the child is dependent upon the mother for feeding (till 6 to 9 months) and mental as well as social development. The health of the child depends upon the health of the mother. The mother is also the first teacher of the child.

Mother and Child Health (MCH) Problems

In the developed countries

There are perinatal complications, congenital malformations, genetic diseases, behavioral, and psychological problems, etc.

In the developing countries

There are issues like malnutrition, bacterial infections, unregulated fertility, and management of pregnancy. These problems are aggravated by social problems, such as poverty, illiteracy, ignorance, poor livelihood conditions, lack of sanitation, taboos and cultural practices and thereby result into increased maternal and child morbidity and mortality.

Objectives of MCH Services

1. To prevent the occurrence of diseases in mothers and children.
2. To promote the lifelong health of the mothers and children.
3. To promote the physical as well as psychological development of the child and adolescent.
4. To protect the health of the mothers and children.
5. To reduce the maternal, perinatal, infant and childhood morbidity and mortality.

Components of MCH Services

- Pre-conceptional care
- Antenatal care
- Intranatal care
- Postnatal care
- Family planning services
- Essential and immediate care of the newborn (neonatal care).

1. Pre-conceptional care

Pre-conceptional care is an important part of basic maternal healthcare that benefits both mother as well as child equally. The main aim of pre-conceptional care is to minimize maternal death rates, miscarriages, birth defects, low birth weight, and health problems.

Ideally, it should start much before marriage. This is a type of preventive healthcare service provided to the woman before she conceives in order to avoid possible health problems during the entire span of the pregnancy. Pre-conceptional care mainly aims to promote healthy lifestyles and to lessen threat factors that might affect future pregnancies.

The main aspects of pre-conceptional care are generally educational, informal and genetic guidance.

i. **Educational:** The high school and college girl students are given education on anatomy and physiology of reproductive system,

pathology of sexually transmitted diseases (STDs) including HIV/AIDS, the maternal physiological and biological changes during pregnancy, and prenatal nutrition.

ii. **Informal:** Women are counselled on the benefits of medical supervision during pregnancy and facilities available for the same. They are also informed about the provisions of the Medical Termination of Pregnancy Act.

iii. **Genetic counselling:** This means improvement in the genetic constitution in the individual by counselling of the couple. There are two types of counselling:
   a. *Prospective counselling:* It is true prevention. In this a heterozygous individual with recessive traits is advised not to marry another heterozygous individual to prevent diseases like thalassemia, sickle cell anemia.
   b. *Retrospective counselling:* This is done when a hereditary disorder is already present in the family. The individuals with harmful traits are advised about different methods of contraception, termination of pregnancy in the event of diagnosing defective fetus by sonography, sterilization, *in vitro* fertilization and embryo transfer (tubal pregnancy). They are advised to avoid exposure to mutagens, such as X-rays, ionizing radiations, etc. treatment of hemophilia with antihemophilic globulin.

2. Antenatal care (care of the mother during pregnancy period)

Antenatal period starts from the time of conception to the onset of labor. The main objective of antenatal care is to accomplish a healthy mother at the end of the pregnancy. In rural areas, antenatal care is provided by female health worker.

☛ Objectives of antenatal care

i. To find out the 'high-risk' pregnant women and to give them special attention.
ii. To predict and prevent complications of pregnancy.
iii. To prepare the mother for breastfeeding.
iv. To prepare the mother to cope up with pregnancy and help her to get rid of anxiety associated with delivery.
v. To promote, protect and maintain the health of the mother during pregnancy so that she delivers a healthy child with a good birth weight.
vi. To reduce maternal and infant mortality and morbidity.

vii. To sensitize the mother to the need of family planning.
viii. To teach the mother basics of personal hygiene, child healthcare, nutrition and environmental sanitation.

To achieve the above objectives, the expectant mother must visit the antenatal clinic ideally, once a month till 28 weeks of pregnancy, twice a month till 36 weeks, thereafter once a week till 40 weeks (delivery). In cases where it is difficult for mothers to visit antenatal clinic so often, then a minimum of three antenatal visits as per following schedule are recommended during the entire period of pregnancy.

a. First visit (within 12 weeks)
   i. To confirm pregnancy.
   ii. To register the mother.
   iii. To detect 'high-risk' mothers.
   iv. To give first dose of tetanus toxoid.
b. Second visit (at 32 weeks)
   i. To deworm the mother.
   ii. To give second dose of tetanus toxoid to the mother.
   iii. To monitor the health of the fetus.
   iv. To detect position and presentation of the fetus.
c. To give one pack of 100 IFA (iron and folic acid) tablets.
d. Third visit (at 36 weeks)
   i. To exclude cephalopelvic disproportion.
   ii. To give antenatal advice.
   iii. To give disposable delivery kit to the mother in the rural areas.

☛ Components of antenatal care

A. **Antenatal registration and maintenance of antenatal card:** Registration of the mother is done in the antenatal register right after the pregnancy is confirmed or after 12 weeks of missing the period, in the rural areas by the female health worker. Early detection of the pregnancy is important as it facilitates proper planning and allows essential care to be given during pregnancy to the mother as well as fetus. An 'antenatal card' is prepared by writing the registration number, identifying data and details of previous and present health history, including present complaints, if any. Preparation of the card not only helps in enumeration of the mothers to calculate infant mortality rate and maternal mortality rate but also helps in evaluation of other MCH/FP services. It helps in knowing the final outcome of pregnancy.

B. **Antenatal history:** A detailed history of the women must be taken. This should include the following:
   i. *Gynec record:* Age at menarche, history of last menstrual period (LMP) in order to compute the particular duration of amenorrhea and to calculate the expected date of delivery (EDD) : (EDD = LMP plus 1 year minus 3 months plus 7 days). For example, if LMP = 10.04.2009 then EDD = 17.01.2010.
   ii. *Obstetric record:* Age at the time of marriage, duration of married life, age at first pregnancy as well as the detailed record associated with past pregnancies including gravid status (order of pregnancy), para-status (number of viable deliveries), abortions, stillbirths, number of living children, number of dead children and their causes.

C. **Antenatal examinations:** This particularly involves checkups for physical, systemic, stomach along with pelvic. Physical examination is carried out to look for built, nourishment, anemia, edema, respiratory rate, pulse, blood pressure and weight and position of nipple. Weight Height Product Index (WHPI) is used to judge the nutritional status of the mother:

$$\text{WHPI} = \frac{\text{Current weight (kg)} \times \text{Height (cm)}}{\text{Expected weight (kg)} \times \text{Height (cm)}} \times 100$$

Less than 100 WHPI indicates malnutrition.

   i. *Systemic evaluation:* It involves examination of the various systems like central nervous system, cardiovascular system, respiratory system, digestive and genitourinary systems to detect systemic diseases, like hypertension, diabetes, heart diseases, tuberculosis, renal diseases, epilepsy, asthma, jaundice, malaria, urinary tract infection, STD, HIV/AIDS, etc. if any.
   ii. *Abdominal examination:* It is done in order to monitor the actual progress of pregnancy, fetal growth, fetal heart sounds, fetal lie position and presentation, fetal movements, fetal parts, multiple pregnancies, and the presence of abdominal scar.
   iii. *Pelvic examination:* It is done in the last check-up to exclude cephalopelvic disproportion.

D. **Antenatal investigations:** Following investigations are carried out (Fig. 4.1).

E. **Antenatal diagnosis of congenital anomalies:** Certain investigations are done to detect congenital anomaly *in*

utero especially in cases involving previous delivery of the malformed baby.

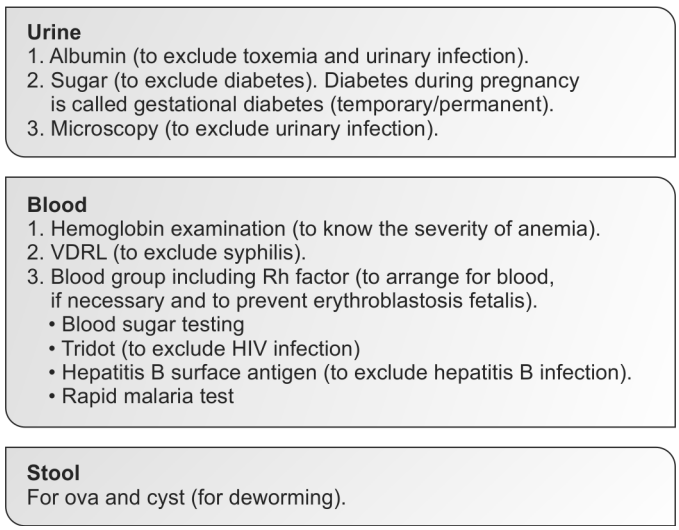


Fig. 4.1: Antenatal investigations

i. *Alfa fetoprotein:* Detection of a specific protein referred to as α-fetoprotein in mother blood during pregnancy allows to diagnose neural tube disorders, e.g. spina bifida.
ii. *Ultrasound:* This assists to see the fetus and its congenital anomalies.
iii. *Nuchal translucency scan (NT scan):* Nuchal translucency is an accumulation of fluid beneath the skin of the neck of the fetus. NT scan measures the thickness of the fluid to assess the risk of Down's syndrome. The skin of the neck of the fetus appears as a white line.
iv. *Aminocentesis:* This is performed only in the second trimester to diagnose abnormalities like Down's syndrome, neural tube defects, and RH status of the fetus.
v. *E. Chorionic villi biopsy:* This is carried out during 10th week of pregnancy and allows determining the sex of the fetus and chromosome status.

F. **Antenatal guidance:** A major component of the antenatal care is antenatal advice. During pregnancy mother is advised on the following topics:
1. *Diet:* Pregnancy needs energy and nutrient requirements of mother considerably increase during this period. Additionally, birth weight of child is related to the weight

gain of the mother throughout pregnancy. Typically, a normal healthy woman gains 1.5 kg per month during pregnancy, so as to obtain 3.0 kg newborn baby.

2. A well-balanced healthy diet providing almost 2200 kcal/day is essential throughout pregnancy in order to meet the increased nutritional requirements of mother throughout pregnancy. Women must eat green leafy vegetables and avoid spicy foods due to the chances of physiological acidity during pregnancy. Abortifacient food or fruit must also be avoided.
3. *Personal hygiene:* Women must be advised regarding need of personal cleanliness and oral hygiene. She must be advised to wear clean, comfortable and loose clothes.
4. *Rest and sleep:* Pregnant women must take a minimum of 2 hours sleep following lunch along with 8 hours sleep during night.
5. *Exercise:* Pregnant women are advised to do mild household work as well as morning and evening walk. She is advised to avoid excessive physical work particularly during first and last trimester of pregnancy.
6. *Habits:* Alcohol as well as smoking are strictly not allowed throughout pregnancy. Alcohol consumption leads to fetal growth retardation along with development delay and may even result into abortion. Smoking leads to low birth weight babies.
7. *Sexual intercourse:* It is restricted during last trimester and prohibited in case of history of miscarriage and premature delivery.
8. *Drugs:* Self-medication and reckless use of drugs must be avoided.
9. *Bowels:* To avoid constipation, regular consumption of green leafy vegetables, fruits and water is advised to pregnant women. She must avoid the use of purgatives like castor oil.
10. *Dance therapy:* Basic easy dance steps and yoga exercises are advised to pregnant women as it reduces stress, serum cholesterol level and tends to make the women's mood more pleasant. Further, dance therapy facilitates smooth and easy labor.
11. *Radiation:* Exposure to radiation must be prevented in pregnant women as it may lead to mortality.
12. *Warning signs:* Mother is advised to report in case of bleeding, blurred vision, fits, swelling of feet, loss of fetal movements, severe headache, and any other unusual symptoms.

G. **Special antenatal services:** (Provided by Government of India)
   a. *Nutritional services:* Under the National Programme of Integrated Child Development Services (ICDS) Scheme all rural, pregnant women are provided some sort of supplementary food everyday in order to avoid nutritional deficiencies of protein, vitamin, and minerals to prevent the low birth weight of newborns.
   b. *Immunisation services*
      - ***Tetanus:*** To prevent tetanus, primary dose of tetanus toxoid must be given to the mother in the 16–20 weeks and second dose after 30 days.
      - ***Hepatitis B infection:*** In case the expecting mother is HBsAg negative, she should be given hepatitis B vaccine. If the mother is actually HBsAg positive, hepatitis B vaccine must not be given to her as vaccine does not provide immunity in an already infected individual. Generally, the fetus gets infection mostly at the time of birth. Transmission at birth can be prevented by immediate post-delivery administration of immunoglobulin B and hepatitis B vaccine.
      - ***German measles:*** One dose of rubella vaccine is to be given to all potential mothers; however it must not be given to the mother throughout pregnancy.
      - ***Erythroblastosis fetalis:*** When the mother is RH (–)ve and the fetus is RH (+)ve, then the mother is given RH anti-D immunoglobulin during 28th week as well as 34th week in order to prevent erythroblastosis fetalis (RH-incompatibility characterized by congenital hemolytic anemia). In case, the newborn is RH (+)ve, mother is given another dose immediately after delivery.
   c. *Medicinal services*
      - Under National Anemia Control Programme, 100 mg of elemental iron along with 500 μg of folic acid, per day following food are distributed to pregnant women in order to prevent anemia through antenatal hospitals and primary health centres.
      - Antihelminthic drug, e.g. Mebendazole is given once during the second trimester, to the pregnant women.
      - Benzathine penicillin is given to the pregnant women in case she is suffering from syphilis.

d. *Family welfare services:* If the mother is actually primigravida, she is sensitized regarding different contraceptive methods and in case she desires to have a second child, she is encouraged with regard to spacing with an IUD following delivery.
e. *Educational services:* The mother is educated concerning the art of child care.

3. *Intranatal care*

Intranatal care implies the care taken during the delivery. This includes taking good care of mother as well as the newborn at the time of childbirth.

☛ Objectives

a. To encourage the care of the baby at the time of delivery like resuscitation, care of the cord, care of the eyes, etc.
b. To prevent infections in both the mother and new baby.
c. To promote clean delivery, i.e. delivery under aseptic precautions. The delivery is to be carried out simply by paying attention to *five cleans,* i.e. delivery with *clean hands* on *clean surface* using *clean razor blade*, *clean ligature*, along with *clean cord-stump*.
d. To promote safe and sound delivery with minimum damage to the mother as well as infant.
e. To realize the maternal danger signs, e.g. obstructed/sluggish labor, bleeding during labor, convulsions, high temperature, collapse during labor, postpartum hemorrhage, prolonged third stage of labor.
f. To recognize the fetal threat signs, e.g. prolapse of the cord, meconium-stained liquor, slow and irregular fetal heart beat.

A. Domiciliary care

Mothers with normal obstetric record are advised to have their confinement inside their own houses, provided the home conditions are good enough. In some instances where the mothers possess normal obstetric record, delivery may be carried out by the Health Worker Female or trained *dai*. This is known as domiciliary midwifery service.

⋆ **Advantages of domiciliary midwifery service:**

i. The mother delivers in the acquainted surroundings of her house, which is likely to eliminate the anxiety connected with delivery in a hospital.

ii. The possibilities of cross-infection are usually less. Mother can certainly watch upon her children and can keep an eye upon the household at the same time simultaneously.

⋆ **Disadvantages of domiciliary midwifery service**

i. Less medical as well as nursing supervision for mother as compared to a hospital. The mother resumes back to her tasks very soon and may even have less rest.
ii. The diet of mother could be neglected.

B. Institutional care

Institutional care is usually recommended for all high-risk cases, and also where home circumstances are not favorable. The main drawback of institutional care is likelihood of cross-infection.

4. Postnatal care

Postnatal care is the care of the mother as well as the newborn after delivery. Generally, this care is categorized into two areas:

a. Proper care of the mother by obstetrician.
b. Proper care of the newborn by obstetrician as well as pediatrician.

☛ **Objectives of postnatal care**

a. To prevent complications of postpartal period, which are:
   i. **Puerperal sepsis:** It is infection of the genital tract within 3 weeks following delivery. It is accompanied by increase in temperature and pulse rate, bad smelling lochia, pain and discomfort in lower abdomen, etc. It can be eliminated by attention to asepsis, just before and after delivery.
   ii. **Thromobophlebitis:** It is an infection of the veins of the legs generally associated with varicose veins. The legs usually become pale, tender, and swollen.
   iii. **Secondary hemorrhage:** Secondary hemorrhage is bleeding from vagina at anytime from 6 hours following delivery to the end of the puerperium (6 weeks). This could be due to retained plasma or membrane.
   iv. **Others:** Urinary tract infection and mastitis, etc.
b. To provide essential care for the speedy recovery of the mother to optimum health. Sub-involution of uterus and cervicitis are the most common conditions found on health checkup during the late postnatal period and need to be treated. Anemia, if present, must also be treated. In addition, the nutritional needs of the mother must be adequately met.

c. To ensure adequacy of breastfeeding simply by inquiring mother the number of times the child is usually passing urine per day. In case the child is exclusive breastfeeding and passes urine about 8 times per day, it means mother is secreting sufficient amount of milk.
d. To offer family welfare services.
e. To educate mother and family regarding cleanliness, feeding for mother and infant, need of pregnancy spacing, importance of health check-up along with birth registration.

5. Family planning services

This is an important component of MCH services. Every postnatal case should be advised about a suitable method of family planning. Further, tubal ligation can be easily performed soon after delivery, when the size of the uterus is still large. The government has put into operation an All India Hospital Postpartum Program.

☛ Essential and immediate care of the newborn (neonatal care)

The proper care of the newborn is essential since the newborn is extremely sensitive and may die in case care is not taken as soon as it is born.

☛ Aims of the neonatal care

i. To provide immediate and vital attention to the infant.
ii. To prevent neonatal problems like infections, hypothermia and birth asphyxia.
iii. To educate the mother regarding 'danger signs' of the newborn.
iv. To identify 'at-risk' newborns and give all of them individual attention.
v. To promote the growth and development of newborn.
vi. To teach the parents to shower love and affection on the newborn.
vii. To lessen perinatal as well as early neonatal mortality rate.

Essential care of the newborn involves caring for the eyes, nose, throat, umbilical cord, rectum and skin of the body.

i. **Care of the eyes:** The moment the head is delivered, eyes are wiped thoroughly clean gently from medial to lateral side using swab and separate sterile, damp cotton swabs for separate eyes. One drop of (1%) silver nitrate solution is instilled in the eyes to prevent conjunctivitis and ophthalmia neonatorum.
ii. **Care of the nose and throat:** Nose and mouth are then wiped clean with separate sterile gauze piece, to ascertain

cardio-respiratory function by making the air passage clean. The majority of the babies cry, lungs expand and child starts breathing. Most of the newborn cry spontaneously.

iii. **Care of the umbilical cord:** Just after the delivery, the cord is still pulsating and it continues to pulsate for several minutes and the baby continues to get additional blood (around 10 ml) from the mother even after birth until the pulse stops. Consequently, the cord is cut immediately after pulsation ceases. Attention should be given to prevent tetanus of the newborn by using suitable sterilized devices and by applying an antiseptic on the cord stump. The cord needs to be kept as dry as possible. It dries up and shrivels up and separates by aseptic necrosis in 5–8 days.

iv. **Care of the rectum:** The patency of the anal canal is then confirmed. The meconium is made to expel by simply inserting little finger with gloves into the rectum for approximately half an inch.

v. **APGAR score:** The APGAR (Appearance, Pulse, Grimace, Activity, and Respiration) score is taken at 1 minute and again at 5 minutes following birth (Table 4.1). It provides an instantaneous estimate of the physical condition of the baby. An ideal score is 9 or 10; 0–3 signifies that the baby is greatly depressed. A score below 5 requires prompt action.

TABLE 4.1: APGAR (appearance, pulse, grimace, activity, and respiration) score

Sign	Score		
	0	1	2
Color	Blue, pale	Body pink, extremities blue	Completely pink
Heart rate	Absent	< 100, slow	> 100
Respiratory effort (cry)	Absent	Slow and irregular (feeble cry)	Good cry
Muscle tone (movements of limbs)	Flaccid	Sluggish	Active
Reflex response	No response	Grimace	Good
Grading	Severe depression	Mild depression	No depression

vi. **Care of the skin:** The body of baby is wiped thoroughly clean with dry towel from head to foot in order to make the skin free from meconium, vernix and blood clots. The baby is then covered with a dry and warm cloth in order to prevent the heat loss and to keep the baby warm.
vii. **Maintenance of body temperature:** The normal body temperature of the newborn is 36.5°C to 37.5°C. A newborn has little thermal control and may lose body heat primarily through evaporation of amniotic fluid. Therefore, in order to avoid the heat loss the child is hurriedly dried with clean cloth and wrapped in warm cloth and given to mother for skin-to-skin contact and breastfeeding.
viii. **Breastfeeding:** Breastfeeding must be started just within hour of birth. The colostrum (first milk) is actually the best option food for baby since it possesses a high concentration of proteins along with other nutrients the body requires. It is abundant in anti-infective factors that protect the body against respiratory infections as well as diarrhea.

Neonatal Examination

a. **First checkup:** The primary checkup is carried out just after birth, and if possible, in the delivery room to make sure that the baby has not suffered from traumas during birth process, to detect malformations, and also to examine maturity of the newborn. The abnormalities such as cyanosis of lips and skin, problems in breathing, imperforated anus, vomiting, cerebral irritation and temperature instability must be immediately attended.
b. **Second checkup:** It must be made by a pediatrician within 24 hours after birth. This includes recording of the following details:
    i. Body size, which includes body weight, crown heel length, head and thoracic perimeters as well as body temperature.
    ii. Skin particularly for cyanosis, jaundice, pallor, erythema.
    iii. Cardiorespiratory activities, e.g. cardiac murmurs, absence of femoral pulse, central cyanosis, respiratory rate, thoracic cage retraction on inspiration.
    iv. Neuro-behavioral activities.
    v. Head and face.
    vi. Abdomen for signs of distension, abnormal masses, and imperforate anus.
    vii. Limbs and joints or deformities of joints.
    viii. Spine for neural tube defects.

ix. External genitalia for undescended testis in male and for fused labia, enlarged clitoris in females.

NATIONAL FAMILY WELFARE PROGRAMME (NFWP)

Introduction

India is one of the countries facing population problems (Table 4.2). Current demographic scenario (census 2011) reveals the population of India has increased by about 18.1 Crore (181 million) between 2001 and 2011.

TABLE 4.2: Population of India in 20th century

Census year	Total population (millions)
1901	238.4
1911	252.1
1921	251.3
1931	279.0
1941	318.7
1951	361.1
1961	439.2
1971	548.2
1981	683.3
1991	846.4
2001	1028.7
2011	1210.2
2021	Census due

India is supporting 16% of the world's population with only 2% of the world's land area. Next to China, India is the world's second most populous country. Area wise India is only two-fifths the size of USA but population wise it is more than triple of USA. India's population is increasing at the rate of 16 million per year and growth rate is 2.2%. India is projected to be the world's most populous country by 2025, surpassing China, its population reaching 1.6 billion by 2050.

Six states, i.e. Uttar Pradesh, Bihar, Maharashtra, West Bengal, Andhra Pradesh and Madhya Pradesh account for nearly 60% of

India's population. The statistics of census 2011 are sufficient to project the alarming population problem of India. The main causes for population explosion in India are:

1. Slight reduction in birth rate as against a steep decline in death rates.
2. Preference of people for a male child leads to the birth of number of children in the quest for a male child.
3. Need of more hands to work in the farms and business to conserve resources within the families.
4. Early age marriages.
5. Acceptance of child birth as God's gift.
6. Poverty and illiteracy.

In spite of the tremendous progress made by the country the benefits are not reaching the public due to increasing population. To some extent this rising population has been checked due to government's policies and family welfare programmes but life expectancy has also increased due to better health facilities and advances in medical sciences.

Evolution of National Family Welfare Programme

The Ministry of Health and Family Welfare, Government of India launched the National Family Planning Programme (NFPP) in 1952 with the objective of reducing the birth rate to the extent necessary to stabilize the population at a level consistent with the requirement of the national economy. The main aim was to improve the quality of the life of the people. Afterwards, the NFPP has undergone several stages (Table 4.3). It is implemented as 100% centrally sponsored program. The approach under the programme during the 1st and 2nd Five Year Plans was mainly 'Clinical' under which large numbers of family planning (FP) clinics were opened. During the 3rd five year plan (1961 to 1966) the emphasis was shifted to the 'extension education approach' for motivating the people to accept the 'small family norm' and emphatic recognition was given to family planning.

In 1965 the NFWP entered a new technological era with introduction of the Lippi's loop, later replaced by copper T. Major changes took place during the 5th Five Year Plan (1975–80). In April 1976 the country framed its first 'National Population Policy'.

In the years 1975-76 and 1976-77 a phenomenal increase in performance of sterilization was recorded. In 1977, the Government of India redesignated the 'National Family Planning Programme' as the 'National Family Welfare Programme', and also changed the

TABLE 4.3.: Milestones of National Family Welfare Programme	
1952	Launch of National Family Planning Programme
1960	Introduction of the Lippi's loop later replaced by copper T
1961–66	''Extension Education Approach'' for motivating people to accept the 'small family norm'. Emphatic recognition to family planning
1974	Campaign for male sterilization
1976	First National Population Policy
1977	Re-designation the 'National Family Planning Programme' as the 'National Family Welfare Programme'
1980	Strengthening of Mother and child health
1983	First National Health Policy
1992–97	Child Survival and Safe Motherhood Programme
1997	Launch of Reproductive and Child Health, RCH I
2000	Second National Population Policy
2002	Second National Health Policy
2005	Launch of Reproductive and Child Health, RCH-II and NRHM
2012	Reproductive Maternal Newborn Child Health + Adolescent Health (RMNCH + A)

name of the Ministry of Health and Family Planning to Ministry of Health and Family Welfare. Although the performance of the programme was low during 1977-78, yet the programme moved into new healthier directions with time. The Family Welfare Programme during 7th Five Year Plan (1985–90) was continued on a purely voluntary basis with major stress on promoting spacing methods between the births of two children, and promoting maternal and child healthcare. The approach adopted during the 8th Five Year Plan was continued during 1990–92. For effective community participation, *Mahila Swasthya Sanghs* (MSS) at village level was constituted in 1990-91. To impart new dynamism to the Family Welfare Programme, several new initiatives were introduced and ongoing schemes were revamped in the 8th FYP (1992–97). In 1997, India changed the strategy of National Family Welfare Programme to Reproductive and Child Health and in the 9th FYP (1997–2002), a total change in implementation was recommended.

The department of family welfare undertook many pilot activities for implementation of the family welfare program to meet the needs of women who are at risk of unwanted births and has assisted the

country to accelerate fertility decline. The 7th FYP placed more stress on the use of spacing methods between the births of two children.

National Population Policy

The salient features of the National Population Policy are:

i. MCH and Family Planning services stand merged with health.
ii. No targets for specific contraceptive methods.
iii. The only target will be achievement of national average of Total Fertility Rate of 2.1 by the year 2010.
iv. Incentives for family planning acceptors to be discontinued.
v. NGO involvement in the program promoted.
vi. IEC activities to be implemented.
vii. Reduction in the incidence of girls below 18 getting married to zero.
viii. Increase in percentage of deliveries conducted by trained personnel.
ix. Reduction of maternal mortality rate to < 100 per 100,000 live births.
x. Universal immunisation.
xi. Reduction of IMR to < 30 per 1000 and a sharp decline in child mortality rate.
xii. Universal access to quality contraceptive services.
xiii. Containment of HIV/AIDS and STDs.

Concept of Family Welfare and Family Planning

The term 'family welfare' is much broader in scope than 'family Planning'. The concept of welfare is basically related to 'quality of life' and refers to a comprehensive package of services, which in addition to all elements of family planning, also includes activities directed towards maternal and child health like immunisation, reduction of low birth weight, safe deliveries, etc. Family planning refers to practices that help individuals to attain the following objectives:

i. To avoid unwanted births and bring about wanted births.
ii. To regulate the spacing between children.
iii. To control the time at which births occur in relation to the age of parents.
iv. To determine the numbers of children in the family.

According to WHO family planning is a way of thinking and living that is adopted voluntarily, upon the basis of knowledge,

attitudes and responsive decisions by individuals and couples, in order to promote the health and welfare of the family group and thus contributes effectively to the social development of a country.

Family planning is a basic human right and all couples have a right to decide and plan the numbers and spacing of their children. Family planning and birth control are not synonymous although birth control is the most important component of family planning. Unfortunately the concept of family planning is not properly understood by many people. Some people associate it with sterility and others equate it with birth control. Both are misconceptions. Family planning is a part of family welfare simply, put, family welfare is FP + MCH . This point would be clear when we examine the scope of family planning.

Scope of Family Planning

Family planning has wide scope and includes the following activities:

i. Proper spacing and limitation of births.
ii. Investigation and advice on sterility.
iii. Education for parenthood.
iv. Sex education.
v. Screening of the reproductive system for pathological conditions, e.g. cervical cancer.
vi. Genetic counseling.
vii. Pre-marital consultations and examinations.
viii. Carrying out pregnancy tests.
ix. Marriage counselling.
x. Preparation of the couples for the arrival of their first child.
xi. Providing services for the unmarried mothers.
xii. Home science including home economics and nutrition.
xiii. Care of unmarried mothers and adoption services.

By understanding themselves and making the public understand the scope of family planning, pharmacists can do a great job, particularly in rural areas.

Only a couple can decide about the size of their family they would like to have. This includes the *number* of children as well as *spacing* between the children. But pregnancy can also endanger the life of a woman and prove to be a health hazard. Married couples can avoid unwanted pregnancies and regulate the proper spacing by adopting family planning measures. Contraception is only one of these measures.

Birth control is an umbrella term for several techniques and methods used to prevent fertilization or to interrupt pregnancy at various stages. Birth control techniques and methods include:

a. *Contraception* (the prevention of fertilization),
b. C*ontragestion* (the prevention of the implantation of the blastocyst), and
c. *Abortion* (the removal or expulsion of a fetus or embryo from the uterus).

Contraception includes barrier methods, such as condoms or diaphragm; hormonal contraception, also known as oral contraception; and injectable contraceptives. Contragestives, also known as postcoital birth control, include intrauterine devices (IUDs) and what is known as the emergency contraceptive.

CONTRACEPTION METHODS

Contraception methods are used to avoid unwanted pregnancies resulting from coitus (sexual intercourse). They are also used as fertility regulating methods (Fig. 4.2).

An *ideal contraceptive method* is the one, which is safe, effective, acceptable to both the partners, reversible, inexpensive, easily available and easy to use. Although, there is no ideal contraceptive available, yet contraception methods are widely used today. Contraceptive methods can be classified as temporary and permanent methods.

Each of the contraceptive methods or device has its own advantages and disadvantages and adoption of a particular method is purely a matter of individual couple's preference.

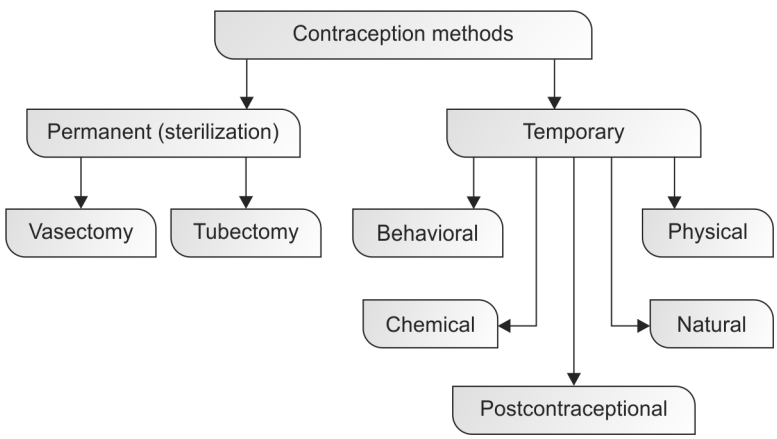


Fig. 4.2: Different methods of contraception

Temporary Contraceptives

The National Family Welfare Programme provides the following temporary contraceptives for spacing births:

i. Condoms
ii. Intrauterine devices (IUD)
iii. Oral contraceptive pill

Condoms and oral contraceptive pills are provided through free distribution scheme and social marketing scheme, whereas IUD is being provided under free distribution scheme only. Under social marketing programme, contraceptives, both condoms and oral pills, are sold at subsidized rates. In addition, manufacturing companies under their brand names commercially sell contraceptives also. Government of India does not provide any subsidy for the commercial sale.

i. Condom

It is widely used physical barrier method in India. It is an effective, simple 'spacing' method of contraception, without any side effects.

Male condom: Condom and sheaths meet the requirement of an ideal contraceptive. Condom is popular in India. Most outstanding advantage of condom is that it protects both the partners from sexually transmitted diseases including AIDS. It is made from latex. The condom is applied on the erect penis before intercourse, air removed from the teat, and withdrawn from the vagina carefully after intercourse to avoid spilling of semen in the vagina.

Nirodh is a sanskrit word meaning prevention. Three types of condoms are made available by the Government of India at highly subsidized cost:

i. Dry Nirodh.
ii. A lubricated Deluxe Nirodh.
iii. A thinner variety, the Super Deluxe Nirodh.

These condoms are distributed free of cost in Primary Health Centers (PHC), Community Health Centers (CHC), and District Hospitals. Various other types of condoms are also available in the market like *Kohinoor*, *Moods dotted condom*, *Durex*, *Masti*, *Climax*, etc.

☛ **Advantages**

a. Safe and easily available.
b. Easy to use; do not require medical supervision.
c. No side effects.
d. Light, compact and disposable.

e. Provide protection not only against pregnancy but also against sexually transmitted diseases.

☛ **Disadvantages**

a. It may slip off or tear during coitus due to incorrect use.
b. It interferes with sex sensation while some get used to it.
c. It can be used once only.

ii. Intrauterine devices

The intrauterine device (IUD) is the world's most widely used method of reversible birth control for women.

a. **Lippes loop:** It is a double S-shaped plastic loop inserted into uterine cavity through cervix with the help of a plastic cylinder. It has now been replaced by Copper-T. Loop was included in the National Family Programme of Government of India in 1961.
b. **Copper-T:** Cu-T is one of the important spacing methods offered under the Family Welfare Programme. Cu-T is supplied free of cost to all the States/UTs by Government of India for insertion at the PHCs, Sub-centres and Hospitals by trained medical practitioners/trained health workers. The earlier version of Cu-T 200 'B' (IUDs) has been replaced by Cu-T 380-A from 2002-03 onwards, which provides protection for a longer period (about 10 years) as against Cu-T 200 'B', which provided protection for about 3 years only.

The Copper-T is a T or Y-shaped IUD made of copper having a surface area of 200 sq mm. The copper contained in it has a strong anti-fertility effect. It stops sperms from making their way up through the uterus into the tubes, thus preventing fertilization. If fertilization does occur, the IUD prevents the fertilized egg from successfully implanting in the lining of the uterus.

☛ **Advantages of Copper-T**

1. Low expulsion rate and lower incidence of side-effects, e.g. pain and bleeding.
2. Easier to fit even in nulliparous women better, tolerated by nullipara, increased contraceptive effectiveness.
3. Effective as postcoital contraceptives, if inserted within 3–5 days of unprotected intercourse.

iii. Emergency contraceptive pill (ECP)

It was introduced under Family Welfare Programme during 2002-03. The emergency contraceptive is the method that can be used to

prevent unwanted pregnancy after an unprotected act of sexual intercourse (including sexual assault, rape or sexual coercion) or in contraceptive failure. ECP is not used as a routine birth control method because it is actually less effective at preventing pregnancies than most types of birth control. Emergency contraceptive is to be taken on prescription of Medical Practitioners. Emergency contraceptive pills prevent pregnancy by preventing or delaying ovulation and they do not induce an abortion or harm a developing embryo.

WHO recommends any of the following ECPs for emergency contraception:

1. ECPs with Ulipristal acetate (UPA), taken as a single dose of 30 mg.
2. ECPs with Levonorgestrel (LNG) taken as a single dose of 1.5 mg, or alternatively, LNG taken in 2 doses of 0.75 mg each, 12 hours apart.

ECPs are effective when used shortly after intercourse and it works best when taken within the first 24 hours. They are licensed for use up to 72 hours after sexual intercourse but WHO says they can be used for up to 5 days after contraceptive failure. Since EC pills can be used up to 5 days after unprotected intercourse, the terms like 'morning-after' or 'postcoital' pills do not convey the correct timing of use. The only contraindication for the use of ECP is pregnancy. It is primarily because they will not be effective.

TERMINAL METHODS

Under National Family Welfare Programme following terminal/ permanent methods are being provided to the eligible couples. These methods are ideal for those couples having two or more children. The Government is encouraging permanent methods by providing monetary incentives for sterilization and IUDs. Central and State Governments offer special incentives to their employees for adopting permanent methods of family planning.

A. Tubectomy

i. **Minilap tubectomy:** 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 (Fig. 4.3).

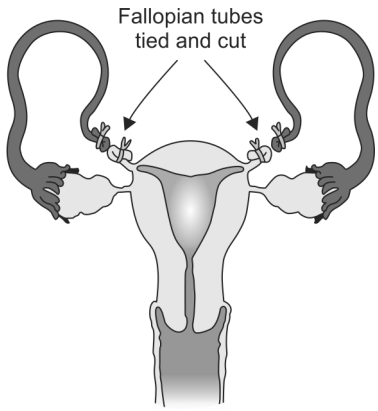


Fig. 4.3: Tubectomy

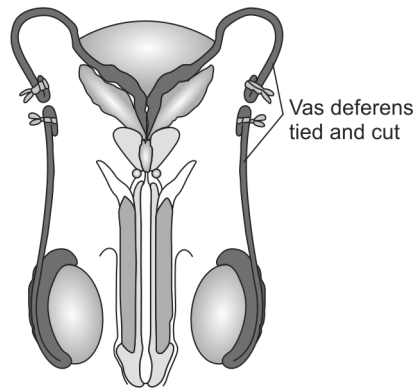


Fig. 4.4: Vasectomy

ii. **Lapro tubectomy:** Lapro tubectomy is a relatively quicker method of female sterilization. This is a technique of female 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-gynecologists are available. The short operating time, short stay in hospital and a small scar are some of the attractive features of this operation. It is a much simpler procedure requiring a smaller abdominal incision of only 2.5 to 3 cm conducted under local anesthesia.

B. Vasectomy

i. **Conventional vasectomy:** Male sterilization or vasectomy is one of the most effective, faster, less expensive, permanent methods of contraception available for males. It is comparatively simple operation than tubectomy and can be performed even in primary health centres by trained doctors under local anesthesia. When carried out under strict aseptic technique, it has no risk of mortality. Minor complications, including swelling and pain, are common. It neither affects the testes nor sexuality.

In vasectomy, a small cut is made in the scrotum on either side above the testes under local anesthesia, and under aseptic precautions. Vas deferens tubes are then lifted, cut and tied

with thread or clamped so that sperms cannot enter the semen that is ejaculated. The incisions are closed with stitches. Then bandage is put (Fig. 4.4). If properly performed, vasectomies are almost 100% effective. Sterilization should be used only if no more children are desired and should be considered a permanent method.

ii. **No-scalpel vasectomy:** It is an improvement on the conventional vasectomy with practically no side effects or complications. This is a newer method; only one small puncture is made instead of incisions as performed in standard incision method of vasectomy. At the end of the procedure, suturing of the wound is not needed; only a small piece of gauze bandage (Tincture Benzoin seal) is required for wound dressing. Barrier contraceptives should be used for 20 ejaculations. Male should use barrier contraceptives or other contraceptive method for 20 ejaculations or three months after the procedure.

This new method is now being actively promoted by the WHO and is acceptable to men who have completed their families and want to adopt sterilization. It promotes male participation in the Family Welfare programme. The non-scalpel vasectomy method is superior to the standard incisional technique because:

i. It eliminates the fear of surgical incision.
ii. It is quick method and can be performed on an OPD basis.
iii. It involves fewer complications and reversal is possible.
iv. It is safe, simple, minimally invasive, very cheap.
v. Recovery time is short.

Recommended Family Planning Methods

The following methods of contraception and sterilization are usually recommended.

Newly married couples:	Condom (Nirodh)
For couple having one child:	Loops or Oral Pill (for spacing)
After second child:	Sterilization

Spacing method is becoming more popular than sterilization program but sterilization is the best method for those couples having larger families.

The salient features of the National Family Welfare Programme (NFWP) are given below.

Aim of NFWP

To improve the quality of the life of the people.

Objectives of NFWP

1. To promote the adoption of small family norm.
2. To promote the use of spacing methods between the births of two children.
3. To ensure easy supply of contraceptives to all eligible couples.
4. To arrange for clinical and surgical services to achieve the set targets.
5. To ensure the participation of voluntary organizations/local leaders/local self-government in family welfare programme at various levels.
6. To promote the use of mass communication and interpersonal communication for public health education about family planning.

Steps to Achieve the Target and Implement the NFWP

1. Each eligible couple has to be motivated to accept the program in the interest of health and welfare of the family and to meet the dangers of population explosion. The couple should accept the norm of two children.
2. Knowledge on methods of contraception and contraceptives should be easily and freely available to eligible couples at their doors, through effective health education and administrative machinery.
3. Government and social organizations should take active social measures, conducive to decline in birth rate, such as raising the age of marriage for women, provision of facilities for abortion, sex education to adolescents and adults in schools and colleges and removal of moral and religious taboos, etc.

Gains of the National Family Welfare Programme

a. Cafeteria approach for consumers who can pick any method of contraception.
b. Lack of force or coercion.
c. Improved child survival.
d. Reduced maternal mortality.

e. Stabilization of the population.
f. Improved status of women in society.
g. Improved socioeconomic status of many families in the country.

NATIONAL TOBACCO CONTOL PROGRAMME (NTCP)

Tobacco use is one of the main risk factors for death and many other chronic diseases, including cancer, lung diseases, and cardiovascular diseases. India is the 2nd largest producer and consumer of tobacco. A range of smoked products like cigarettes, cigars, *bidis* and smokeless tobacco products exist in the country. Globally, tobacco use is responsible for deaths of nearly 6 million people. As per WHO, if current trends continue, by 2030 tobacco use will kill more than 8 million people worldwide each year. It is estimated that 80% of these premature deaths will occur among people living in low and middle income countries. Over the course of the 21st century, tobacco use could kill a billion people or more unless urgent action is taken.

Nearly 8–9 lakh people die every year in India due to diseases related to tobacco use and nearly 50% of cancers in males and 25% cancers in females in India are directly attributed to tobacco use. According to the Global Adult Tobacco Survey (GATS) 2009-10, conducted in the age group of 15 years and above, 47.8% men and 20.3% women consume tobacco in some form or other. The Government of India has enacted the national 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' in May, 2003 in order to discourage the consumption of tobacco. The main provisions of this Act are:

1. Prohibition of smoking in public places.
2. Prohibition of advertisement of cigarettes and other tobacco products.
3. Prohibition of sale to minors (less than 18 years of age).
4. Prohibition of sale of tobacco products within 100 yards of educational institutions.
5. Mandatory display of the pictorial warnings on tobacco products packages.
6. Mandatory depiction of tar and nicotine contents along with maximum permissible limits on tobacco packs.

Government of India launched the National Tobacco Control Programme (NTCP) in the year 2007-08 during the 11th Five-Year-Plan.

Aims of NTCP

1. To create awareness about the harmful effects of tobacco consumption.
2. To reduce the production and supply of tobacco products.
3. To ensure effective implementation of the provisions under 'The Cigarettes and Other Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, Supply and Distribution) Act, 2003' (COTPA).
4. To help the people quit tobacco use.
5. To facilitate implementation of strategies for prevention and control of tobacco advocated by WHO Framework Convention of Tobacco Control.

During the 11th Five Year Plan, NTCP was implemented in 21 States covering 42 districts. To carry forward the momentum generated by the NTCP during the 11th FYP and baseline data generated through the Global Adult Tobacco Survey (GATS) India 2009-2010, indicating high level of prevalence of tobacco use; it was up-scaled in the 12th FYP with a goal to reduce the prevalence of tobacco use by 5% by the end of the 12th FYP. As per the second round of GATS, the number of tobacco users has reduced by about 81 lakh.

Objectives of NTCP

1. Public awareness/mass media campaigns for awareness building and behavior change.
2. Establishment of tobacco product testing laboratories, to build regulatory capacity, as required under COPTA, 2003.
3. Mainstreaming the program component as a part of the health delivery mechanism under the National Rural Health Mission framework.
4. Mainstreaming research and training on alternate crops and livelihood in collaboration with other nodal ministries.

Main Thrust Areas

1. Training workshop and capacity building of health and social workers, NGOs, school teachers, civil society organization, and enforcement officers, etc. on tobacco epidemic, tobacco control laws and implementation of the schemes.

2. Launching media campaign/information, education and communication (IEC) activities like poster display, article publications, rallies, street role plays, exhibitions, etc. in regional languages.
3. Conducting school health awareness programs to create awareness of health hazards of smoking among school-children.
4. Monitoring and evaluation including surveillance, e.g. Global Adult Tobacco Survey (GATS) India.
5. Setting up of National Regulatory Authority (NRA).
6. School programmes.
7. Monitoring of tobacco control laws.
8. Coordination with *Panchayati Raj* Institutions for village level activities.
9. Setting-up and strengthening of cessation facilities including provision of pharmacological treatment facilities at district level.

NTCP is implemented through a three-tier structure, i.e.

i. National Tobacco Control Cell (NTCC) at Central level,
ii. State Tobacco Control Cell (STCC) at State level, and
iii. District Tobacco Control Cell (DTCC) at District level.

There is also a provision of setting up Tobacco Cessation Services at district level.

National tobacco control cell (NTCC)

NTCC is responsible for overall policy formulation, planning, monitoring and evaluation of the different activities envisaged under the program. The National Cell functions under the direct guidance and supervision of the program incharge from Ministry of Health and Family Welfare and the technical assistance is provided by the identified officers from the Directorate General of Health Services, i.e. Deputy Director General (DDG)/Chief Medical Officer (CMO). The NTCC is supported by consultants in specific areas of tobacco control like policy, legal, national coordination and IEC and advocacy.

State tobacco control cell (STCC)

Dedicated State Tobacco Control Cells are set up for effective implementation and monitoring of tobacco control initiatives. The nodal officer at the state is responsible for the coordination, monitoring and evaluation of the program at the district level. Two consultants support him to reduce tobacco use and thus to

enforce Anti-tobacco Act effectively. The key activities of STCC include:

1. State Level Advocacy Workshop.
2. Training of Trainers Programme for staff appointed at District Tobacco Control Cell (DTCC) under NTCP.
3. Refresher training of the DTCC staff.
4. Training on tobacco cessation for healthcare providers.
5. Law enforcers training/sensitization programme.

District tobacco control cell (DTCC)

The District Tobacco Control Programme comprises the following components:

1. **Tobacco cessation center:** This provides counselling and pharmacotherapy to tobacco users for quitting the tobacco addiction. It also conducts training and awareness programs at schools and colleges to promote quitting and prevent initiation among youths.
2. **Training:** The cell conducts training, workshop among school teachers, health workers, women self-help group, civil society organization, etc. on tobacco epidemic, tobacco control laws and implementation of the schemes.
3. **IEC activities:** There will be active involvement of the media through poster display, article publications, rallies, street role plays, exhibitions, *mela*, etc. in regional languages. IEC materials will be developed and disseminated in local languages also.
4. **School programs:** This is to create awareness of health hazards of smoking among schoolchildren.
5. **Monitoring of tobacco control laws:** This is done by small teams of trained school teachers, health workers, law enforcers, women self-help groups, etc. to cover small areas of each district.

NATIONAL MALARIA PREVENTION PROGRAMME

Approximately 22% population of country was estimated to suffer from malaria in 1947 at the time of India's independence. To combat devastating effects of malaria, National Malaria Control Programme (NMCP) was launched in 1953 (NMCP) to slowdown malaria transmission.

Strategies Under NMCP

1. Insecticidal residual spray (IRS) of human dwelling and cattle sheds with dichlorodiphenyltrichloroethane (DDT) to control the vectors (anopheline mosquitoes).
2. Monitoring and surveillance of cases by malaria control teams.
3. Treatment of patients with anti-malarial drugs.

The NMCP was operated for five years. Malaria related morbidity and mortality in India was rapidly brought down within a few years. Encouraged by the program' tremendous success, it was renamed National Malaria Eradication Programme (NMEP) in 1958 with the objective of eradicating malaria by killing entire vectors and elimination of reservoir of infections.

Strategies of NMEP

1. Two rounds of DDT spray in all areas.
2. Active and passive surveillance.
3. Presumptive and radical treatment.

NMEP reduced cases to 0.1 million in 1966, but after 1967 there was resurgence of the disease countrywide, mainly due to technical, operational and administrative failures. There were incomplete spraying operations due to sense of complacency among spray workers as well as the general population. The insecticide resistance in the vectors and drug resistance in the parasites were also noted.

With increase in malaria cases in urban areas, The Urban Malaria Scheme (UMS) was launched in 1971 with the objective of controlling malaria in the urban areas by reducing the vector population. Passive surveillance (case detection and treatment) and anti-larval measures were the main components of UMS strategy.

The number of malaria cases rose gradually and consistently with a peak of 6.47 million cases in 1976. As a consequence, the Modified Plan of Operations (MPO) was launched in 1977.

Objectives of the MPO

1. To reduce malaria morbidity.
2. To prevent mortality deaths due to malaria.
3. To reduce transmission of malaria.

Strategies of MPO

1. Active and passive surveillance.
2. Early diagnosis and prompt treatment.
3. Vector control.

The implementation of Urban Malaria Scheme, and MPO reduced prevalence of malaria and controlled mortality but resurgence still continued in some areas. Malaria Action Programme (MAP) was launched in 1995. Under this program areas were divided into high-risk and low-risk areas based on epidemiology. Priority spray operation and differential treatments were given in high-risk area. The areas with adverse epidemiological parameter were selected for implementation of Enhanced malaria control project (EMCP), 1997.

Objectives of EMCP

1. Prevention of death.
2. Reduction of morbidity from malaria.
3. Consolidation of the gain achieved so far.

Strategies of EMCP

1. Early case detection and prompt treatment.
2. Vector control by appropriate insecticide.
3. Promoting health education and community participation.

In 1999 name of national program was changed to National Anti Malarial Program (NAMP). Though NAMP successfully reduced the Average National API but some areas continued to register high API. Intensified Malaria Control Project (IMCP), 2005 was introduced with introduction of Rapid Diagnostic Tests (RDTs) in the programme, Artesunate Combination Therapy (ACT), Insecticide Treated Bed Nets (ITNs) and Health Systems Strengthening (HSS). Since then the programme has undergone many changes and the milestones of malaria control activities in India (Table 4.4):

TABLE 4.4: Milestones of malaria control activities in India

Before 1940	No organized National Malaria Control Programme
Prior to 1953	Estimated number of malaria cases in India—75 million; Estimated number of deaths due to malaria—1 million
1953	Launching of National Malaria Control Programme (NMCP)
1958	NMCP renamed National Malaria Eradication Programme (NMEP)
1966	Cases reduced to 0.1 million
Early 1970's	Resurgence of malaria
1971	Launching of Urban Malaria Scheme (UMS)

Contd.

TABLE 4.4: Milestones of malaria control activities in India *(Contd.)*	
1976	Malaria cases—6.46 million—highest in post-DDT era
1977	Implementation of Modified Plan of Operations (MPO)
1984-1998	Annual reported incidence of malaria within 2–3 million cases
1995	Implementation of Modified Action Plan for malaria control
1997	Launching of World Bank assisted Enhanced Malaria Control Project (EMCP)
1999	Renaming of programme to National Anti-Malaria Programme (NAMP)
2002	Integration of Malaria Control Progamme into the National Vector Borne Disease Control Programme (NVBDCP)
2005	Global fund assisted Intensified Malaria Control Project (IMCP)—in 94 districts of 10 states (2005–2010)
2006	ACT introduced in areas showing chloroquine resistance in *P. falciparum* malaria
2008	Revision of drug policy with artemisinin-based combination therapy (ACT) use extended to high-risk *P. falciparum* districts covering about 95% of *P. falciparum* infections
2009	World Bank assisted National Vector Borne Diseases Control Project; Introduction of Long-lasting Insecticide Treated Bednet (LLINs)
2009	Artemisinin mono-therapy banned in the country
2010	New National Drug Policy 2010
2012	Introduction of bivalent RDTs
2013	New Drug Policy 2013
2016–2030	National framework for malaria elimination

The main activities of the program are:

1. Formation of policies and guidelines.
2. Active and passive surveillance.
3. Promoting health education and technical guidance of health workers and community.
4. Planning.
5. Monitoring and evaluation.
6. Consultation with national organizations such as National Centre for Disease Control (NCDC) and National Institute of Malaria Research (NIMR).

7. Collaboration with international organizations like WHO, World Bank, and other donor agencies.
8. Mainstreaming research and training.
9. Coordinating control activities in the inter-state and inter-country border areas.

Encouraged by the achievement accomplished in malaria control in recent years, the vision of India's Malaria Control Programme has now shifted to sustained malaria elimination to contribute more adequately to improved well-being and quality of life of the individuals. The National Framework for Malaria Elimination in India 2016–2030 was launched in February, 2016 by the Ministry for Health and Family Welfare.

Aims

The main aims of the National Framework for Malaria Elimination in India are:

1. To eliminate malaria (zero indigenous cases) throughout the entire country by 2030.
2. To maintain malaria-free status in areas where malaria transmission has been interrupted, and prevent re-introduction of malaria.

Objectives

1. To eliminate malaria from all 26 low (Category 1) and moderate (Category 2) transmission states/union territories by 2022.
2. To reduce the incidence of malaria to less than 1 case per 1000 population per year in all States/Union Territories and their districts by 2024.
3. To interrupt indigenous transmission of malaria throughout the entire country, including all high transmission States/ Union Territories (Category 3) by 2027.
4. To prevent the re-establishment of local transmission of malaria in areas where it has been eliminated and maintain national malaria-free status by 2030 and beyond.

Strategic Approaches

1. **Programme phasing:** Malaria elimination in India is done in a phased manner considering the varying malaria endemicity in different parts of country due to differences in their eco-epidemiological settings, financial conditions, health system development and malaria control accomplishments.

States/Union Territories are classified on the basis on API as primary criterion (Table 4.5).

Malaria incidence in high transmission areas (Category 3) must be brought down first before it is conceivable and reasonable to examine each case.

TABLE 4.5: Classification of States/UTs based on API

S. No.	***Categories of states/UTs***	***API***
1.	Category 0 (Prevention of re-establishment phase)	Zero indigenous cases of malaria in States/ UTs
2.	Category 1 (Elimination phase)	Less than 1 case per 1000 population at risk in States/UTs
3.	Category 2 (Pre-elimination phase)	Less than 1 case per 1000 population at risk, but in some districts of States/UTs API is 1 case per 1000 population at risk or above
4.	Category 3 (Intensified control phase)	1 case per 1000 population at risk or above in States/UTs

2. **District as the unit of planning and implementation:** Each state/UT is advised to further classify and subclassify their districts for localized planning and implementation. District is functional unit for planning as well as monitoring malaria elimination interventions
3. **Concentrate on high transmission zones:** A forceful scaling-up of existing interventions, intensification of malaria control movements and imaginative procedures in the high transmission zones must be done to quickly reduce malaria morbidity and mortality.
4. **Special methodology for *P. vivax* elimination:** Special measures like:
   i. Good quality microscopy to detect all *P. vivax* infections.
   ii. Operational research to estimate prevalence of glucose-6-phosphate dehydrogenase (G6PD) deficiency in the population.
   iii. Appropriate vector control measures.
   iv. Ensuring good compliance to 14-day radical treatment with Primaquine in affected individuals are to be undertaken.

The milestones and targets were set for 2016, 2020, 2022, 2024, 2027 and 2030. It is expected that by 2030 the nation will have

sustained zero indigenous cases and deaths due to malaria. An enabling environment and necessary resources are critical to achieve the objective of malaria elimination.

NATIONAL PROGRAMME FOR HEALTH CARE OF ELDERLY

Introduction

National Programme for Health Care of Elderly (NPHCE) was launched in 2010 by the Ministry of Health and Family Welfare to address various health related problems of elderly people. NPHCE is an articulation of the International and National commitments of the Government as envisaged under the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), National Policy on Older Persons (NPOP) adopted by the Government of India in 1999 and Section 20 of 'The Maintenance and Welfare of Parents and Senior Citizens Act, 2007' dealing with provisions for medical care of senior citizens.

The basic aim of the programme is to provide specialized long-term, and comprehensive healthcare facilities to the senior citizens (>60 years of age) at various levels of primary healthcare.

Vision of NPHCE

1. To provide accessible, affordable, and high-quality long-term, comprehensive and dedicated care services to an aging population.
2. To create a new architecture for aging.
3. To build a framework to create an enabling environment for 'A society for all ages'.
4. To promote the concept of 'Active and Healthy Aging'.

Objectives

1. To provide easily accessible, affordable, promotional, preventive, curative and rehabilitative services to an aging population through community-based primary health care (PHC) approach.
2. To identify health problems in the elderly and provide appropriate health interventions in the community with a strong referral backup support.
3. To build capacity of the medical and paramedical professionals as well as the caretakers within the family for providing healthcare to the senior citizens.

4. To provide referral services to the elderly patients through district hospitals and regional medical institutions.
5. Convergence with National Rural Health Mission (NRHM), *Ayush* and other line departments like Ministry of Social Justice and Empowerment.

Salient Features

1. Setting up of geriatric departments in identified Regional Geriatric Centres (RGC) with OPD care services and 30 bedded geriatric wards for management of specific diseases of the elderly, training of health personnel in geriatric healthcare and conducting research.
2. Regional Geriatric Centres (RGC) in eight Regional Medical Institutions by setting up RGCs with a dedicated geriatric outpatient department (OPD) and 30-bedded geriatric ward for management of specific diseases of the elderly, training of health personnel in geriatric healthcare and conducting research.
3. Community-based primary healthcare approach including domiciliary visits by trained healthcare workers.
4. Setting up of 10 bedded geriatric units equipped with machinery, equipment, and drugs in district hospitals to provide specialist services, training and IEC.
5. Establishment of rehabilitation unit for therapeutic modalities like therapeutic exercises, training in activities of daily life (ADL) and treatment of pain and inflammation through physiotherapy at all community health centres (CHCs), district hospital and regional geriatric centre.
6. Setting up weekly geriatric clinic by trained medical officer at primary health centres (PHCs) for regular checkup of old persons.
7. Information, education and communication (IEC) using mass media, folk media and other communication channels on healthy lifestyle to reach out to the target community.
8. Providing training to staff of public healthcare system in geriatric care.
9. Continuous monitoring and independent evaluation of the program and research in geriatrics and implementation of NPHCE.
10. Promotion of public–private partnerships in geriatric healthcare.
11. Strengthening of 8 Regional Medical Institutes to provide dedicated tertiary level medical facilities for the elderly,

introducing PG courses in Geriatric Medicine, and in-service training of health personnel at all levels.
12. Mainstreaming AYUSH—revitalizing local health traditions, and convergence with programmes of Ministry of Social Justice and Empowerment in the field of geriatrics.
13. Reorienting medical education to support geriatric issues.
14. Establishment of geriatric clinics/rehabilitation units set up for domiciliary visits in community/Primary Health Centres in the selected districts.
15. Establishment of subcentres with provision of equipment for community outreach services.
16. Training of human resources in the Public Health Care System in geriatric care.

Main Strategies

1. Community-based preventive and promotive healthcare approach through domiciliary visits by trained health workers.
2. Dedicated outdoor and indoor patients services at PHC/CHC, district hospitals and regional geriatric centres for management of chronic and disabling diseases.
3. Ten bedded wards at district hospital.
4. Strengthening of regional medical institutes.
5. The postgraduate courses in Geriatric Medicine and in-service training of health personnel.
6. Information education and communication activities to reach out to the target community for promoting the concept of healthy ageing, importance of physical exercise, healthy habits, and reduction of stress.
7. Medical rehabilitation and therapeutic intervention including therapeutic exercises, training in activities of daily life (ADL) and treatment of pain and inflammation through physiotherapy unit at CHC, district hospital and regional geriatric centre.
8. Continuous monitoring and evaluation of the programme.
9. Promotion of public–private partnerships in Geriatric Health Care.
10. Reorienting medical education to support geriatric issues.

Programme Organization

1. Integration with National Rural Health Mission (NRHM)
2. Constitution of State Health Society (SHS)
3. Constitution of District Health Society (DHS).

Package of Services under NPHCE

In the program, it is envisaged to provide promotional, preventive, curative and rehabilitative services in an integrated manner for the elderly in various Government health facilities. The packages of services depend on the level of health facility and may vary from facility to facility. The range of services includes health promotion, preventive services, diagnosis and management of geriatric medical problems (out- and in-patient), day care services, rehabilitative services and home-based care, as needed. Districts are linked to RGCs for providing tertiary level care. The services under the program are integrated below district level and will be integral part of existing primary healthcare delivery system. The packages of services made available at different levels under NPHCE are as follows:

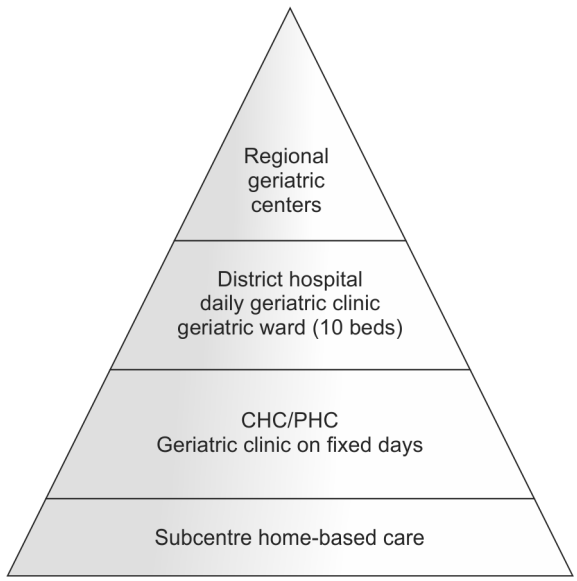


Fig. 4.5: Packages of services at different levels under NPHCE

1. **Subcentre**
   i. Health education related to healthy aging.
   ii. Domiciliary visits for care to home bound/bedridden elderly persons and to provide training to their family members.
   iii. Arrange for suitable supportive devices from the primary health centre (PHC) to the elderly disabled persons to make them ambulatory.

iv. Establish linkage with other support groups and day care centres, etc. operational in the area.

2. **Primary health centre**
   i. Weekly geriatric clinic run by a trained Medical Office.
   ii. Routine health assessment and simple investigation including blood sugar, etc. of the elderly persons.
   iii. Maintain record of the elderly persons during their first visit.
   iv. Conduct a routine health assessment of the elderly persons based on simple clinical examination relating to eye, blood pressure, blood sugar, etc.
   v. Provision of medicines and proper advice on chronic ailments.
   vi. Create awareness in public on promotional, preventive and rehabilitative aspects of geriatrics during health and village sanitation day/camps.
   vii. Refer the elderly patients needing further investigation and treatment to community health centre or the district hospital as per need.
3. **Community health centre**
   i. Act as First Referral Unit (FRU) for the elderly from PHCs and below.
   ii. Geriatric clinic for the elderly persons twice a week.
   iii. Act as rehabilitation unit for physiotherapy and counselling.
   iv. Domiciliary visits by the rehabilitation worker for bedridden elderly and counselling of the family members on their home-based care.
   v. Health promotion and prevention.
   vi. Referral of difficult cases to district hospital/higher healthcare facility.
4. **District hospitals**
   i. Dedicated geriatric clinic for regular OPD services to the elderly.
   ii. Facilities for laboratory investigations for diagnosis and provision of medicines for geriatric health problems.
   iii. Ten-bedded geriatric ward for inpatient care of the elderly.
   iv. Provide services for the elderly patients referred by the CHCs/PHCs, etc.
   v. Conduct camps for geriatric services in PHCs/CHCs and other sites.
   vi. Referral services for severe cases to tertiary level hospitals.

5. **Regional geriatric centers**
   i. Development of specialized human resource through MD courses in geriatric medicine as well as research.
   ii. Geriatric clinic (specialized OPD for the elderly).
   iii. 30-bedded geriatric ward for inpatient care and dedicated beds for the elderly patients in the various specialties, *viz.* surgery, orthopaedics, psychiatry, urology, ophthalmology, neurology, etc.
   iv. Laboratory investigation required for elderly with a special sample collection centre in the OPD block.
   v. Providing tertiary healthcare services to the cases referred from medical colleges, district hospitals and below.

The programme is being implemented under non-communicable disease (NCD) flexible pool within the overarching umbrella of National Health Mission for Districts and below in the States.

ROLE OF WHO IN INDIAN NATIONAL PROGRAMME

World Health Organization (WHO) is a specialized, non-political, health agency of the United Nations with headquarter at Geneva. It was established on 7th April, 1948. It is an inter-governmental organization that works in collaboration with its member states usually through the ministries of health. WHO is responsible for providing leadership on global health matters.

The World Health Day is celebrated on the 7th April every year.

Objective of WHO

The attainment of the highest possible level of health by all peoples.

Functions of WHO

The wide range of functions of WHO are as follows:

i. To act as the directing and coordinating authority on international health work.
ii. To promote technical cooperation to countries.
iii. To assist National Governments in strengthening health services.
iv. To furnish appropriate technical assistance and in emergencies, necessary aid, upon the request or acceptance of Governments.
v. To stimulate work on the prevention and control of epidemic, endemic, and other diseases.

vi. To promote the improvement of nutrition, housing, sanitation, recreation, economic or working conditions, and other aspects of environmental hygiene.
vii. To promote and coordinate biomedical and health services research.
viii. To improve standards of teaching and training in the health, medical and related professions.
ix. To establish international standards for biological, pharmaceutical, and similar products, and to standardize diagnostic procedures.
x. To promote and monitor the implementation of set norms and standards.
xi. To foster activities in the field of mental health especially those activities affecting the harmony of human relations.

WHO also proposes conventions, agreements, regulations and makes recommendations about international nomenclature of diseases, causes of death, and public health practices. WHO is staffed by health professionals, other experts and support staff working at headquarters in Geneva, six regional offices and country offices.

The World Health Organization is considered as the 'global guardian of health.' Presently, it is facing the most devastating global health threat (coronavirus pandemic) in its 72 years history. WHO is devoting hundreds of millions of dollars to vanquish the virus. WHO gathered data and research from around the world, evaluated it, and then gave guidelines on how to respond.

WHO has published hundreds of comprehensive package of guidance documents about COVID-19. Of these, more than half are detailed technical guidance, on how to find and test cases, how to provide safe and appropriate care for people depending on the severity of their illness, how to trace and quarantine contacts, how to prevent transmission from one person to another, how to protect healthcare workers, and how to help communities to respond appropriately. WHO has also developed online courses to train healthcare workers to diagnose and treat COVID-19 patients.

Role of WHO Country Office in India

India became a party to the WHO constitution on 12 January 1948. The WHO country office for India is headquartered in Delhi with country-wide presence. All countries with a WHO office have a

Country Cooperation Strategy (CCS). The WHO country office for India's areas of work is mentioned in its Country Cooperation Strategy (CCS). This CCS has been jointly developed by the Ministry of Health and Family Welfare (MoH & FW) of the Government of India and WHO Country Office for India (WCO). CCS provides a roadmap for WHO country office support to the Government of India:

1. To improve the health of its population.
2. To shape the research agenda and stimulate the generation, translation and dissemination of valuable knowledge.
3. To promote and monitor the implementation of set norms and standards.
4. To articulate ethical and evidence-based policy options.
5. To provide technical support, catalyze change, and build sustainable institutional capacity.
6. To monitor the health situation and assess health trends.
7. To prevent and control specific communicable and non-communicable disease problems, such as cancer, cardiovascular diseases, genetic disorders, diabetes, blindness, mental disorders, drug addiction and dental diseases.
8. To promote environmental health.
9. To promote and support national health policy development and the development of comprehensive national health programs.

India has a record of significant health improvements in the past two decades. Major health achievements in India in recent years are:

1. Eradication of polio in 2014.
2. Elimination of maternal and neonatal tetanus in 2015 and yaws in 2016.
3. Increase in life expectancy at birth.
4. Reduction in the national maternal mortality rate, infant mortality rate and mortality rate in children under five years.
5. Decline in new HIV infections and AIDS-related deaths.
6. An increase in the percentage of institutional births.
7. Significant reductions in the incidence of neglected tropical diseases (NTDs).

WHO has also played an important role in India in:

i. Strengthening the health sector by influencing and shaping health policies.

ii. Strengthening capacity of the health sector to plan, implement, monitor health policies and programmes.
iii. Providing continual, hands-on support for specific programs and during health emergencies.

The added value of WHO in India includes its role as a reliable and credible source of high-quality data and information. This enhances its ability to influence and advocate for policy change and programme improvements—both with the government and with other development partners.

On the basis of this success, the Government of India set ambitious goals in National Health Policy 2017, including achievement of universal health coverage (UHC) and doubling of public spending on health. To reach these goals, the country embarked on a series of initiatives, the cornerstone of which is *Ayushman Bharat*, a programme aimed at:

1. Achieving UHC by establishing health and wellness centres providing comprehensive, quality primary healthcare services in the public sector.
2. Expanding a hospital insurance programme that will cover 40% of India's population.
3. Developing effective referral systems to ensure a continuum of care between the different levels of care.

Other major health initiatives have also been taken (i) to end open defecation throughout the country by constructing indoor latrines (ii) to prevent and control viral hepatitis (iii) to provide free drug therapy for hepatitis B and C (iv) to reduce tuberculosis (TB) cases (v) to provide 90% full immunisation coverage nationwide (vi) to effectively control the growing burden of non-communicable diseases (NCDs) (vii) to develop a single, integrated, real-time health information platform.

Country Cooperation Strategy (CCS) 2019–2023

WHO-India Country Cooperation Strategy (2019–2023) was jointly developed by the Ministry of Health and Family Welfare (MoH & FW) of the Government of India and the WHO country office for India to improve health and equity in India. The role of WHO in this CCS is to support the Indian government:

i. In enacting the sweeping health reforms and improvements.
ii. In reaching other key goals of the National Health Policy 2017 to ensure quality of life for every citizen, especially the vulnerable and the poor.

WHO's support to the Government of India fall under the following four strategic priorities:

Strategic Priorities

The strategic priorities of the WHO India Country Cooperation Strategy (2019–2023) are:

☛ **Strategic Priority 1: Accelerate progress on UHC**

1. Implementing Ayushman Bharat: Health and Wellness Centres and Hospital Insurance scheme.
2. Monitoring and Evaluation of health sector performance.
3. Improving access to priority health services such as immunisations, maternal and child health, tuberculosis, hepatitis.
4. Digital health ecosystem.
5. Eliminating neglected tropical diseases and control of vaccine-preventable and vector-borne.

☛ **Strategic Priority 2: Promote health and wellness by addressing determinants of health**

1. Noncommunicable diseases (NCDs) action plan roll-out.
2. Environmental health, including air pollution.
3. Mental health promotion and suicide prevention.
4. Nutrition and food safety.
5. Road safety.
6. Tobacco control.
7. Integration of NCD and environmental risk factors in the digital health information platform.

☛ **Strategic Priority 3: Better protect the population against health emergencies**

1. Disease surveillance and outbreak detection and response, including International Health Regulation.
2. Roll-out of integrated disease surveillance programme using the real-time integrated health information platform (HIP).
3. Preparedness for and response to all emergencies.

☛ **Strategic Priority 4: Enhance India's global leadership in health**

1. Improving access to medical products of assured quality made in India.
2. Development and information sharing of innovations in health practices and technologies including IHIP.
3. Strengthening India's leadership in digital health.

1. Accelerate progress on universal health coverage (UHC)

This focuses on equitable access of primary health service, implementation of the *Ayushman Bharat* health sector reforms, providing financial protection to strengthen health systems, improving the availability and quality of specific health programs, eliminating NTDs, controlling vaccine-preventable and vector-borne diseases and ensuring digital health interventions to deliver healthcare.

2. Promote health and wellness by addressing determinants of health

This covers a wide range of issues that affect health and wellness like non-communicable diseases risk factors (e.g. unhealthy diets, tobacco use, harmful use of alcohol, and physical inactivity), depression, suicide and other mental illnesses, air pollution, poor sanitation and waste management, and road traffic injuries. This work focuses on generating evidence for policy and assists in the implementation of recently launched national action plans and strategies, like the National Multisectoral Action Plan for prevention and control of common non-communicable diseases (2017–22), the National Clean Air Programme, and the Mental Healthcare Act 2017. To ensure longitudinal health records and continuity of care, an effective monitoring strategy utilizing digital tools is put forth.

3. Better protect the population against health emergencies

This encompasses public health surveillance, outbreak detection and response. This work includes:

i. Strengthening capacities for implementation of the International Health Regulations (IHR).
ii. Roll-out of the Integrated Disease Surveillance Programme (IDSP).
iii. Prevention and preparedness for response and recovery from all types of emergencies.
iv. The containment of AMR (Anti Microbial Resistance) through improved AMR surveillance and reporting.
v. Training in infection prevention and control at healthcare facilities.
vi. Surveillance of antibiotic use.
vii. A fully operationalized digital health and information platform to effectively manage data for decision-making.

4. Enhance India's global leadership in health

This work is focused on ensuring India's leadership presence in digital health through representation of the Ministry of Health & Family Welfare in major multisectoral global digital health activities. It is concerned with:

i. Providing support to the country's efforts to improve global access to medical products.
ii. The regulation and safety monitoring of medicines, medical devices and diagnostics made in India.
iii. Sharing innovations in health practices and technologies invented in India with the rest of the world to become a leader in digital health technology.
iv. The development and nationwide roll-out of the Integrated Health Information Platform (IHIP) and electronic medical records.

To determine the extent to which the strategic plans are being implemented, the monitoring and evaluation of the CCS India 2019–2023 will be done using following six part framework:

1. Monitoring of India's disability-adjusted life years (DALYs) overtime.
2. Measuring outputs and impact targets for the four CCS strategic priorities.
3. Implementing biennial Country Support Plans.
4. Programmatic evaluations.
5. Qualitative reports of health impact and WHO's contribution.
6. Progress and achievement in enhancing India's global leadership in health.

UNIT
5

Community Services

INTRODUCTION

Community means the group of people living together in such a way that the members share not only one or more specific interests (like occupational, educational, etc.) but also the basic conditions of a common life. The hallmark of a community is that one's life may be wholly lived within it. One cannot live a whole life within a club or a business group. But one can certainly live wholly within a tribe or a village or city.

Community service is a non-paying job performed by one person or a group of people for the benefit of their community. Engaging in community service provides healthcare workers with the opportunity to become active members of their community and has a lasting, positive impact on society at large. Community service or volunteerism enables healthcare workers to acquire skills and knowledge, as well as provide a service to those who need it most.

Community health is a major field of study within the medical and clinical sciences, which focuses on the maintenance, protection, and improvement of the health status of communities via the prevention, diagnosis, treatment of disease, illness, injury, and other physical and mental impairments. WHO defines community health as 'environmental, social, and economic resources to sustain emotional and physical well-being among people in ways that advance their aspirations and satisfy their needs in their unique environment'. Health service delivery systems are responsible for providing healthcare services. High quality, safe, easily accessible, integrated health service delivery systems are critical for moving towards universal health coverage of community. Healthcare is delivered by health professionals (doctors, paramedical staff, etc.) and includes work done in providing primary, secondary, and

tertiary care to individuals, families, communities and populations in general. Patient-centred care mainly focuses on the patient while people-centred care encompasses clinical encounters, with special attention to the health of people and plays crucial role in shaping health policy and health services.

PROBLEMS IN INDIA

Health has been declared as a fundamental human right. Government of every nation has the responsibility for the care of health of its people. Health is influenced by a number of factors like environment (e.g. air, soil, water, etc.), food, housing, sanitation, lifestyle, etc. Provision of healthcare also embraces multitude of services to be provided to individuals, families or communities by the agents of health services for the purpose of promoting and maintaining the health. The term 'medical care' refers chiefly to those personal services that are provided directly by physicians.

Before discussing the healthcare system, it is worthwhile to consider the major health problems in India. These are briefly discussed here:

1. Population Problem

India is one of the countries facing population problems. India is supporting 17.7% of the world's population with only 2.4% of the world's land area. Next to China, India is the world's second most populous country. Area wise India is only two-fifths the size of USA but population wise India is more than triple of USA. India's population is increasing at the rate of 18 million per year. Already containing 17.7% of the world's population, India is projected to be the world's most populous country by 2050, surpassing China. Five states, i.e. Uttar Pradesh, Bihar, Maharashtra, West Bengal, Andhra Pradesh and Madhya Pradesh account for nearly 50% of India's total population. In spite of the tremendous progress made by the country the benefits are not reaching the public due to increasing population. There is huge scarcity of food as food production lag behind in comparison to the rate of population growth. Poverty and illiteracy are the root causes of population problem in India. Population explosion absorbs the national income and lowers the standard of living. Unintended and unplanned pregnancies are an important cause of maternal deaths. Pregnancies that occur too early, too late or too frequently can lead to maternal illness during pregnancy, complications at the time of delivery and infant

mortality. Lowering fertility rates by increasing the use of family planning methods can help to reduce pregnancy-related deaths and population growth. In addition to the above, rapid increase of population growth has serious strain on our environment. It is considered as the main cause of pollution and environmental degradation.

2. Malnutrition

Malnutrition is one of the major problems in India. Around 60% of the children below the age of three are malnourished in India. Madhya Pradesh, Uttar Pradesh, Jharkhand, and Tamil Nadu are among the four states that have India's highest number of malnourished children. India stands first in the world in the prevalence of children suffering from malnutrition.

Malnutrition is a state that results from eating a diet in which one or more nutrients are either inadequate (undernutrition) or are in excess (overnutrition). In both cases the diet causes health problems. Major problems are protein-energy malnutrition (PEM), anemia, stunting, wasting, xerophthalmia and iodine deficiency disorders.

3. Lack of Environmental Sanitation

This includes the twin problems of unhygienic methods of excreta disposal and non-availability of safe drinking water. These together are responsible for the high incidence of diarrhea, enteric fever, intestinal worms, eye and skin infections, polio and infective hepatitis, etc. The national goal aimed at providing safe water and safe excreta disposal facilities for 100% population by 2000 AD could not be achieved.

4. High Prevalence of Communicable Diseases

Communicable diseases, i.e. the diseases, which spread from person to person through an infectious agent (viruses, bacteria, fungi or parasite) accounts for a very high rate of morbidity and mortality. These include diseases like enteric fever, *kala-azar*, etc. To take just one example, about 40% persons in the population are infected with tubercle bacilli and only 1.5% have radiological evidence of pulmonary tuberculosis. Of the latter, about one-fourth is sputum positive. The number of pulmonary tuberculosis patients in India is estimated to be 9 to 10 million, of whom 2.5 million are open cases. Nearly 4 million people are now believed to be HIV positive.

5. Lack of Medical Care Facilities

There is mass unavailability of healthcare support in the rural areas and about 75% medical facilities are concentrated in urban areas where only about 25% population resides.

According to *Healthy People 2020* (a mission launched on December 2, 2010 for improving the Nation's health) access to healthcare is important for:

1. Detection, diagnosis, and treatment of illness.
2. Improving the quality of life.
3. Increasing life expectancy.
4. Overall improving physical, social, and mental health status.
5. Prevention of untimely deaths.
6. Prevention of disease.

HEALTHCARE

Healthcare consisting of a three-tier pattern is described as follows:

Primary Healthcare

The World Health Organization's (WHO) Alma Ata conference defined the concept of Primary Healthcare (PHC) to provide healthcare to the patients in 1978. It formed the basis of 'Health for All' by 2000 AD. Primary healthcare (PHC) is essential healthcare based on methods and technology made universally accessible to individuals, families and communities through their active participation and at an affordable cost. PHC is an integral part of a country's health system based upon participation of the people themselves. Primary healthcare can provide comprehensive care ranging from promotion and prevention to treatment, rehabilitation and palliative care. It represents the first level of contact between individuals and families with the health system. In rural areas, primary healthcare is provided through a network of Primary Health Centres (PHC) and Subcentre (SC), whereas in urban areas, it is provided through health posts and Family Welfare Centres. At the village level, primary healthcare is provided by the village health guide (VHG) and the trained *dai*.

The key elements of primary healthcare include:

1. Education about prevailing health problems and methods of identifying, preventing and controlling them.
2. An adequate supply of safe food and food supplements.
3. An adequate supply of safe water and basic sanitation.

4. Maternal and child healthcare, including family planning.
5. Immunisation against major infectious diseases.
6. Prevention and control of endemic diseases.
7. Appropriate treatment of communicable and non-communicable diseases and promotion of mental health.
8. Essential drugs arrangement.

Secondary Healthcare

This refers to second level of healthcare and serves as the first referral level in the healthcare system. At this level, specialist facilities are available to deal with the complex health problems referred from the primary level. The community health centers at block level and the district hospitals provide the secondary healthcare.

Tertiary Healthcare

This refers to the third level of health systems, which provides facilities for specialized consultative care usually on referral from primary and secondary medical care. Sophisticated investigations and therapeutic procedures can be performed at this level. Tertiary healthcare is provided by intensive care units, medical college hospitals and advanced medical research institutions.

HEALTHCARE IN RURAL COMMUNITIES

Access to healthcare services is critical to good health. Ideally, residents should be able to conveniently and confidently access services such as primary care, dental care, behavioral health, emergency care, and public health services. Presently, healthcare system in India is mainly cure oriented and unfairly weighted in favor of the urban population as compared to the vast rural population. Rural residents often encounter barriers that limit their ability to access the healthcare facilities.

Barriers to Healthcare Access in Rural Areas

The rural residents experience the following barriers to healthcare access:

1. **Distance and transportation:** Rural populations mostly have to travel long distances to access healthcare services. Public or private transportation services are often lacking in rural areas or pose significant burden in terms of travel time, and cost.

2. **Health insurance:** Individuals living in rural areas mostly do not have health insurance coverage due to affordability issue. They face delays in receiving healthcare facilities due to the limited supply of rural healthcare providers who offer low-cost or charity healthcare as compared to their urban counterparts.
3. **Poor health literacy:** Health literacy is a major barrier to healthcare access. Most of the people in rural areas have lower level of education and thus are less capable to understand health information and instructions given by the healthcare providers. Additionally, they are less efficient in navigating the healthcare systems as compared to their urban counterparts.
4. **Social stigma and privacy issues:** In rural areas, there is little social stigma. Privacy concerns are more likely to act as barriers to healthcare access. Rural residents feel shy in seeking care for conditions associated with stigma like substance abuse, mental health, pregnancy, sexual health, or even common chronic illnesses due to unease or privacy concerns. In villages almost all people are known to each other. Patients feel fear or concerns about family, friends, or people, who are frequently friends, family members of healthcare providers. They do not want to disclose others about health conditions, which are not openly discussed like counselling or HIV testing services. The integration of behavioral health services with primary care healthcare services in the same building can help ease patient concerns.
5. **Shortage of healthcare providers:** A shortage of healthcare providers in rural communities impact healthcare access. It is necessary that appropriate healthcare services are made available in rural areas so that rural residents may obtain sufficient access in a timely manner. Even if an adequate supply of healthcare services exists in the rural community, there are other factors to consider in terms of healthcare access. For instance, to have good healthcare access, a rural resident must have:
   a. Confidence to communicate with healthcare providers, particularly if the patient has poor health literacy.
   b. Facility to take paid time off from work to use such services.
   c. Faith that they can use services without compromising privacy.
   d. Financial means to pay for services, such as health or dental insurance that is accepted by the provider.

e. Means of transportation to reach and use services, which may be located away from their place.
f. No stigma associated with conditions in rural communities, such as mental health or substance abuse.
g. Trust that they will receive good quality healthcare.

Rural Health Scheme

In 1977, the Government of India launched a 'Rural Health Scheme,' based on the recommendation of the Srivatsav Committee (1975) for 'placing people's health in people's hand'. The healthcare services are provided at village level, subcenter level, and primary health center (PHC) level in rural areas.

A. Village level

Primary healthcare is aimed to provide widespread coverage and equal distribution of health resources so that healthcare facilities must reach into all parts of rural areas and that everybody have equal access to it. We all know that health facilities are inadequate in the villages and physicians are not available in each village 24 × 7 days for providing healthcare to the villagers. At this level, the primary healthcare is provided in villages not by the medical personnel but by the non-medical personnel such as village health guide, *Dai* (traditional birth attendant) and *Anganwadi* workers. They bridge the gap between the health sector and the community. They are working under the following schemes:

☛ Village Health Guides Scheme (VHG Scheme)

On October 2, 1977, Village Health Guides Scheme was launched to provide health services to people in the villages by enlisting people's participation. The scheme was launched in all States and union territories except Arunachal Pradesh, Karnataka, Kerala, Tamil Nadu, and Jammu and Kashmir, which had alternative systems, e.g. Jammu and Kashmir (*Rehbar-e-Sehat*), Tamil Nadu (Mini Health Centres), Arunachal Pradesh (Medics), and Kerala (strengthening of PHCs) of providing health services at the village level.

The Health Guide provides primary healthcare to the people in the village. They serve as links between the community and the governmental infrastructure. They provide the first contact between the individual and the health system. Health guides have aptitude for social service and they are not full time government servants. Government of India issued a circular in May 1986 that females only would be placed as village health guides. Accordingly, now women

are health guides in every village. Usually one VHG is provided for 1000 population (500 in case of tribal, hilly or remote areas).

Village Health Committee consisting of 4 members selects the Health Guides from the village where she is going to work. The guidelines for their selection are:

a. They should be a permanent resident in the village.
b. They should be able to read and write, and must have minimum formal education at least up to the VI standard.
c. They should be able to spare at least 2 to 3 hours everyday for community health work.
d. They should be acceptable to all sections of the community.

After selection, the Health Guides undergo training in the Primary Health Center, for 3 months on the basic aspects of health including treatment of minor ailments, first aid, environmental sanitation, family planning, personal hygiene. They get a stipend of ₹200 per month during training period. On completion of training, Health Guide receives a certificate, a working manual describing the detailed information about medical care of common illnesses and a kit of general medicines like paracetamol tabs, tincture iodine, plaster roll, cotton, bandage cloth and multivitamins worth of ₹600 per annum. Broadly, the duties of health guides include treatment of simple ailments, first aid, mother and child healthcare and sanitation. They also guide the people on healthcare by providing education about family welfare services, immunisation, sanitation, personal hygiene, etc. Rest of the time she engages in her own pursuits. She is paid an honorarium of ₹600 every year. She works in liaison with other health functionaries. She is answerable to village health committee but not to the MO of PHC. The Health Guides are free to attend to their normal vocation. The national target is to achieve one Health Guide for each village or 1000 rural population.

☛ Training of local dais (traditional birth attendants)

This is another component of Rural Health Scheme undertaken by Government of India, launched in 1978, following the introduction of VHG scheme, for encouraging the community participation of healthcare delivery. Local *dais* or traditional birth attendants (TBAs) are the only people who are available in the villages to conduct the deliveries. Because of their illiteracy, ignorance and uncleanliness, the deliveries conducted by them under unhygienic conditions often resulted in high maternal and infant morbidity and mortality. An extensive *dai* training programme has now been undertaken to train all categories of local *dais* (one in every village) in the

country to improve their knowledge on the elementary concepts of maternal and child health, antenatal, natal and postnatal care, family planning, asepsis, besides obstetric skills. She is also given knowledge on anatomy of the reproductive system, physiology of pregnancy and labor and observation of danger signals. The training is of 1 month duration. Each *dai* during her training period is paid a stipend of ₹300. Training is given at the PHC/subcentre or MCH centre for 2 days in a week and on the remaining four days of the week *dais* accompany the female Health worker (HW) to the villages preferably in the *dai's* own area. During training period each *dai* is required to conduct at least 2 deliveries under the guidance and supervision of the HW female (F), Auxiliary nurse midwife (ANM) or health attendant (HA) female (F). The *dai* may charge for her services. After training, the traditional birth attendant is called trained birth attendant. She is given a certificate and a maternity kit (midwifery kit). The kit consists of sterile gauze, cotton, clean blade, sterile thread, bowl, soap, antiseptic lotion, plastic sheet, tincture iodine and enema can. The contents are replaced after conducting delivery. She gets ₹10/- per delivery, provided the case is registered in subcenter or primary health center (PHC) and also receives ₹3 for each newborn registered by her. However, she is free to charge her fee for conducting delivery. The national target is to train one local *dai* in each village.

☛ Anganwadi worker (AWW)

'*Angan'* literally means a courtyard. *Anganwadi* worker is a local lady selected from within the community she is expected to serve. She is a part-time worker with qualification up to 10th standard. She gets an honorarium of ₹1500 per month for the services she rendered. She is assisted by a helper who is also from the same community. Under the ICDS (Integrated Child Development Services) Scheme, there is one *anganwadi* worker for a population of 400–800. There are about 100 such workers in each ICDS Project. Every AWW undergoes training for 4 months on basic aspects of health, nutrition, and child development. The responsibilities of an AWW include:

1. To provide basic health services, health education and supplementary nutrition to pregnant and nursing mothers, other women (15–45 years), children below the age of 6 years and adolescent girls.
2. To give non-formal preschool education to children between 3 and 5 years of age.

3. To act as the community's primary link that maintains liaison with other health services and functionaries for young children present in the village.
4. To assist the PHC staff in the implementation of the health component of ICDS Program.

B. Subcentre level

A subcenter (sub-health centre; SHC) is an infrastructure of PHC that constitutes the peripheral outpost of healthcare delivery system in the rural areas. It is the first contact point between the community and the primary healthcare system. SHC is established as per the population norms, *viz.* one subcentre for every 5000 population in plain areas and one for every 3000 population in hilly, tribal and backward areas. There are about 4 to 6 subcenters under each PHC. A subcenter provides all the primary healthcare services, such as immunisation, antenatal, natal and postnatal care, prevention of malnutrition and common childhood diseases, family planning services and counselling. They carryout community needs assessment and also supply general drugs for minor ailments, such as acute respiratory infections, diarrhea, fever, worm infestation, etc. and help in the implementation of several National Health and Family Welfare Programmes.

Currently one female ANM and one male Multi Purpose Worker (MPW) staff are assigned for a subcenter. ANM and MPW workers have to undergo training for 6 to 8 weeks (6 weeks for females and 8 weeks for males). One female Health Assistant (Lady Health Visitor; LHV) and one male Health Assistant at the PHC level are appointed to supervise all the subcenters under a PHC. Most of the health assistants appointed for supervision are the former health visitors, malaria inspectors, health inspectors and sanitary inspectors, who have undergone 8 to 10 weeks in-service training. The Ministry of Health and Family Welfare, Government of India has been providing assistance to all the subcentres in the country since April 2002 in the form of contingency, salary of ANMs and LHVs, rent of sub-health centre, and drugs and equipment kits. The salary of male health worker is borne by the State Governments. In addition, a voluntary worker is provided at the subcentre level as a helper to ANM, as and when needed. The ANM pays to the voluntary worker from her contingency fund.

Further, Indian Public Health Standards (IPHS) for subcentres are being prescribed to provide an acceptable quality of basic promotive, preventive and curative primary healthcare services to

the community. These standards help to monitor and improve the functioning of the subcentres.

Subcentres provide the following services that have been classified as Essential (Minimum Assured Services) or Desirable (that all states/UTs should aspire to achieve).

1. Maternal healthcare
   a. Antenatal care
      i. Early registration of pregnancy (ideally within first trimester).
      ii. Minimum four antenatal check-ups.
      iii. Recording of general check-up, height, weight, blood pressure, abdominal examination, anemia, routine urine examination for albumin and sugar and blood group.
      iv. Folic acid supplementation from first trimester and folic acid and iron supplementation from 12 weeks onwards.
      v. Tetanus Toxoid (TT) immunisation.
      vi. Identification and timely referral for HIV/AIDS, high-risk pregnancy cases.
      vii. Counselling on diet, tobacco cessation, pre-birth preparedness, danger signs, and rest.
   b. Intranatal care
      i. Promotion of institutional deliveries.
      ii. Skilled attendance at home deliveries.
      iii. Appropriate and prompt referral of high-risk cases in case of complications.
      iv. Identification and management of danger signs during labor.
      v. Identification and basic first aid treatment for eclampsia, sepsis and prompt referral of such cases.
   c. Postnatal care
      i. Minimum of 2 postpartum home visits, first within 48 hours, 2nd within 7 days and third on 42nd day of delivery.
      ii. Initiation of breastfeeding within an hour of delivery.
      iii. Counseling on diet, rest, hygiene, newborn care, immunisation and contraception.
      iv. Provision of facilities of *Janani Suraksha Yojana*.
2. Child healthcare
   i. Essential newborn care as per guidelines for antenatal care.
   ii. Counselling on exclusive breastfeeding for 6 months followed by complimentary feeding from six months of age.
   iii. Full immunisation of all infants and children against vaccine preventable diseases.

iv. Vitamin A prophylaxis.
v. Assessment of the growth and development of the infants and under 5 children.
vi. Prevention and control of childhood diseases like malnutrition, ARI, diarrhea, etc.

3. Family planning and contraception
   i. Education, motivation and counselling of couples to adopt appropriate family planning method.
   ii. Provision of contraceptives such as oral pills, condoms, emergency contraceptives and IUD insertion.
   iii. Follow-up services to the eligible couples adopting permanent methods of tubectomy and vasectomy.
4. Safe abortion services
   i. Counselling and appropriate referral for safe abortion services/medical termination of pregnancy(MTP).
   ii. Follow-up for any complication after abortion/MTP and appropriate referral, if needed.
5. Curative services: Provide treatment for minor ailments including diarrhea, fever, worm infestation, acute respiratory infections (ARI), and prompt referral, if needed.
6. Adolescent healthcare
   i. Education, counselling and referral.
   ii. Prevention and treatment of anemia.
   iii. Counselling on harmful effects of tobacco and its cessation.
7. Assistance to school health services.
8. Water quality monitoring.
9. Promotion of sanitation including use of toilet and appropriate garbage disposal.
10. Field visits by appropriate health workers for disease surveillance, family welfare services including STI, RTI awareness.
11. Community needs assessment.
12. Control and reporting of local endemic diseases, such as malaria, kala-azar, Japanese encephalitis, filariasis, and dengue, etc.
13. Training of Traditional Birth Attendants and ASHA/ community health volunteers.
14. Coordinate services of *anganwadi* workers (AWW), ASHA, village health sanitation and nutrition committee, etc.
15. Implementation of national health programmes including:
    a. National AIDS Control Programme (NACP).
    b. National Vector Borne Disease Control Programme (NVBDCP).

c. National Leprosy Eradication Programme (NLEP).
d. Integrated Disease Surveillance Projects (lDSP).
e. Revised National Tuberculosis Control Programme (RNTCP).
f. National Blindness Control Programme (NBCP).
g. Non-communicable Disease (NCD).
h. Cancer Control Programmes (CCP).

C. Primary health centre (PHC)

The concept of Primary Health Centre (PHC) is old in India. In 1946, the Bhore Committee gave the concept of a PHC as a basic health unit to provide an integrated curative, promotive, rehabilitative and preventive healthcare to the rural people. The health planners in India have envisaged the PHC and its subcentres (SCs) as the suitable set-ups to provide health facilities to the rural population.

PHCs are the keystone of rural health services. It is a first port of call to a qualified doctor of the public sector in rural areas for the ill and those who directly report or referred from subcentres for curative, preventive and promotive healthcare. It has 4–6 beds for indoor patients and acts as a referral unit for 6 subcentres and refers out cases to Community Health Centres (CHCs: 30 bedded hospital) and higher order public sub-district and district hospitals.

As per the National Health Plan (1983), one PHC is present for every 30,000 rural populations in the plains and for every 20,000 population in hilly, tribal and desert areas for more effective coverage. However, as the population density in the country is not uniform, the number of PHCs depends upon the case load. PHCs are functional for round the clock with provision of 24 x 7 nursing facilities.

☛ Functions of the PHC

The PHCs hold a key position in the nation's healthcare system. It provides an integrated curative and preventive healthcare to the rural population with emphasis on preventive and promotive aspects of healthcare. The functions of the PHC are given below:

1. To provide basic laboratory workers.
2. To collect and report vital statistics.
3. To educate community about health.
4. To provide maternal-child health including family planning.
5. To help in the effective implementation of national health programmes.
6. Prevention and control of locally endemic diseases.

7. To provide medical care.
8. Referral services.
9. To ensure safe water supply and basic sanitation.
10. To provide training of health guides, health workers, local *dais* and health assistants.

The PHCs are equipped with facilities for selected minor surgical procedures (e.g. vasectomy, tubectomy, MTP) and for pediatric care.

☛ Indian Public Health Standards (IPHS) for PHC

In order to provide need based optimal level of quality healthcare, a set of standards called Indian Public Health Standards (IPHS) have been recommended for PHCs.

The objectives of IPHS for PHCs are:

1. To provide comprehensive primary healthcare to the community through the Primary Health Centres.
2. To achieve and maintain an acceptable standard of quality of care.
3. To make the healthcare services more responsive and sensitive to the needs of the community.

☛ Types of services by PHC

Depending upon the load of delivery cases, PHC are classified as:

1. **Type A:** PHC with delivery load of less than 20 deliveries per month.
2. **Type B:** PHC with delivery load of 20 or more per month.

Services provided by PHC have been classified as Essential (Minimum Assured Services) or Desirable as follows:

1. **Medical care:** PHCs provide:
   i. 6 hours per day OPD services for 6 days per week. Medical Officer at PHC should spend at least 2 hours per day twice in a week for monitoring the field work.
   ii. 24 hours emergency services to manage injuries and accident, first aid, stitching of wounds, incision and drainage of abscess, stabilization of the condition of the patient before referral, dogbite/snakebite/scorpionbite cases, and other emergency conditions.
   iii. Referral services.
   iv. Inpatient services (6 beds).
2. **Maternal and Child Healthcare including Family Planning**
   a. *Antenatal care:*
      i. Chemoprophylaxis for malaria in high malaria endemic areas for pregnant women.

ii. Counselling on diet, tobacco cessation, pre-birth preparedness, danger signs, and rest.
iii. Early registration of pregnancy (ideally within first trimester).
iv. Folic acid and iron supplementation.
v. Identification, management and timely referral for HIV/AIDS, high-risk pregnancy cases.
vi. Laboratory investigations like urine examination for albumin and sugar test, blood test for hemoglobin, blood grouping and Rh typing, and rapid plasma regain (RPR) test for syphilis.
vii. Minimum 4 antenatal check-ups.
viii. Recording of general check-up, height, weight, blood pressure, abdominal examination.
ix. Tetanus toxoid immunisation.

b. *Intranatal care*
i. 24-hour services for both normal and assisted delivery.
ii. Appropriate and prompt referral for cases needing specialist care.
iii. Conducting assisted vaginal deliveries including forceps/vacuum delivery whenever required.
iv. Management of normal deliveries.
v. Management of pregnancy-induced hypertension.
vi. Management of labor using partograph.
vii. Manual removal of placenta.
viii. Minimum 48 hours of stay after delivery.
ix. Pre-referral management in obstetric emergencies that need expert assistance.
x. Promotion of institutional deliveries.

c. *Postnatal care*
i. Counselling on contraception, nutrition, immunisation, hygiene, and essential newborn care.
ii. Initiation of early breastfeeding within one hour of birth.
iii. Minimum 2 postpartum home visits, first within 48 hours of delivery and 2nd within 7 days through subcentre staff; 3 additional visits for a low birth weight baby (less than 2.5 kg) on 14th day, 21st day.
iv. Provision of facilities under *Janani Suraksha Yojana* (JSY).

d. *Newborn care*
i. Early initiation of breastfeeding within 1 hour of birth.
ii. Essential Newborn Care (ENBC) and Resuscitation.
iii. Identification of sick newborn and prompt referral.

iv. Management of neonatal jaundice, hypothermia, infection protection, and cord care.

e. *Care of the child*

i. Assess the growth and development of the infants and under 5 children.
ii. Counselling on exclusive breastfeeding for 6 months and complementary feeding from 6 months of age along with breastfeeding.
iii. Full immunisation of all infants and children against vaccine preventable diseases as per specified guidelines.
iv. Management of acute and severe malnutrition cases.
v. Prevention and control of infections like diarrhea, pneumonia and anemia, etc.
vi. Routine and emergency care of sick children including Integrated Management of Neonatal and Childhood Illnesses (IMNCI) strategy and inpatient care. Prompt referral of sick children requiring specialist care.
vii. Vitamin A prophylaxis to the children as per national guidelines.

f. *Family welfare*

i. Counselling and appropriate referral for couples having infertility.
ii. Education, motivation and counselling of couples to adopt appropriate family planning methods.
iii. Provision of contraceptives such as condoms, oral pills, emergency contraceptives, IUCD insertions.
iv. Referral and follow-up services to the eligible couples adopting permanent methods (tubectomy/vasectomy).

3. **Medical termination of pregnancies (MTP)**
   i. Counselling and appropriate referral for safe abortion services (MTP) for those in need.
   ii. MTP using Manual Vacuum Aspiration (MVA).
   iii. Medical method of abortion with linkage for timely referral to the facility approved for 2nd trimester of MTP.
4. **Management of reproductive tract infections/sexually transmitted infections:**
   i. Health education of people for prevention of RTI/STIs.
   ii. Treatment of RTI/STIs.
5. **Nutrition services**
   i. Identification and counselling of malnourished children, pregnant women and others.
   ii. Diagnosis and management of anemia and vitamin A deficiency.

iii. Coordination with Integrated Child Development Services (ICDSs).

6. School health services.
7. Adolescent healthcare.
8. Disease surveillance and control of locally endemic diseases like malaria, kala-azar, Japanese encephalitis, etc.
9. Collection and reporting of vital events.
10. Promotion of safe drinking water, sanitation including use of toilet and appropriate garbage disposal.
11. Testing of water quality and disinfection of water sources.
12. National health programmes
    i. *Revised National Tuberculosis Control Programme (RNTCP):* All PHCs function as DOTS Centres to treat TB patients through DOTS as per RNTCP treatment guidelines and maintain record of RNTCP activities. Facility for collection and transport of sputum samples should be available as per the RNTCP guidelines.
    ii. *National Programme for Control of Blindness (NPCB):*
        a. Basic services: diagnosis and treatment of common eye diseases.
        b. Refraction services.
        c. Detection of cataract cases and referral for cataract surgery.
        d. Awareness generation through appropriate IEC strategies for prevention and early detection of impaired vision and other eye conditions.
    iii. *National Vector Borne Disease Control Programme (NVBDCP)*:
        a. Diagnosis and reporting of malaria cases after microscopic confirmation and treatment.
        b. Symptomatic treatment, hospitalization and case management of Japanese Encephalitis (JE), lympho-edema/elephantiasis, and dengue cases as per the protocols.
        c. Complete treatment to kala-azar cases in endemic areas as per guidelines issued by *NVBDC*.
        d. Complete treatment of microfilaria positive cases.
    iv. *National AIDS Control Programme:*
        a. IEC activities to enhance awareness and preventive measures about STIs and HIV/AIDS.
        b. Parents to Child Transmission (PPTCT) preventive services.

c. Screening with one rapid test, counselling and referral of HIV suspects and high-risk groups.
d. Condom promotion and distribution of condoms to the high-risk groups.
e. Help and guide patients with HIV/AIDS pre and post-test counselling of AIDS patients by PHC staff in high prevalence states.

v. *National Leprosy Eradication Programme (NLEP):*
a. Health education to community regarding signs and symptoms, complications, and treatment of leprosy.
b. Training of leprosy patients having ulcers for self-care.
c. Counselling of leprosy patients about treatment of leprosy.

vi. *National Programme for Prevention and Control of Deafness (NPPCD):*
a. Early detection of cases of hearing impairment and deafness.
b. Creating awareness in community regarding basic diagnosis and treatment services for common ear diseases like wax in ear, otomycosis, otitis externa, ear discharge, etc.
c. Education of community regarding prevention, early detection of hearing impairment/deafness.

vii. *National Mental Health Programme:*
a. Early diagnosis and treatment of common mental illnesses.
b. IEC activities for prevention and early detection of mental disorders and role of community for primary prevention of mental disorders.

viii. *National Cancer Control Programme and National Programme for Prevention and Control of Diabetes, Cardiovascular diseases (CVD) and Stroke:*
a. Essential IEC activities to promote healthy lifestyle to sensitize the community about prevention of cancers, cardiovascular diseases, diabetes, and strokes.
b. Early detection and prompt referral of suspect cases.
c. Health promotion services to modify individual, group and community behavior through promotion of healthy dietary habits, increased physical activity, avoidance of tobacco and alcohol, and stress management.

ix. *National Iodine Deficiency Disorders Control Programme:*
a. Essential IEC activities to promote consumption of iodized salt by the community.

b. Testing of salt for presence of iodine through salt testing kits.

x. *National Tobacco Control Programme:*
   a. Health education and IEC activities regarding ill effects of tobacco use and second-hand smoke especially in pregnant females, and in patients with non-communicable disease where tobacco is a risk factor.
   b. Promoting quitting of tobacco in the community.
   c. Implementation of ban on smoking in public places, sale of tobacco products to minors, sale of tobacco products within 100 yards of educational institutions.

xi. *Oral Health:* Oral health promotion, and oral checkups and appropriate referral on identification.

xii. *National Programme for Healthcare of Elderly:*
   a. IEC activities on healthy ageing people.
   b. Complete health assessment of elderly persons, management of chronic diseases and referral services.

xiii. *Physical Medicine and Rehabilitation (PMR) Services:*
   a. Primary prevention of disabilities.
   b. Early identification, detection, and counselling of persons with disabilities.
   c. Community-based rehabilitation services.
   d. Issue of disability certificate for obvious disabilities by PHC doctor.

xiv. *National Programme for Prevention and Control of Fluorosis (NPPCF) (In affected (Endemic) Districts):*
   a. IEC activities to prevent fluorosis.
   b. Clinical examination and preliminary diagnostic parameters for cases of fluorosis.

13. Appropriate and prompt referral of cases needing special care and providing transport facilities either by PHC vehicle or other available referral transport.
14. Basic Laboratory and Diagnostic Services
   i. Routine urine, stool and blood tests (Hb%, platelets count, total RBC, WBC, blood sugar, blood grouping and Rh typing, cholesterol, bleeding and clotting time).
   ii. Diagnosis of RTI/STDs with wet mounting, Gram stain, etc.
   iii. Sputum testing for mycobacterium (as per guidelines of RNTCP).
   iv. Blood smear examination for malaria parasite.
   v. Rapid tests for pregnancy.
   vi. RPR test for syphilis.

vii. Rapid test kit for fecal contamination of water.
viii. Estimation of chlorine level of water using orthotoludine reagent.
ix. ECG.

15. Record of vital events, reporting of births and deaths, and maintenance of all relevant records concerning services provided in PHC.
16. Orientation training of male and female health workers in various National Health Programmes including RCH, Adolescent health services and immunisation.
17. Skill-based training to ASHAs.
18. Initial and periodic training of doctors/paramedics through continuing medical education, conferences, skill development trainings.
19. Mainstreaming of AYUSH-based preventive, promotive and curative healthcare and public health education activities including awareness about the uses of medicinal plants and local health practices.

IMPROVEMENT IN RURAL SANITATION

Health and hygiene of a person largely depend upon the availability of clean drinking water and proper sanitation. **Sanitation** is the science of *safeguarding* health. Consumption of unsafe drinking water, improper disposal of human excreta are also attributed largely to the high prevalence of disease. Good sanitation practices prevent contamination of water and soil, and thereby, prevent diseases.

The term sanitation covers the whole field of controlling the environment with an aim to prevent diseases and promote health. Sanitation includes the safe disposal of human waste (feces and urine), maintaining hygienic conditions, through services such as liquid and solid waste disposal, industrial/hazardous waste management, waste water treatment and disposal. Besides food, water, housing and clothing; sanitation is an important factor in the environment.

Improper sanitation, non-availability of adequate safe water and its disposal, air pollution, industrial pollution and increasing population all are posing serious threats to the healthy environment. Therefore, attainment of a healthy environment is becoming more and more complex.

India is still lagging behind many countries in the field of environmental health and sanitation. The basic problem of safe water supply and sanitary disposal of human excreta and refuse still pose a serious challenge before the country especially in rural areas. Rural sanitation is one of the major problems as more than 70% of the population of India live in rural areas. Sanitation in rural areas can be promoted by the use of toilet, safe water supply and appropriate garbage disposal.

Excreta disposal, solid and liquid waste management, safe water supply are some of the key components of various National Programmes launched with the objective of bringing sanitation in rural areas.

Excreta Disposal

Human excreta are a potential source of infection and pollution. Improper excreta disposal may

i. Pose health hazards like soil pollution, water pollution, contamination of foods and propagation of flies.
ii. Cause diseases like typhoid and paratyphoid fever, dysentery, diarrheas, cholera, hookworm and parasitic infestations.

The problem is more serious in India where only 15% of the urban population has the amenity of a sewerage system. Most of the population lives in rural areas and defecates in fields. This pollutes the environment. It is estimated that millions of people in India die every year due to intestinal group of diseases.

Thus proper disposal of human excreta constitutes a fundamental environmental health service.

The infectious organisms present in the human excreta of sick persons act as disease carrier and constitute the chief source of infection. Transmission of infectious organisms into susceptible host from excreta may take place through water, soil, fingers, flies and food (Fig. 5.1a). The cycle is best interrupted at the level of source, i.e. excreta. Thus proper disposal of excreta is the most important method, which can offer a **sanitation barrier** as shown in Fig. 5.1b. Sanitation barrier could be a sanitary latrine or a sanitary pit.

Methods of Excreta Disposal

A. Unsewered areas
   1. Service type latrines (Conservancy system)
   2. Non-service type latrines (Sanitary latrines)
      a. Bore hole latrine
      b. Dug well or pit latrine

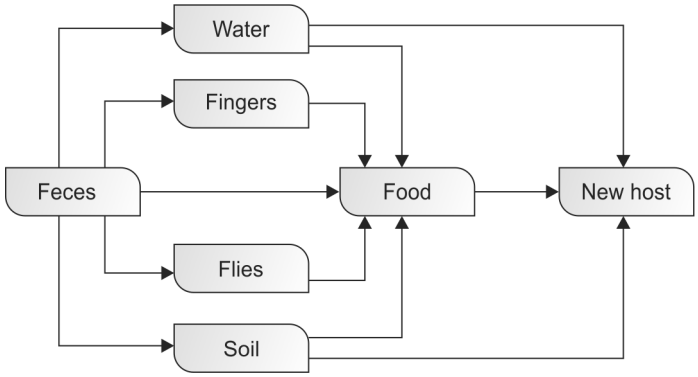


Fig. 5.1a: Transmission of infection through feces

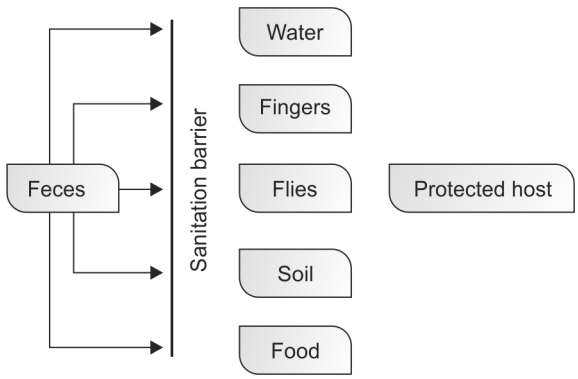


Fig. 5.1b: Sanitation barrier for transmission of infection through feces

c. Water-seal type of latrines
   i. PRAI type
   ii. RCA type
   iii. Sulabh Shauchalaya.
d. Septic tank
e. Aqua privy

B. Sewered areas
1. Water carriage system
2. Disposal of sewage
   a. By dilution
   b. By purification
      i. Preliminary treatment
      ii. Primary treatment

iii. Secondary treatment
- Trickling filters
- Activated sludge process.

A. Unsewered Areas

1. Conservancy system

The principle of this system is that filth, refuse and all other putrefiable matters should not be exposed to flies, should not contaminate the water and should be transported for safe disposal. Excreta are removed by manual labor from privies and latrines.

Privy means structure for depositing excreta in private houses while *latrines* are similar structures for public use.

☛ Types of privies and latrines

i. **Privy system:** Privy is meant for private use, hence it should be constructed at the ground floor of the house at a distance of 6′ from living room and about 40′ from the nearest well or source of water supply. It consists of a chamber made of brick with cement lining and provided with a proper seat. A small window for ventilation and air supply should also be provided. Although privy system is simplest yet it is most unsanitary. There remains the possibility of leakage and pollution of water and soil. Besides, buckets and pan get corroded and require replacement.

ii. **Pail system:** Here a receptacle is placed under the squatting seat and excreta removed into pail carts for disposal.

iii. **Commode:** This system is more popular in urban areas at places where there is no adequate water carriage system. It consists of wooden or plastic seat with self-closing lid and enamel pot to receive excreta. The sweeper empties the pail from the commode after use, cleaned and refitted.

The privy, pail and commode types are also know as **service types** but these should be replaced by sanitary latrines, which do not require service and excreta can be disposed off in a hygienic manner.

2. Non-service type (Sanitary latrines)

The requirements of a sanitary latrine are as follows.
- The excreta is not accessible to carriers of infection like flies, rodents, and animals, e.g. pigs, dogs, cattle, etc.
- Excreta do not create a nuisance due to offensive smell or unsightly appearance.

Sanitary latrines are most important for disposal of human excreta, common types are described below.

☛ Bored hole latrine

This type of latrine is recommended for rural areas. It was introduced in 1930 by the Rockfeller Foundation. It consists of a circular hole (14 to 16'' diameter) penetrating 18 to 20' into ground water. It should reach subsoil water 3' in depth. The opening is covered with squatting plate and superstructure is made for privacy. Dilution of excreta takes place in subsoil water. The latrine is sunk (Fig. 5.2) into hard soil to prevent its collapse. This type of latrine is useful in

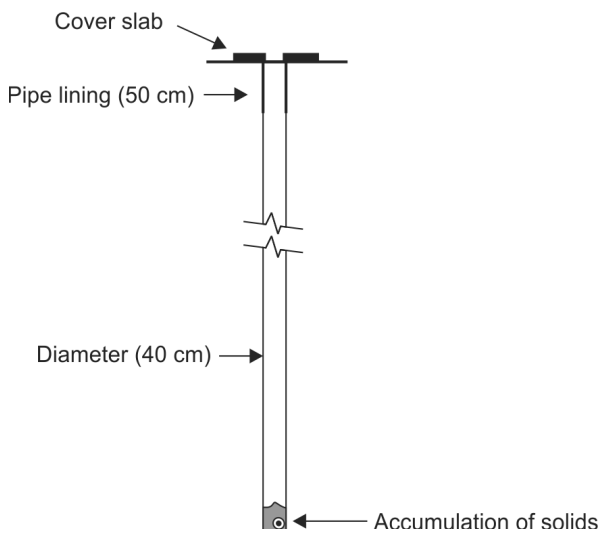


Fig. 5.2: Bored hole latrine

preventing hookworm infestation in rural areas. When hole is filled about 3' from surface level, it is covered with earth and another is dug at a new site.

☛ Dug well latrine

This type is also recommended for rural areas. It consists of a 10 to 15' ft. deep pit with 75 cm in diameter. It is provided with 1/2'' water seal and a squatting plate of 3.5' diameter. The pit may be lined with pottery rings. A concrete squatting plate is placed on the top of the pit, and the latrine is enclosed with a superstructure. Dug well latrine is better than bored hole latrine and has a comparatively longer life.

☛ Water seal latrine

This is also suitable for rural families. It is the hand-flushed 'water seal' type of latrine. It is provided with 1/2'' water seal and a squatting plate of 3.5' diameter. It can be flushed with 3 liters of water. Water seal prevents the access to flies and suppresses offensive smell. The construction is economical and excreta are quickly disposed off with septic tank like action. Two more important types of latrines are:

i. PRAI type evolved by the Planning, Research and Action Institute, Lucknow.
ii. The RCA evolved by the Research-Cum-Action Projects in Environmental Sanitation of the Ministry of Health, Government of India. Both are similar except in minor engineering details.

1. **RCA latrine:** Selection of site—site should be selected inside a house and at a distance of 15 meters from the nearest source of water supply and should be at a lower elevation to prevent possibility of bacterial contamination of water supply.
   i. *Squatting plate:* Minimum dimensions of squatting plate (Fig. 5.3) are 90 cm × 90 cm × 5 cm. It is made of impervious material like glazed stone, cement or concrete for ease of washing and keeping clean and dry. Circular squatting plates (90 cm diameter, 5 cm thickness) are also used. A 1/2'' slope towards the pan is also provided so that the water used for cleansing purposes (ablution) may drain out. Rigid footrests over the plate are provided for convenience of the user so that they ease out comfortably, in appropriate position.



Fig. 5.3: Squatting plate

ii. *Pan:* All the night soil, urine and wash water are received in the latrine pan. It measures 42.5 cm in length but varies from front portion (12.5 cm) to widest portion (20 cm) (Fig. 5.4). A uniform slope from front to back allows drainage of the material. The pan should have smooth finish for good washing and cleaning, etc.

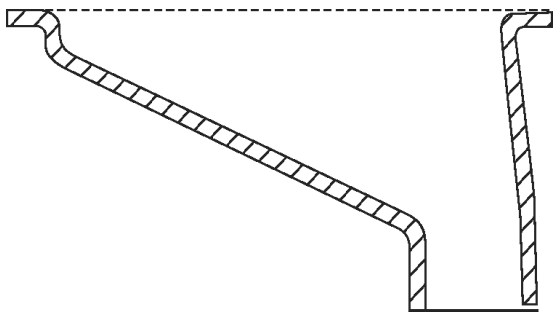


Fig. 5.4: Pan

iii. *Trap:* A trap consists of a pipe (7.5 cm diameter), bent upon itself in such a way that it retains certain amount of water in the bend. The purpose of using a trap is to hold water and provide necessary *water seal,* i.e. the distance between the level of water in the trap at the lowest point in the concave upper surface of the trap (Fig. 5.5). The trap is obviously connected to the pan.

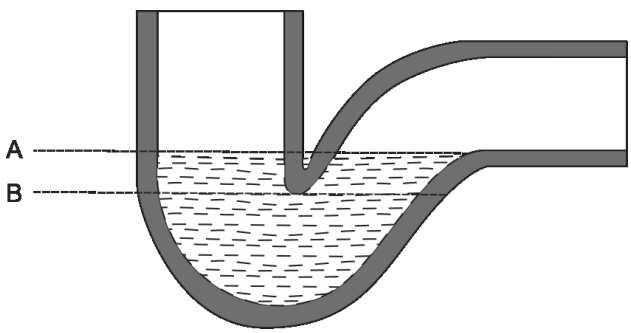


Fig. 5.5: Trap

iv. *Connecting pipe:* It connects the trap to the pit. It is 1 meter long with 7.5 cm diameter and has a bend at the end. Connecting pipe is used in indirect type RCA latrine because the pit is

away from the squatting plate (Fig. 5.6). Connecting pipe is not required in direct type latrine. The advantage of indirect pipe is that when the pit fills up, a second pit can be used just by changing the direction of the connecting pipe. The pit or dug well is 75 cm in diameter and 3 to 3.5 meter deep.

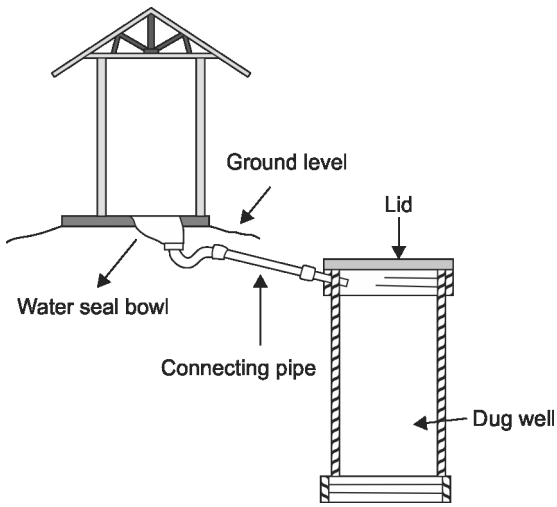


Fig. 5.6: Indirect type RCA latrine

Education of the public about the proper use of RCA latrine is essential. Pan must be flushed after use with 1.5 liters of water. The squatting plate should not be soiled. Latrine should not be used for dumping of refuse or other debris.

iii. **Sulabh Sauchalaya:** *Sulabh Sauchalaya* is an improved version of RCA type latrine. It is a low cost, pour-flush, water seal type of latrine. The method requires very little water and excreta undergo bacterial decomposition. Sulabh International also maintains community latrines. Such latrines have been constructed in many cities throughout India even at railway stations and bus stands.

☛ Aqua privy

It is a small septic tank like system. Excreta go into a tank where septic action takes place. Tank is ventilated by a pipe opening in outside air. Effluent from tank flows into garden or soak pit (Fig. 5.7). It could be rectangular or circular in shape. Size of aqua privy can be varied for use to individual families or general public.

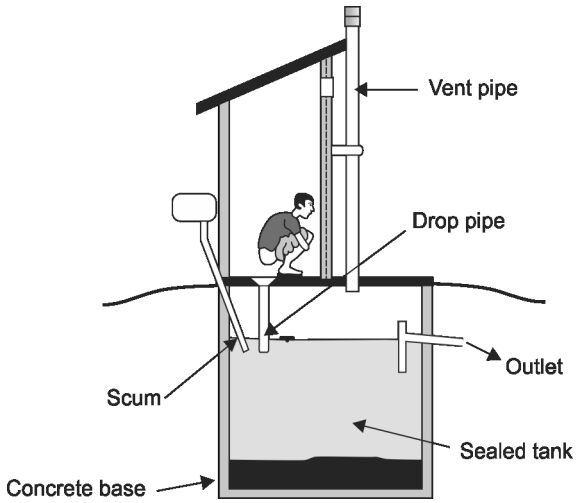


Fig. 5.7: Aqua privy

☛ Septic tanks

Septic tanks (Fig. 5.8) were first introduced in 1906 for the disposal of liquid waste and excreta but not connected to public sewerage system. Anaerobic digestion of solid waste in the subsoil outside the tank brings about purification of sewage. Length of the chamber is twice its breadth and it is 1.5 to 2 meters deep. Inlet and outlet pipes are submerged. The capacity of household tanks should be about 25 gallons. It is covered by a concrete slab and provided with a manhole for inspection.

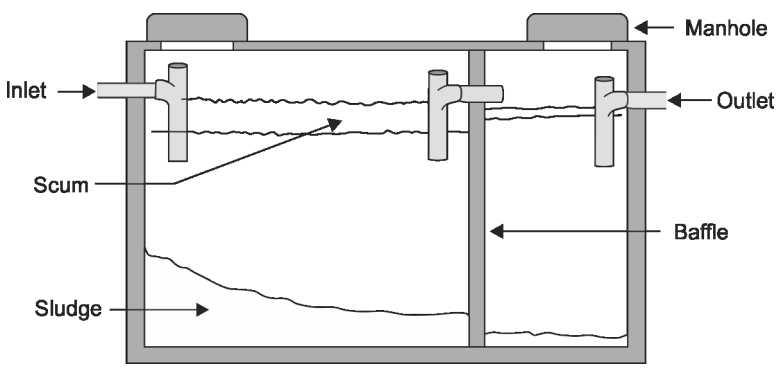


Fig. 5.8: Septic tank

Because the purification of sewage in septic tank depends on the bacterial flora, use of soap water and disinfectants should be avoided. The contents of the septic tank should be emptied out at least once a year (dislodging).

B. Sewered Areas

1. Water carriage system (Sewerage system)

Sewage includes excreta, urine, house water and rain water along with water from stables, factories, etc. Water carriage system comprises collecting human excreta, urine, water and waste from residential, industrial and commercial areas by a flush of water through a network of underground pipes (sewers) and transporting to far off place outside the town. This is the most sanitary method if plenty of water is available. It is also called sewage or **sewerage system,** which may be either:

i. Combined system in which sewers carry both the sewage and storm water, or
ii. Separate system in which surface water is not admitted into sewers.

Essential requirements for the successful working of water carriage system are:

1. Abundant water supply for flushing water closet.
2. Good underground drains and sewers with proper ventilation.
3. Sufficient fall to give required velocity to the sewage.
4. Proper methods of utilization of sewage.

Essential elements of a water carriage system are discussed below:

1. **Household sanitary fittings:** These include water closet, urinal and wash basin. Water closet is a sanitary installation for reception of excreta and is connected with sewer through soil pipe and house drain. It works by siphon action and consists of a basin and a trap (closet proper) and flushing apparatus (cistern) having 15 liters capacity, connected with closet type pipe. An ideal water closet is shown in Fig. 5.9.
2. **House drain:** Water closet is connected to house drain through soil pipe. The soil pipe is made of cast iron with internal diameter of 10 cm and extending 1 to 1.5 meter above the roof for escape of offensive gases from house drain. It should be situated outside the house.

   House drain is the underground pipe connecting soil pipe with sewer and empties the sewage into the main sewer or public drain.

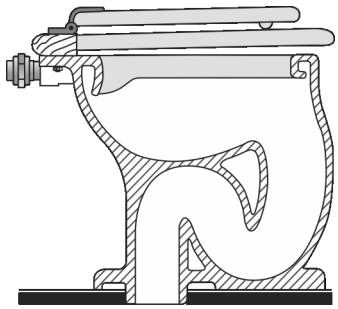


Fig. 5.9: Water closet

3. **Public sewer:** Sewage from several houses is collected through trunk sewers and transported to the place of final disposal. Trunk sewers may be small (not less than 9'') or bigger (2 to 3 meters) laid on a bed of cement concrete, about 3 meters below the ground level.

Manholes provided in the sewerage system permit inspection, repair and cleaning. Traps are also provided to prevent foul gases entering the houses and to remove sand, grit and grease from sewage.

2. Disposal of sewage

The main purpose of disposal of sewage is to convert different unstable organic matters present in sewage into harmless stable chemical compounds. Sewage generally contains 99.9% water plus organic and inorganic impurities. But it is the organic matter, which imparts offensive nature to the sewage. Either aerobic or anaerobic processes bring about decomposition of organic matter. In aerobic process the organic matter is broken down into simpler compounds like carbon dioxide, water, ammonia, nitrites, nitrates and sulphates by the action of bacteria, fungi and protozoa. The end products of anaerobic process are methane, ammonia, carbon dioxide and hydrogen.

The disposal of sewage into water course may be carried out *(i)* by dilution (without prior treatment), or *(ii)* by purification (after prior treatment).

a. **By dilution:** The method consists of diluting sewerage by discharging it into sea or river water. It can be applied in places near sea or the riverside. It must be ensured that the dilution is sufficient. Disposal of sewage into rivers makes the water polluted and unsafe for potable purposes. The best method of

sewage disposal is therefore disposal after purification. The objective is to collect, treat and dispose off sewage in such a manner that will protect health, preserve our natural resources and prevent nuisance factors and water-borne diseases.

b. **By purification:** Purification is done through either preliminary or secondary treatment.
   i. *Preliminary treatment:* It removes solids by passing through screens and grit chambers. Bar screens remove gross solids like stones, bricks, dead animals, etc. The screen consists of iron bars 2.5 to 4 cm apart and set at 33 to 60° angles in direction of sewage flow. Comminutor may be used in place of screens. **Comminutor** is a mechanical grinder, which crushes larger solids to smaller size that can pass through 1 cm apart screens. Grit chamber consists of a long, narrow and deep channel. In this chamber sewage flows at the rate of one foot per second, the grit settles and sewage passes out. Grit consists of heavy inorganic material like sand, gravel, glass, etc. which, if not removed, causes wear and tear of the plant. Grit is disposed off by land filling.
   ii. *Primary treatment:* This is carried out in primary settling tanks, usually rectangular in design. The sewage passes through the tank at a slow speed, 1 to 2 feet per minute and remains in the tank for 6 to 8 hours. This allows solids to settle to form sludge at the bottom followed by removal by sludge collectors. The scum rises at the top and removed into a scum-removing trough near the outlet. Pretreatment removes about 50% of solids and suspended matter and reduces the coliform bacteria by 30 to 40%. The Biological Oxygen Demand (BOD) of sewage is reduced by about one-third. *BOD* is the amount of oxygen needed to oxidize organic matter in the sewage.
   iii. *Secondary treatment:* This is carried either by trickling filter unit or activated sludge unit. Biological action takes place and organic matter in the sewage is converted into inorganic nitrates by aerobic bacteria. This reduces BOD of sewage by about 90%.
      - **Trickling filter unit:** After primary treatment, the sewage effluent is led to trickling filters, which consist of a bed of crushed stones or clinker, 6 to 100 feet in diameter and 5 to 6 feet deep. During the passage through filters, the bacterial flora oxidizes the effluent. The sewage is then taken to secondary settling tanks

for the settlement of sludge. The resulting effluent is treated with chlorine and discharged into a river or a stream.

- **Activated sludge unit:** Activated sludge process is also known as *biaeration process*. It is aerobic process of disposal of sewage and is considered to be most satisfactory method of sewage purification. The sewage effluent is mixed (Fig. 5.10) with 15 to 25% of activated sludge from the secondary settling tanks, mixed with compressed air and left in aeration tank for 4 to 8 hours for the biological action. The organic matter in the sewage is thus converted into stable inorganic form.

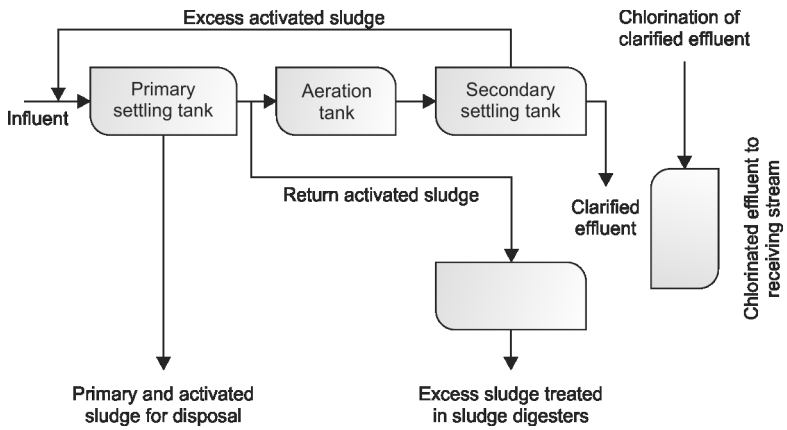


Fig. 5.10: Activated sludge unit

The typhoid and cholera organisms are destroyed and coliforms are greatly reduced.

The sewage effluent after preliminary treatment and primary treatment is carried to the mixing chambers of aeration chambers in which whole of sewage are converted into fine emulsion with the help of compressed air. The scum is removed from top and sewage led to mixing chambers. In mixing chamber the sewage is mixed with 15 to 25% of activated sludge obtained from secondary settling tanks. The mixed sewage is then led to aeration tanks where it is agitated by compressed air through diffusers. The aeration period is 4 to 8 hours. The organic matter breaks up and ammonia is oxidized to nitrates. Sewage from aeration tanks flows to secondary settling tanks where coagulated material settles and forms activated sludge. A portion of this activated sludge is again used for mixing

with sewage in mixing chambers and remaining portion is taken for process of digestion.

The effluent form secondary settling tanks may be chlorinated to destroy pathogenic organisms and finally discharged to water course.

Sludge digestion is the process of sludge fermentation under anaerobic conditions. This digestion produces:

i. In-offensive sludge, much reduced in amount and easily handled.
ii. Burnable gas.

A modern sewage treatment plant is shown in Fig. 5.11.

The modified modern technologies may be appropriate in larger villages that have water supplies close to, or within, the homes.

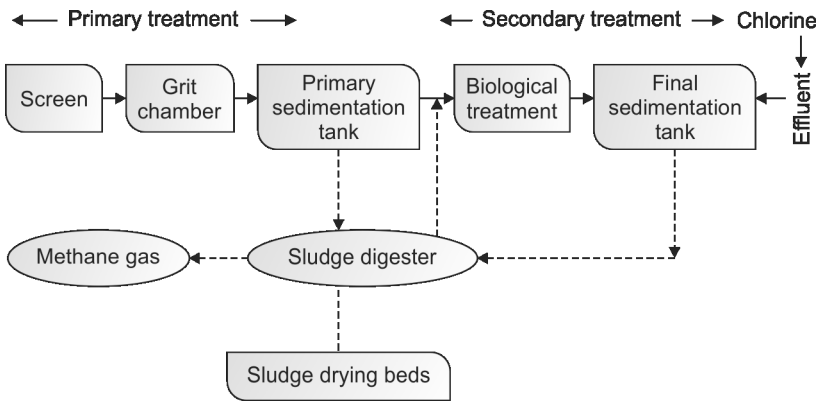


Fig. 5.11: Modern sewage treatment plant

SAFE WATER SUPPLY

There is no life without water. This is the reason why man preferred to settle near water sources, i.e. near rivers, lakes, etc. Water is the essential and predominant constituent of living cell protoplasm. It is a necessary vehicle for all the metabolic processes. Water constitutes nearly two-thirds of the total body weight, 79% of blood, 80% of brain and 10% of bones. It is required for domestic, public, agricultural and individual purposes. Supply of safe and potable drinking water to the country is of greatest importance in maintaining positive health measures. *Safe water* is one that cannot harm the consumer. Drinking water should not only be safe but also agreeable to use. Such water is called *potable water*. Thus, the desirable qualities of safe, potable water should include freedom from pathogenic agents,

freedom from harmful substances, pleasant to taste and usable for domestic purposes. On an average, every individual should be supplied with 150 to 200 liters of water everyday.

Main sources of water supply in rural areas are tanks and ponds and groundwater.

a. **Tanks and ponds:** These are good sources of water supply in some Indian villages. These are the excavations in which surface water is stored. Tanks and ponds can be kept free from pollution by the following measures:
   i. It should be fenced to keep the cattle away.
   ii. It should have good soil with no sources of seepage around its site.
   iii. The banks should be sloped and bathing or washing should be strictly prohibited.
   iv. It should be fairly deep and large and preferably of a rectangular shape having an area of about an acre.
   v. Water should be drawn from an elevated platform, preferably by hand pumps.
   vi. Any trade like jute steeping should not be allowed in the tanks.
   vii. Weeds and algae should be periodically removed and Garbasia fish kept to eat away the larvae.

b. **Groundwater:** It is the cheapest and most practical means of providing water to communities. It is superior to surface water because the ground acts as an effective filter medium for water. Water gets filtered and purified while passing over it. The advantages of ground water are:
   i. It is usually free from pathogenic agents.
   ii. It usually requires no further treatment.
   iii. The supply is nearly assured even during dry seasons.

The disadvantages include high mineral content, which render the water hard, and need for pumping to lift the water.

Sources of ground water are springs and wells.

1. **Wells:** Wells are artificially driven holes to reach the underground water level. They are the main source of water supply in Indian villages. Wells are of four varieties:
   i. *Shallow wells:* These simply tap the subsoil water, i.e. ground water lying between the surface and first impermeable strata. The term 'shallow' has nothing to do with the depth of the well. The water of these wells gets easily polluted from surface with sewage and other impurities from surrounding cesspools, leaking drains, privies, droppings of animal and

plant leaves. It is an unsafe source of water and chemically water is moderately hard. Most of the wells in India are of this type.

ii. *Deep wells:* Deep well is dug well, which goes beyond the first impervious layer to reach the water strata below. The water is comparatively safer for drinking purposes than shallow wells. This is due to efficient filtration because the water travels a greater distance through the earth and also gets better protection from surface contamination. The water is much harder due to nitrites and nitrates.

iii. *Artesian wells:* These are a variety of deep wells in which water under great pressure comes out to the surface automatically. The strata are cup-shaped and surface of well is much lower than the upper layer of water stratum tapped. They derive their name after *Artois* province in France where they have been in use for a very long-time. These wells are not common in India.

iv. *Tube wells:* These are shallow wells formed by simply driving galvanized iron pipes (1.5 to 2′ diameter and 20 to 25′ deep) to trap the groundwater. A pump is attached to the pipe to draw the water. These are more sanitary than the dug wells. The water is bacteriologically safe and cheaper in comparison to other sources. These wells are successful as a source of drinking water in many parts of India.

2. **Springs:** These are natural outlets of groundwater held under pressure by the impermeable layer. The quality and quantity of water from springs is unreliable. Springs are not considered as an important source of water supply because their yield is very low. In India springs are an unimportant source of water supply. Springs are of following types:

   i. *Shallow or surface or land springs:* They issue from superficial water-bearing sand or gravel and reach the surface at the foot of the slopes. They resemble shallow wells.

   ii. *Deep or main springs:* They issue at points of outcrops from porous strata located between impervious strata. They resemble deep wells.

   iii. *Hot or thermal springs:* They issue from regions where volcanic eruptions have ceased and they have high temperature.

   iv. *Mineral springs:* The water of these springs contains minerals like sulfur, iron, magnesium, etc., hence there are called mineral springs. Spring water is usually hard and unfit for washing.

Water Purification

As water is the most important vehicle of transmission of various diseases, large-scale purification of water is necessary for public use because it makes the water free from most of the common impurities.

The steps involved in the large-scale purification of water are:

1. Aeration and purification
2. Chlorination
3. Filtration
4. Storage and distribution.

Chlorination is most efficient, cheap, reliable and easily available method of water purification in rural areas. Chlorine may be used in the form of gas or solution or as bleaching powder. Chlorine kills pathogenic bacteria (but does not affect spores and viruses), oxidizes iron, manganese and hydrogen sulfide, destroys some taste and odour-producing constituents, controls algae and slime organisms, and helps in coagulation.

The point at which free chlorine (i.e. chlorine demand of water) begins to appear is called *break point* (break point chlorination). The chlorine left after this point is called *residual chlorine,* which acts as a disinfectant.

Bleaching powder or chlorinated lime is white amorphous powder or brittle lumps having a faint odour of chlorine and disagreeable saline taste. It contains 33% of available chlorine. The requisite quantity of powder is dissolved and mixed with water in a mixing tank. The mixture is allowed to flow into a storage tank and taken to the main water supply. In India bleaching powder is largely used for sterilizing wells, tanks, canals or rivers, especially when cholera spreads in the rural areas.

Solid Waste Disposal and Control

Waste is the solid and liquid matter from household and environments, and includes commercial and industrial wastes.

Solid waste is also called refuse in cities and litter in villages. It consists of garbage, ashes and all rubbish discarded from houses and environments except human excreta.

Liquid waste is from humans and animals, laundry, kitchen, street, commercial and industrial wastes.

Waste becomes a source of spread of pathogens and diseases like enteric fever, cholera, bacillary dysentery and amoebic dysentery, infectious hepatitis, helminthic infections, etc. are transmitted through human waste. Waste disposal is therefore important from

public health viewpoint. The objective is to protect health, preserve our natural resources, maintain healthy environment and prevent nuisance conditions.

a. **Sources of refuse:**
   i. **Household refuse** includes food waste, dust, ashes, rugs, papers, animal droppings, etc. Affluent societies in general produce more and more bulk refuse.
   ii. **Street refuse** includes dust, dung, paper, bird droppings, animal and vegetable wastes and other droppings.
   iii. **Industrial refuse** consists of a wide variety of wastes ranging from inert material like calcium carbonate to highly toxic and explosive compounds.
   iv. **Stable refuse** is collected from stables and contains waste straw, dust, dung, etc.
   v. **Domestic refuse** consists of ash, rubbish and garbage. Rubbish comprises paper, clothing bits of wood, metal, glass, dust and dirt.
   vi. **Garbage** is the waste matter resulting from preparation, cooking and consumption of foods and consists of waste food, vegetable peelings and other organic matter. Garbage ferments on storage, hence it must be quickly disposed.

b. **Collection and removal of refuse:** Sanitary bins should be used for collection of household refuse to avoid putrefaction and fly breeding. Street refuse is collected by conservancy staff. It should be kept in specially provided public bins. The refuse so collected should be transported to places of disposal in covered carts or motor vans, etc.

c. **Disposal of refuse:** Following methods are commonly used for disposal of refuse:
   i. **Controlled tipping and dumping:** Controlled tipping is an easy and cheap method. The refuse is generally utilized in filling up clay pits and hollows, in sanitary tanks or in reclaiming low lying lands. Indiscriminate dumping causes nuisance from fire, flies, rats and offensive gases. Dumping sites should be 30–50 meters away from habitation. Refuse material should be deposited in layers of about 6′ and covered with about 9′′ thick layer of earth. According to WHO, dumping is a most unsanitary method that creates public health hazards and leads to pollution of environment.
   ii. **Burning or incineration:** It is one of the best methods of refuse disposal. Burning makes the refuse harmless and reduces it to one-fourth of its original weight. The mass left

behind is hard clinker, which is used in making roads. The incineration is carried out in a furnace constructed of bricks with firebrick lining.

iii. **Composting:** This method is useful in towns where refuse has to be disposed off with night soil and converted into compost, which has high manure value. Composting is a process of changing organic matter into manure with the help of bacterial action. Excreta, refuse and moisture are mixed in a suitable proportion to give carbon: nitrogen ratio of 30 : 1. Two-week-old inoculum of bacteria is also added. The mixture is laid in dug out trenches (3′ deep and 6–8′ wide with adjustable length till the layer is 6′′ to 9′′ above ground level). Then it is covered with earth. Composting is completed in 4 to 6 months time.

iv. **Mechanical composting:** This is a development in composting, which is currently practiced in Holland, Germany, Switzerland and Israel. Mechanical composting plants are likely to be set up by the Government of India in cities with over 5-lakh population. The process consists of first removing salvable materials such as rags, bones, metal, glass, etc. from refuse. It is then pulverized to reduce the size of the particles to less than 2′′. The pulverized refuse is mixed with nightsoil, sewage or sludge in a rotating machine and incubated. The compost gets ready in 4 to 6 weeks time.

v. **Pitting:** This method is particularly useful in rural areas. The refuse is dumped into manure pits and covered with earth. In about 6 months the refuse is converted into valuable manure.

vi. **Burial:** In this method refuse is buried into an excavated trench of 1.5 meter width and 2 meters depth and covered with 20 to 30 cm of earth at the end of each day. When the level of dumped material in the trench comes to 40 cm above the ground level, the trench is filled with earth and composted and a new trench excavated.

vii. **Disposal in sea:** Refuse at airports can be dumped in deep sea, at least 8 to 10 km away from seashore. This is an expensive method.

Public education about the importance of refuse disposal would go a long way in solving the problem. The International Solid Wastes and Public Cleansing Association assists various countries in the general endeavor to improve sanitary services. Information

about waste disposal can also be obtained from WHO International Reference Center in Switzerland.

Keeping in view the above facts the Central Rural Sanitation Programme (CRSP) was launched in 1986 with the objective of improving the quality of life of rural people, to provide safe sanitation in rural areas, as well as privacy and dignity to women. However, there was first shift in the programme towards a demand-driven approach in 1999 and restructured Total Sanitation Campaign (TSC) was initiated to create supply-led sanitation by promoting local sanitary marts and a range of technological options. The revised approach in the programme titled 'Total Sanitation Campaign (TSC)' emphasizes more on information, education and communication (IEC), human resource development, capacity development activities to increase awareness and demand generation for sanitary facilities.

Objectives of TSC

1. To accelerate demand-led promotion through awareness creation and health education to people.
2. To accelerate sanitation coverage in rural areas.
3. To bring an improvement in the general health and quality of life of people in the rural areas.
4. To focus on intensive education and awareness campaigns to ensure that people understand the need for safe sanitation.
5. To promote marketing endeavor in order to reduce the incidence of water and sanitation-related diseases.
6. To promote sanitary habits among school students.
7. To promote cost-effective and appropriate technologies in sanitation.
8. To provide sanitation facilities in schools in rural areas.

In 2012, the TSC scheme was modified, restructured and renamed the 'Nirmal Bharat Abhiyan' (NBA) to transform rural India into *Nirmal Bharat*. With intent to transform India to *Nirmal Bharat*, the scheme's revised target for reaching total sanitation was changed from 2012 to 2022. '*Nirmal Gram Panchayats*' (NGP) have following priorities:

1. Appropriate convergence with 'The Mahatma Gandhi National Rural Employment Guarantee Scheme' (MNREGS).
2. Extensive capacity building of the Panchayati Raj Institutions (PRIs), Village Water and Sanitation Committees (VWSCs) and field functionaries for sustainable sanitation.

3. Provision of Individual Household Latrine (IHHL) to both Below Poverty Line (BPL) and identified Above Poverty Line (APL) households within a Gram Panchayat (GP).
4. Provision of sanitation facilities in government schools and *Anganwadis* in government buildings within Gram Panchayats (GPs).
5. Solid and Liquid Waste Management (SLWM) for proposed and existing Nirmal Grams.

Main Objectives of NBA

1. To develop community managed environmental sanitation systems focusing on solid and liquid waste management for overall cleanliness in the rural areas.
2. To encourage cost effective technologies for ecologically safe and sustainable sanitation.
3. To improve the general quality of life of people in the rural areas.
4. To motivate communities and Panchayati Raj Institutions in promoting sustainable sanitation facilities through awareness creation and health education.
5. To provide proper sanitation facilities and to promote hygiene and sanitary habits among students in the schools not covered under *Sarva Shiksha Abhiyan* (SSA) and *Anganwadi* Centres in the rural areas.
6. To speed up sanitation coverage in rural areas to achieve the vision of *Nirmal Bharat* by 2022.

NATIONAL HEALTH MISSION (NHM)

The government of India in 2013 launched National Health Mission (NHM). It encompasses two sub-missions, the National Rural Health Mission (NRHM) and the National Urban Health Mission (NUHM). The main components of the program include strengthening of health system in rural and urban areas for Reproductive Maternal Neonatal Child and Adolescent Health (RMNCH+A), and communicable and non-communicable diseases. The NHM envisages achievement of universal access to equitable, affordable and quality healthcare services that are accountable and responsive to people's needs. The National Health Mission seeks to ensure the achievement of the following indicators:

1. Reduce maternal mortality rate (MMR) to 1/1000 live births.
2. Reduce infant mortality rate (IMR) to 25/1000 live births.

3. Reduce total fertility rate (TFR) to 2.1.
4. Prevention and reduction of anemia in women aged 15–49 years.
5. Prevention and reduction of mortality and morbidity from communicable, non-communicable; injuries and emerging diseases.
6. Reduce household out-of-pocket expenditure on total healthcare expenditure.
7. Reduce annual incidence and mortality from tuberculosis by half.
8. Reduce prevalence of leprosy to <1/10000 population and incidence to zero in all districts.
9. Reduce annual malaria incidence to be <1/1000.
10. Reduce microfilaria prevalence in all districts by less than 1%.
11. Elimination of kala-azar by 2015, <1 case per 10000 population in all blocks.

NATIONAL URBAN HEALTH MISSION (NUHM)

NUHM seeks to improve the health status of the urban population with the focus on urban poor, by facilitating their equitable access to essential primary healthcare services at affordable cost. This is achieved by strengthening the existing public health capacity of urban local bodies. NUHM covers all state capitals, district headquarters and other cities/towns with population of 50,000 and above (as per 2011 census) in a phased manner. Cities and towns with population below 50,000 are covered under NRHM.

Focus of NUHM

The NUHM have high focus on:

1. Urban poor population living in listed and unlisted slums.
2. All other vulnerable populations, such as homeless, rag-pickers, street vendors, rickshaw pullers, homeless people, construction site workers, railway and bus station coolies, street children, sex workers, and other temporary migrants.
3. Clean drinking water, sanitation, school education, vector control, etc.

Goals of NUHM

1. To provide need-based, city-specific urban healthcare system to the urban poor and other vulnerable sections.

2. To develop institutional mechanism and management systems to meet the health-related challenges of a rapidly growing urban population.
3. To develop partnership with community and local bodies for a more proactive involvement in planning, implementation, and monitoring of health activities.
4. To make availability of resources for providing essential primary healthcare to urban poor.
5. To develop partnerships with NGOs, for profit and non-profit health service providers and other stakeholders.

Strategies of NUHM

1. Strengthening urban primary health structures by:
   a. Creating new urban healthcare centres each covering slum population of 20,000 to 30,000.
   b. Provision of evening OPD.
   c. Provision of comprehensive healthcare (preventive, promotive and curative care).
   d. Provision of need based equipment, drugs and human resources.
   e. Formation and promotion of '*Rogi Kalyan Samiti*' to ensure provision of better facilities to the patients in the hospital.
   f. Provision of outreach health sessions in the slums.
   g. Using GIS map for easy access of patients.
2. Strengthening community participation, and capacity building through partnership with non-government providers.
3. Prioritizing the most vulnerable amongst the poor like destitute, beggars, street children, construction workers, coolies, rickshaw pullers, sex workers, street vendors and such others.

Service Delivery Infrastructure

NUHM envisages setting up of service delivery infrastructure to specially address the healthcare needs of urban poor as it provides:

1. Urban–Primary health centre (U-PHC)

New U-PHCs are established as per gap analysis. As per norm one U-PHC is required for approximately 50,000–60,000 urban populations. The new U-PHCs are preferably located within or near a slum to provide services including OPD (consultation), basic lab diagnosis, drug/contraceptive dispensing and counselling for

all communicable and non-communicable diseases. The working hours of U-PHC may be 12 noon to 8 pm. U-PHCs do not provide inpatient care.

2. Community health centre (U-CHC) and referral hospitals

30–50 bedded U-CHCs are established for providing inpatient care. U-CHCs are set up in cities with a population of above 2.5 lakhs (100 bedded for every 5 lakhs population in metro cities), the Central Government provide only a one time capital cost for setting up the U-CHCs. The recurrent costs including the salary of the staff are borne by the respective state governments. The U-CHC provides medical care and facilities for minor surgeries, and institutional delivery (Fig. 5.12).

3. Outreach services

NUHM support engagement of ANMs in conducting outreach services for targeted groups, particularly slum dwellers and the vulnerable population to provide preventive and promotive healthcare services at the household and community level.

4. Referral linkages

State government hospitals, medical colleges, private hospitals including maternity homes are enlisted/approved to act as referral points for different types of healthcare services like maternal and child health, diabetes, critical illness, trauma care, orthopedic complications, mental health, deafness control, cancer management, tobacco counselling/cessation, critical illness, diabetes, surgical cases dental surgeries, etc.

5. Community process

The NUHM encourage the effective participation of the community-based institutions like Mahila Arogya Samiti (MAS) (50–100 households) and Rogi Kalyan Samitis in planning and management of healthcare services. It promotes engagement of community health volunteer: Accredited Social Health Activist (ASHA) or Link Worker (LW) in urban poor settlement.

a. **Mahila Arogya Samiti (MAS):** One Mahila Arogya Samiti covers 250–1,000 beneficiaries and between 50–100 households. MAS act as community-based peer education group in slums to facilitate (i) community mobilization, (ii) access to identified facilities, (iii) monitor preventive and promotive care, and (iv) management of grants received.

b. **ASHA/link worker:** ASHA (frontline community worker) serves as an effective link between the health facility and the urban slum population. Each link worker/ASHA has a well-defined service area (one ASHA for 1000–2500 urban poor population covering about 200 to 500 households). However, the states have the flexibility to either engage ASHA or entrust her responsibilities to MAS. The NUHM would provide annual grant of ₹5000/- to MAS every year.

Essential services rendered by the ASHA are as follows:

i. Accompany pregnant women and children requiring treatment to the nearest UPHSC or secondary/tertiary level healthcare facility.

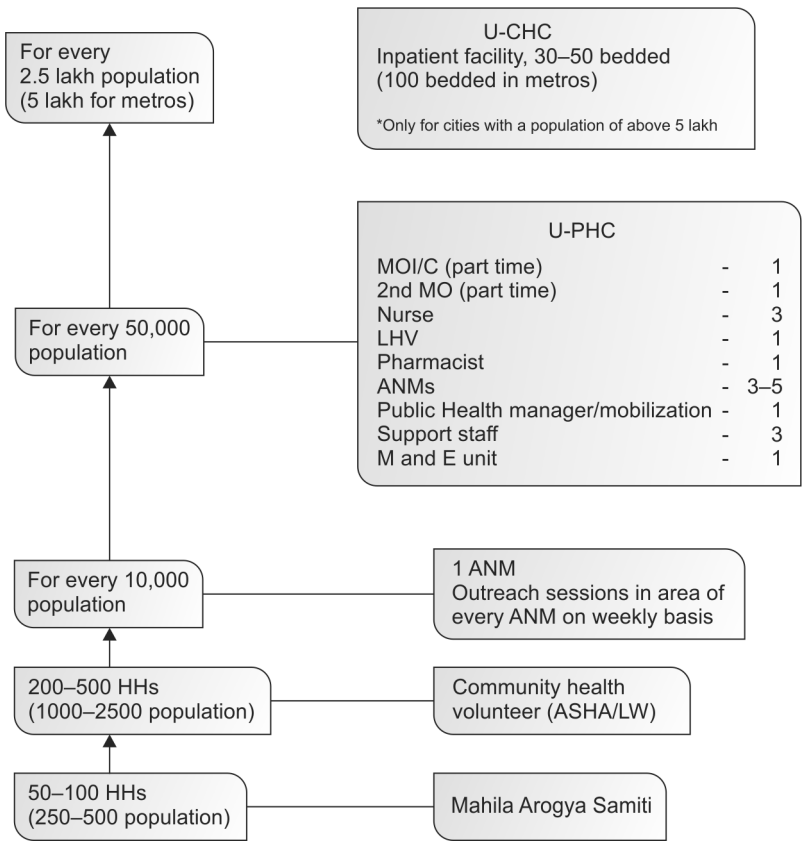


Fig. 5.12: Urban healthcare facilities

ii. Act as a depot holder for essential health products like oral rehydration therapy (ORS), zinc, iron folic acid tablet (IFA), chloroquine, oral pills, condoms, contraceptives, sanitary napkins, etc. as appropriate to local community.
iii. Active promoter of good health practices.
iv. Mobilize the community and facilitate people's access to health and health related services available at the *anganwadis* /PHSCs/ urban secondary and tertiary health centres, for institutional delivery, immunisation, antenatal checkup and postnatal checkup.
v. Carrying out preventive and promotive health activities with *Mahila Arogya Samiti*.
vi. Create awareness among women, families and adolescents on gender equality, birth preparedness, importance of clean and safe delivery, nutritional care during pregnancy, identification of danger signs during pregnancy; breastfeeding and complementary feeding, immunisation, contraception, medical termination of pregnancy, sterilization, spacing methods and prevention of common infections including reproductive tract infections (RTIs) and sexually transmitted infections (STIs), care of the young child, substance abuse, prevention of domestic violence and sexual violence.
vii. Create awareness in community on essential determinants of health, such as nutrition, basic sanitation and hygienic practices, healthy living and working conditions, timely use of available health services and facilities.
viii. Formation and promotion of *Mahila Arogya Samitis* (MAS) in community.
ix. Identify target beneficiaries and support the ANM in conducting regular monthly outreach sessions and tracking service coverage.
x. Maintenance of necessary information and records about births and deaths, immunisation, antenatal services in her assigned locality and share it with the ANM in charge of the area.
xi. Provide community level curative care for ailments such as diarrhea, fevers, care for the normal and sick newborn, childhood illness, nutrition counselling, and first aid.
xii. Measure blood pressure and blood and urine sugar.
xiii. Reinforcement of appropriate community level action for immunisation, prevention of water borne and other communicable diseases like tuberculosis (DOTS), malaria, chikungunya, Japanese encephalitis, and leprosy.

NATIONAL RURAL HEALTH MISSION

The National Rural Health Mission (NRHM) was introduced to provide equitable, affordable and quality healthcare to the rural population, especially the vulnerable groups. NRHM was launched by the Prime Minister on 12th April 2005. It is operational in the whole country with special focus on Empowered Action Group states (Bihar, Jharkhand, Madhya Pradesh, Chattisgarh, Uttar Pradesh, Uttarakhand, Odisha and Rajasthan), 8 North East states (Asom, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura), Himachal Pradesh and Jammu and Kashmir.

Goals

i. To bring population stabilization, gender and demographic balance.
ii. To mainstream the Indian systems of medicine (AYUSH—ayurveda, yoga, unani, siddha, and homeopathy) to provide healthcare facilities to those residing in the rural areas, especially the disadvantaged group including, women and children.
iii. To prevent and control communicable and non-communicable diseases, including locally endemic diseases.
iv. To promote healthy lifestyles.
v. To provide accessible, effective, and affordable primary healthcare facilities, mainly with reference to nutrition, sanitation, hygiene, safe drinking water, and immunisation especially to the poor and vulnerable section of population.
vi. To provide universal access to integrated comprehensive public health services.
vii. To reduce Maternal Mortality Ratio (MMR) and Infant Mortality Rate (IMR).

Strategies

The strategies to achieve the above goals include:

1. Creation of a cadre of Accredited Social Health Activist (ASHA) to bridge the gaps in rural health.
2. Train and enhance capacity of Panchayati Raj Institutions (PRIs) to own, control and manage public health services.
3. To make health plan for each village through Village Health Committee of the Panchayat.

4. Strengthening of subcentres by:
   a. Continuous supply of essential drugs (both allopathic and AYUSH) to the subcentres.
   b. Provision of multipurpose worker (male)/additional ANMs wherever needed.
   c. Sanction of new subcentres and upgrading existing subcentre.
5. Strengthening Primary Health Centres (PHC) for quality, preventive, promotive, curative, supervisory and outreach services through: (a) Adequate and regular supply of essential drugs and equipment; (b) provision of 24 hours service in 50% 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 need; (e) strengthening the ongoing communicable disease control programs and new programs for control of non-communicable diseases.
6. Preparation and implementation of an intersectoral district health plan prepared by the District Health Mission, including drinking water, sanitation, hygiene and nutrition.
7. Integrating vertical Health and Family Welfare programmes at national, state, block, and district levels.
8. 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 anesthetist.
   b. Codification of new 'Indian Public Health Standards' by setting up norms for infrastructure, staff, equipment, management, etc. for CHCs.
   c. Promotion of '*Rogi Kalyan Samiti*' for hospital management.
   d. Developing standards of services and costs in hospital care.
9. Provision of mobile medical units and national ambulance services to provide services at the doorsteps of population living in the most remote and hard to reach areas.

Health Promotion and Education in School

School health services is an important branch of community health that aims to provide a comprehensive healthcare to children throughout the school years to promote, maintain and protect their health. The school going years have a profound influence on the physical as well as mental growth of child. Healthy habits, which

get developed in the children at this stage, always remain with them and are carried even to the next generation.

It is very much important to educate the children about the health issues, healthy behaviors and good habits, so that they lead a healthy life. One of the best possible ways to teach children and adolescents is through schools.

The main health problems of schoolchildren that need consideration include:

- Malnutrition
- Communicable diseases
- Intestinal parasites
- Diseases of skin, eye and ear
- Dental caries.

In school, children come from families of different socioeconomic status. Growing children are prone to various communicable diseases like tuberculosis, tetanus, rheumatic fever, diarrheal diseases, etc. and non-communicable diseases such as malnutrition, infestation of intestinal parasites, dental, visual and hearing problems. Most of these can be prevented and corrected.

School health services were neglected as morbidity and mortality was comparatively much lower at school age (5–17 years) than in the preschool years and other periods of life. The Bhore Committee (1946) reported that School Health Services were practically non-existent in India, and where they existed, they were not well organized. In 1953, the Secondary Education Committee emphasized the need for medical examination of schoolchildren. In 1960, the Government of India constituted a School Health Committee to assess the standards of health and nutrition of schoolchildren. This Committee was also assigned the task of suggesting ways and means to improve the health status of school going children. In 1961, this Committee submitted its report, which contained many useful suggestions and recommendations.

In spite of various efforts of the Government to improve school health, the school health services provided were not sufficient and up to mark because of paucity of recourses and insufficient facilities. The poor state of school health services may be attributed to the following reasons:

- Lack of transport facilities for the PHC medical officer.
- Lack of budget for printing health cards, etc.
- Lack of properly trained school teachers, multi-purpose workers, and health personnel who can ensure effective functioning of the School Health Programme.

- Lack of proper documentation and evaluation.
- Lack of coordination between:
  - Different schemes and health programs within the health department.
  - Health department and outside agencies, particularly the education department.

In 2013, Government of India launched the Rashtriya Bal Swasthya Karyakram (RBSK) under the National Health Mission for early detection and timely management of illnesses among school children (0–18 years). Government also launched a comprehensive programme called, 'Rashtriya Kishor Swasthya Karyakram' (RKSK) in 2014 to respond to the health and development requirements of adolescents in a holistic manner.

Furthermore, the School Health Programme has been incorporated as a part of the Health and Wellness component of the Ayushman Bharat Programme of Government of India. The school health promotion activities are implemented in all the government and government aided schools in the country through the joint efforts and close coordination between Ministry of Health & Family Welfare and Department of School Education and Literacy, Ministry of Human Resource and Development at all levels (Centre and State).

Objectives of School Health Programmes

1. To develop health consciousness among schoolchildren.
2. To provide healthy environment to children in school.
3. To provide information about health and nutrition to the children in schools.
4. Early diagnosis, treatment and care of students with health problems.
5. To promote positive health in schools.
6. To prevent the spread of diseases in the school.
7. To promote use of safe drinking water in schools.
8. To promote safe menstrual hygiene practices by girls.

Main Components of School Health Promotion

These are designed to provide comprehensive healthcare such as preventive, promotive and curative services. The main activities of the School Health Service are:

1. Screening tests

Screening tests include medical examination of all students of the elementary and secondary schools. Main screening tests carried out by health visitors are:

i. Test for vision acuity.
ii. Hearing test to detect hearing defects.
iii. Physical assessment of child growth by measuring child height, weight, and body mass index to confirm that the growth is normal.
iv. Color vision test to check color blindness.
v. Scoliometresis for early detection of deformities of the spinal cord, particularly scoliosis.
vi. Periodical medical checkup of students' physical illness such as dull face, runny nose, flushed face, red and watery eyes, rashes, etc.
vii. Dental check up.

2. Prevention and investigation of communicable diseases

i. Health education of the school teachers and other personnel is important in order to motivate them to take the necessary measures to prevent various communicable diseases such as viral meningitis and tuberculosis.
ii. During an outbreak of a communicable disease, the health visitors take the necessary measures in order to prevent spreading of the disease in community.

3. Health education

Both health visitors and school doctors provide health education to students, teachers and other personnel to give them the knowledge about the diseases, rules of hygiene and healthy behavior. In developing countries, where ill-health is a major problem, 'every schoolchild is a health worker' as they apply the knowledge they receive in school to their own families. The teacher plays a very vital role in health education. Efforts are made to strengthen the health knowledge of teacher as teacher is the key person who made presentation of the study material and advice 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. To update the knowledge of teachers, subjects such as growth and development of children, nutrition, control of communicable diseases and mental health should be included in teacher training programmes.

Health education in schools is aimed to instill life-long healthy habits and health knowledge in children. Health education should be mainly focused on the following topics:

i. My body.
ii. Ill effects of smoking.
iii. Protection from radiations from sun.
iv. Dental hygiene to prevent caries and gingivitis.
v. Menstrual cycle.
vi. Prevention of accidents.
vii. Personal hygiene.
viii. Prevention from HIV/AIDS and hepatitis B.
ix. Prevention of drug abuse.
x. Importance of nutrition and healthy diet.
xi. Adolescence.
xii. Right sitting and standing posture.
xiii. Environment cleanliness.
xiv. Family life education.

4. Nutrition

Nutrition is closely linked to both general health promotion and health maintenance. It makes important contributions in the growth and development of child. If a child takes nutritious diet according to age and activity, then he/she will get sufficient energy for proper growth, physical activity, cognition, and immune function. Since in India nutritional deficiency diseases are widely prevalent among schoolchildren, the School Health Committee (1961) recommended the provision of one nourishing meal in the middle of the day (mid-day meal) to combat malnutrition. This ambitious program has been in operation in many states.

a. *Mid-day school meal:* Every school should have some arrangement to provide mid-day meals to the children through their own cafeteria on a 'no profit no loss' basis. In many developing countries, efforts are made to make *mid-day school meal* programme as an integral part of the education system, since it not only improves the nutritional status of the children but also improves their educational performance. The school meal must provide at least one-third of the daily calorie requirement and about half of daily protein requirement of the child. The meal should not involve complicated cooking process.
b. *Applied nutrition programme:* UNICEF is assisting in the implementation of the applied nutrition programme in

providing supply of implements, seeds, manure and water for developing school gardens wherever, land is available. The produced products may be utilized in the school feeding programmes as well as for nutrition education.

5. Oral health

Oral health is important because teeth are related to positive self-image formation and also assist in language development. Impacted or infected teeth lead to systemic diseases. Children are affected by tooth decay and pain that interferes with their daily activities, such as eating, sleeping, attending school, and speaking. Oral health promotion is done by educating people about oral care and providing access to dental checkup visits. Health maintenance activities relate to prevention of caries and dental disease.

6. Vaccination

Students are given the routine vaccinations like hepatitis B vaccine and typhoid by the health visitor according to the existing vaccination program of the Ministry of Health after taking the written consent from parents or guardians of children.

7. First-aid and emergency care

It is the responsibility of the teacher to give first-aid and emergency care to students who become sick or injured in school premises. Therefore all teachers must be given adequate training during 'Teacher Training Programmes' or 'In-service Training programmes' to train them to carry out this responsibility. The commonly met emergencies within schools are:

a. Accidents leading to minor or serious injuries.
b. Medical emergencies, such as colic, epileptic fits, gastroenteritis, fainting, etc. First-Aid-Post may be provided in every school.

8. Mental health

The school is the most strategic place for promoting child's mental health and building their social, emotional and spiritual health. Mental health of the child affects his physical health and the learning process. Juvenile recklessness and drug addiction are becoming problems among schoolchildren and are the result of mental sickness. The school teacher has both a positive and preventive role. He should show concern with all the children and must help them to attain mental health, so that they may grow into mature, responsible

and well-adjusted adults. The school should use interactive learning and teaching approaches to improve mental health of the students. School routine should be planned in such a way that there must be enough relaxation between periods of intense work. Every effort should be made to relieve the tediousness of the classroom. No distinction should be made between race, religion, caste or community; between the rich and poor; and between the clever and the dull. Every effort should be done to nurture humble and helpful connections among students. It is now realized that there must be vocational counselors and psychologists in schools (a) for guiding the children into careers for which they are suited, (b) to build the social, emotional and spiritual well-being of students to enable them to achieve education and health goals, and (c) to improve the interaction of the children with teachers, family and community in ways that are respectful. The teacher–pupil relation is important for a healthful school living. The teacher acts as role model for the students in maintaining decency, discipline, decorum, punctuality, sincerity and honesty. Healthy relation between the student and teacher not only helps in the development of behavior pattern in the student but also helps to retain the affection throughout the rest of the life.

9. Healthy school environment

The schoolchildren spend most of their time in the school. Thus, the inside and outside environment of the school must be healthy, so that the children remain physically, mentally, socially, emotionally and culturally healthy. The elements of healthful school living are related to school building with a playground and clean sanitation.

a. **School building**
   i. *Location:* The school site should be carefully selected. It should be dry, on raised ground, centrally situated at a fair distance from the road and busy places, cinema houses, factories, railway tracks and market places. The school premises should be properly fenced and kept free from all hazards.
   ii. *Classrooms:* The classrooms should be spacious and must have verandahs outside. Every classroom should accommodate not more than 40 students. Per capita space for students in a classroom should not be less than 10 sq. ft. The floor surface should be so smooth as to facilitate easy cleaning and washing.

iii. *Lighting:* Classrooms should get sufficient natural light preferably from the sides as light entering from the front of room is dazzling to the eyes.

iv. *Ventilation:* The classrooms should be properly ventilated and equipped with broad windows arranged on different walls. Total door and window area should be 40% of the floor area. Improper ventilation often facilitates transmission of diseases.

v. *Sitting arrangements:* Furniture available for sitting of students should be suitable as per their age group. Single desks and chairs should be available for sitting of students. Desks should be of 'minus' type. Chairs should be provided with proper back-rests, with facilities for desk-work. If the furniture is improper then it may result in the development of myopia, orthopedic, postural defects in the child. Additionally, student also loses interest in writing and reading.

b. **Clean sanitation:** The sanitation should be maintained. The area outside the school building and within the campus should be clean. There should be provision of protected water supply and proper disposal of sanitary refuse.

i. *Water supply:* There should be provision of continuous supply of clean, safe and potable tap water or chlorinated well water. Drinking water should be given to children in a proper container like glass. In case water is stored in earthenware containers then a ladle must be provided to take water out of it.

ii. *Latrines and urinals:* There must be one urinal for every 50 students and one latrine for every 100 students, separately for boys and girls. The habit of passing urine anywhere should be curbed.

iii. *Refuse:* Each room should have a dustbin. The refuse collected in the dustbin should be emptied into a compost pit.

Glossary

- **Agent:** Anything that can cause a disease is known as agent. It is a factor, such as a microorganism, chemical substance, or form of radiation, whose presence, excessive presence, or relative absence is essential for the occurrence of a disease.
- **Airborne disease:** The transmission of disease causing microorganisms through the air to the human respiratory tract (e.g. nose, mouth, throat, and lungs).
- **Allergen:** Any substance that causes an allergy.
- **Antibiotics**: Substances produced by one microbe that inhibits or kills another microbe. Often the term is used more generally to include synthetic and semi-synthetic antimicrobial agents.
- **Antibody:** A molecule (also known as immunoglobulin) produced by a mature B cell (plasma cell) in response to an antigen. When an antibody attaches to an antigen, it helps the body destroy or inactivate the antigen.
- **Antigen:** A substance or molecule that is recognized by the immune system. The antigen can be from foreign origin such as bacteria or viruses.
- **Antimicrobial drugs:** Substances that kill or prevent the spreading of infectious agents or organisms in order to prevent the spread of infection.
- **Antisepsis:** The use of chemicals (antiseptics) to make skin or mucus membranes devoid of pathogenic microorganisms.
- **Antiserum:** A serum rich in antibodies against a particular microbe.
- **Appendix:** Lymphoid organ in the intestine.
- **Asepsis:** The employment of techniques (such as usage of gloves, air filters, UV rays, etc.) to achieve microbe-free environment.
- **Asymptomatic carriers:** A person or animal not currently showing the symptoms of a communicable disease but that can serve as a potential source of infection.

- **Asymptomatic:** A term used to describe an individual who does not currently show symptoms of the disease but who, in fact, may be infected. Asymptomatic individuals may develop symptoms of the disease at a later point in time if and when the disease onsets.
- **Bacteria:** Microscopic organisms composed of a single cell. Some cause disease.
- **Bacterial disease:** Infections and associated diseases caused by bacteria, general or unspecified.
- **Bactericidal:** Chemical that can kill or inactivate bacteria. Depending on the spectrum of activity such chemicals may be called bactericidal, virucidal, fungicidal, microbicidal, sporicidal, tuberculocidal or germicidal.
- **Bacteriostasis:** A condition where the multiplication of the bacteria is inhibited without killing them.
- **Balanced diet:** A balanced diet is one that contains a variety of foods in such quantity and proportion as to meet the need for energy, amino acids, vitamins, minerals, fats, carbohydrates and other nutrients; to maintain health, vitality and general well-being.
- **Basophil:** A white blood cell that contributes to inflammatory reactions. Along with mast cells, basophils are responsible for the symptoms of allergy.
- **Blood vessel:** An artery, vein, or capillary that carries blood to and from the heart and body tissues.
- **Carrier host:** A person or animal without apparent disease that harbors a specific infectious agent and is capable of transmitting the agent to others. The carrier state may be of short or long duration (transient carrier or chronic carrier).
- **Carrier:** A person or animal that harbors a specific infectious agent without discernible clinical disease and serves as a potential source of infection.
- **Cell:** The smallest unit of life; the basic living unit that makes up tissues.
- **Chronic disease:** Any illness is called 'chronic' if it is long-lasting or even lifelong. The opposite of chronic is 'acute', referring to diseases that come on quickly and often do not last long (if they last, they are said to become 'chronic').
- **Clone:** A group of genetically identical cells or organisms descended from a single common ancestor; or, to reproduce identical copies.
- **Communicable diseases:** The diseases, which spread from person to person through an infectious agent (viruses, bacteria,

fungi or parasite) account for a very high rate of morbidity and mortality, e.g. enteric fever, kala-azar, etc.

- **Community**: The group of people living together in such a way that the members share not only one or more specific interests (like occupational, educational, etc.) but rather the basic conditions of a common life.
- **Community health:** Environmental, social, and economic resources to sustain emotional and physical well-being among people in ways that advance their aspirations and satisfy their needs in their unique environment.
- **Community service**: It is a non-paying job performed by one person or a group of people for the benefit of their community.
- **Complement:** A complex series of blood proteins whose action 'complements' the work of antibodies. Complement destroys bacteria, produces inflammation, and regulates immune reactions.
- **Contact:** A person or animal that has had an opportunity to acquire an infection by being within the environment of an infected individual.
- **Contagious:** Capable of transmitting disease.
- **Contaminated:** Impure or unclean because of contact with a communicable disease agent.
- **Contraceptive:** A device, drug, or chemical agent that prevents conception and, in some instances, may help prevent the spread of a sexually transmitted disease.
- **Diagnosis:** The act or process of identifying or determining the nature and cause of a disease or injury through evaluation of patient history, examination, and review of laboratory data. Also, the opinion derived from such an evaluation.
- **Disability adjusted life years (DALYs):** It is defined as the number of years of healthy life of a person lost due to premature mortality, mortality or disability.
- **Disease elimination:** Elimination of disease implies the interruption of transmission of a disease and reduction of the incidence of disease in a specific geographical area or country to zero.
- **Disease eradication:** Disease eradication is termination of all the transmission of infection caused by a specific agent and permanent reduction of the specific disease cases to zero worldwide.
- **Disease:** It can be defined as an impairment of the normal state of the living animal that affects the performance of the vital functions.

- **Dormant:** A virus that is inactive in an infected individual or animal but may reactivate given the right circumstances.
- **Droplet nuclei:** The residue of dried droplets that may remain suspended in the air for long periods, may be blown over great distances, and are easily inhaled into the lungs and exhaled.
- **Enteric diseases:** Diseases of or relating to the intestines; 'intestinal disease'.
- **Environmental factors:** An extrinsic factor (insects, geology, climate, sanitation, health services, etc.) which affects the agent and the opportunity for exposure. Anything not agent but outside factors influencing exposure of infection is considered as environmental factors.
- **Evaluation:** It is the process by which results of a project are compared with the intended aims, goals and objectives.
- **Exposure:** To have contact with an infectious disease agent or its toxic products.
- **Family planning:** It refers to practices that help individuals to avoid unwanted births, to regulate the spacing between children, to control the time at which births occur in relation to the age of parents and to determine the numbers of children in the family.
- **Family welfare:** It refers to a comprehensive package of services which in addition to all elements of family planning also includes activities directed towards maternal and child health like immunisation, reduction of low birth weight, safe deliveries, etc.
- **Feces** (synonym: stool)**:** The medical and scientific term for the 'excrement discharged from the intestines.'
- **Food:** Food may be defined as 'any substance, which can be utilized to yield heat or energy, to build up new tissues and to repair worn-out tissues, to regulate body processes and to aid in the production of important body compounds'.
- **Foodborne illness:** (Synonym: Food poisoning) Any illness resulting from the consumption of food contaminated with pathogenic bacteria, toxins, viruses, prions, or parasites.
- **Fungus:** A member of a class of relatively primitive vegetable organisms. Fungi include mushrooms, yeasts, rusts, molds, and smuts.
- **Growth factors:** Chemicals secreted by cells that stimulate proliferation of/or changes in the physical properties of other cells.
- **Health adjusted life expectancy (HALE):** It can be defined as the number of years a newborn is expected to live in full health based on current rates of ill-health and mortality.

- **Health:** Health is a state of complete physical, mental and social well-being and not merely an absence of disease or infirmity.
- **Helper T cells (Th cells):** A subset of T cells that carry the CD4 surface marker and are essential for turning on antibody production, activating cytotoxic T cells, and initiating many other immune functions.
- **Hepatitis:** The name of several viruses that cause liver diseases including hepatitis A, hepatitis B, and hepatitis C.
- **Histocompatibility testing:** A test conducted before transplant operations to find a donor whose MHC molecules are similar to the recipient's; helps reduce the strength of transplant rejection.
- **HIV (human immunodeficiency virus):** The virus that causes AIDS.
- **Host:** A person or other living organism that can be infected by an infectious agent under natural conditions and sometimes experimental conditions.
- **Hygiene:** It may be defined as the science of health and embraces all factors, which contribute to healthful living. It refers to conditions and practices that help in maintaining good health and in preventing the spread of the diseases.
- **Iatrogenic:** Refers to adverse effects or complications caused by or resulting from medical treatment or advice. In addition to harmful consequences of actions by physicians, iatrogenesis can also refer to actions by other healthcare professionals, such as psychologist, therapist, pharmacists, nurses, dentist, etc.
- **Immune response:** Reaction of the immune system to foreign substances. Although normal immune responses are designed to protect the body from pathogens, immune dysregulation can damage normal cells and tissues, as in the case of autoimmune diseases.
- **Incidence rate:** The number of new cases of a specified disease during a defined period of time, divided by the number of persons in a stated population in which the cases occurred. This is usually expressed as cases per 1,000 or 100,000 per year. This rate may be expressed as age- or gender-specific or as specific for any other population characteristic or subdivision.
- **Incubation period:** The time interval between contact with an infectious agent and onset of symptoms of disease.
- **Infant mortality rate:** It is defined as the number of infant deaths (0–12 months) per 1000 live births in a country. It is a sensitive indicator of the level of health services in a country.

- **Infectious disease:** A clinically manifested illness of humans or animals resulting from an infection.
- **Infectious period:** The length of time that a person or animal harboring a communicable disease is able to transmit that disease to another person or animal.
- **Infectivity:** The proportion of persons exposed to a causative agent who become infected by an infectious disease.
- **Major histocompatibility complex (MHC):** A group of genes that controls several aspects of the immune response. MHC genes code for 'self' markers on all body cells.
- **Malaise:** A vague feeling of bodily discomfort, as at the beginning of an illness.
- **Maternal mortality:** Maternal mortality pertains to the death of a woman during pregnancy or within 42 days of termination of pregnancy (stillbirth, abortion or even term delivery).
- **Monitoring:** It is the systematic and routine collection of information about all the projects and programmes aimed at detecting changes in the environment or health status of population.
- **Nutrition:** Nutrition may be defined as 'the science of food and its relationship to health'. It is concerned mainly with the role of nutrients in body growth, physical and mental development, and maintenance.
- **Medical care:** Personal services that are provided directly by physicians.
- **Outbreak:** The occurrence of cases of a disease or condition in any area over a given period of time in excess of the expected number of cases.
- **Parasite:** A plant or animal that lives, grows, and feeds on or within another living organism.
- **Pathogen:** A disease-causing organism or virus.
- **Portal of entry:** To gain entry to the body, pathogens must either (1) infect cells in one of the body surfaces (skin, respiratory mucosa, alimentary tract), (2) otherwise breach the surface (by trauma, bite, or injection), or (3) be transmitted congenitally.
- **Prevalence rate:** The total number of persons sick or portraying a certain condition in a stated population at a particular time (point prevalence), or during a stated period of time (period prevalence), regardless of when that illness or condition began, divided by the population at risk of having the disease or condition at the point in time or midway through the period in which they occurred.

- **Protein calorie malnutrition** (PCM): It means deficiency of calories due to deficiency of protein.
- **Recommended daily allowance (RDA):** RDA is defined as 'the amounts of nutrients sufficient for the maintenance of health in all the people'.
- **Recurrence:** The concept that an illness may come back again.
- **Reservoir:** It means any person, animal, arthropod, plant, soil or substance (or combination of these) in which an infectious agent normally lives and multiplies, on which it depends primarily for survival, and where it reproduces itself in such a manner that it can be transmitted to a susceptible host.
- **Reservoir of disease:** A reservoir of disease is any person, animal, or thing (fomite) which can contain the cause of a disease without suffering from it.
- **Sanitization:** The process of chemical or mechanical cleansing, applicable in public health systems. Usually used by the food industry. It reduces microbes on eating utensils to safe, acceptable levels for public health.
- **School health services:** It is an important branch of community health that aims to provide a comprehensive healthcare to children throughout the school years to promote, maintain and protect their health.
- **Serum:** The clear liquid that separates from the blood when it is allowed to clot. Serum contains the antibodies that were present in the whole blood.
- **Sexually-transmitted disease (STD):** (Synonym: Venereal disease) A group of various diseases that are spread by sexual contact.
- **Sterilization:** The process where all the living microorganisms, including bacterial spores, are killed. Sterilization can be achieved by physical, chemical and physicochemical means.
- **Surveillance:** Surveillance of disease is the continuing scrutiny of all aspects of occurrence and spread of a disease that are pertinent to effective control.
- **Symptomatic:** A term used to describe an individual who shows symptoms of a disease.
- **Tissue:** A group of similar cells joined to perform the same function.
- **Tolerance:** A state of immune non-responsiveness to a particular antigen or group of antigens.
- **Toxin:** An agent produced in plants and bacteria, normally very damaging to cells.

- **Transmission of infection:** Any mode or mechanism by which an infectious agent is spread through the environment or to another person.
- **Transmission:** Any mechanism by which an infectious agent is spread from a source or reservoir to a person.
- **Vaccine:** A preparation that stimulates an immune response that can prevent an infection or create resistance to an infection. Vaccines do not cause disease.
- **Vector:** A vector is a carrier of disease agents.
- **Viral infection:** The disease state resulting from the invasion of the body by a virus that can cause illness in humans.
- **Virus:** A particle composed of a piece of genetic material (RNA or DNA), surrounded by a protein coat. Viruses can reproduce only in living cells.
- **Water-borne bacterial disease:** An illness due to infection with bacteria from a contaminated water supply.
- **Widal test:** A tube agglutination test employed in the serological diagnosis of enteric fever.
- **Zoonoses:** An infectious disease that is transmissible from animals to humans under normal conditions.

Revision Questions

UNIT 1: Concepts of Health and Disease

Long Answer Questions (10 Marks)

1. What do you mean by 'health'? Explain different concepts of health.
2. Discuss the different models for health description.
3. Discuss the important dimensions of health.
4. Give a brief account of different determinants of health.
5. What are indicators of health? Explain different indicators and their uses.
6. Explain the concept of disease and discuss the two phases in the natural history of disease.
7. Discuss the concept of prevention of disease.
8. What do you mean by 'incidence rate', 'prevalence rate' and 'case fatality rate'?
9. What are nutritional deficiency diseases? Name some common nutritional deficiency diseases in India and how they can be controlled.
10. Define the terms 'food' and 'nutrition' and explain their importance in 'health for all'.
11. Give a classification of foods.
12. Discuss briefly the nutritional requirements of adults.
13. What diseases are caused due to the deficiency of proteins? What is RDA of proteins? How can protein deficiency diseases be treated?
14. What are fat-soluble vitamins? Name diseases which result from deficiency of fat-soluble vitamins. How can you control such diseases?
15. Discuss the source, functions, uses of vitamin A and describe the associated deficiency and toxicity diseases.

16. Discuss the source, functions, uses of water-soluble vitamins and describe the associated deficiency and toxicity diseases.
17. Describe major food sources, functions, deficiency and toxicity symptoms of minerals.
18. What minerals are required by the body? Discuss their food sources, role in maintenance of health and give their recommended daily intake.
19. Define balanced diet and give the balanced diet for adult male and female as recommended by ICMR.
20. Explain the importance of pantothenic acid, ascorbic acid and folic acid in human health.
21. Describe the function, sources, daily requirement and the associated deficiency diseases of the following:
    a. Calcium
    b. Magnesium
    c. Phosphorus
    d. Sodium and potassium
    e. Fluoride
22. Describe various sociocultural factors that are related to health and disease.
23. Why poverty is considered as major cause of illness? Write about the various measures to alleviate poverty.
24. Discuss the social causes of diseases.
25. Write about the social problems of sick people.

Short Answer Questions (5 Marks)

1. Critically examine the different definitions of health.
2. Describe the role of heredity and environment as determinants of health.
3. Explain the terms 'crude death rate', 'age and sex-specific death rate' and 'infant mortality rate'.
4. Draw and explain the iceberg of disease.
5. Give some examples of how agent factors cause disease.
6. Explain the 'primordial prevention'. How far is it important in prevention of disease?
7. What do you understand by levels of prevention?
8. What do you understand by phases of prevention?
9. Write short notes on:
    a. Physical health
    b. Social health
    c. Tertiary prevention
    d. Holistic concept

10. What is disease eradication? How does it differ from disease elimination and disease control?
11. What measures should be taken to prevent protein-energy malnutrition?
12. What is PEM?
13. What is the difference between marasmus and kwashiorkor?
14. Give a classification of vitamins.
15. Discuss the source, functions, daily requirement and overconsumption of vitamin D.
16. Discuss the functions of vitamin E and describe the associated deficiency diseases.
17. Give the sources, daily requirement and overconsumption of vitamin C.
18. Discuss the functions of vitamin K and describe the associated deficiency diseases.
19. Write about sources, daily requirement and overconsumption of vitamin K.
20. Discuss the functions of vitamin B_1 (thiamine) and describe the associated deficiency diseases.
21. Give the functions, sources, daily requirement of niacin and describe the associated deficiency diseases.
22. Describe the functions, sources, daily requirement of folic acid and describe the associated deficiency diseases.
23. Discuss the functions, sources, RDA of vitamin C (ascorbic acid) and describe the associated deficiency diseases.
24. Write about the social problems of sick people.
25. What is the role of family in health and disease?
26. What is the role of hygiene in human health?
27. How do the following differ:
    a. Mental health *and* spiritual health
    b. Determinants of health *and* indicators of health
    c. Health *and* disease
    d. Pre-pathogenesis *and* pathogenesis phases

Very Short Answers Questions (2 Marks)

1. Define mental health.
2. What do you understand by the term natural history of disease?
3. What is Sullivan's index?
4. Define primordial prevention.
5. Define mortality index.
6. What is holistic concept of disease?

7. What is spiritual health?
8. What are morbidity indicators?
9. What is Germ theory of disease?
10. Give some examples of how agent factors cause disease.
11. What is surveillance?
12. What is the difference between monitoring and evaluation?
13. What do you mean by lifestyle? In which diseases are lifestyle factors very important?
14. What is DALY?
15. What is HALE?
16. What do you understand by tip of the iceberg?
17. What is prevalence rate?
18. What is incidence rate?
19. What is the relationship between prevalence and incidence?
20. What are micronutrients and macronutrients?
21. Write about the iodine and iron deficiency diseases.
22. What is the role of biotin and niacin in human health?
23. Define poverty.
24. Define hygiene.
25. What are avoidable habits?

Multiple Choice Questions [right answers are bold]

1. Which of the following dimensions is included in the WHO definition of health?
   a. Physical
   b. Mental
   c. Social
   d. All of above
2. Which of the following indices are used for measuring disability?
   a. Sullivan's index
   b. HALE (health adjusted life expectancy)
   c. DALYs (disability adjusted life years)
   d. All of above
3. Sullivan index is:
   a. Expectation of life free of disability
   b. Expectation of total life
   c. Expectation of life at 25 years of age
   d. Average life expectancy
4. Progress of a disease in an individual over time, in the absence of intervention is known as:
   a. Spectrum of disease
   b. Epidemiology of disease
   c. Iceberg phenomenon
   d. Natural history of disease

5. In the natural history of disease, the 'pathogenesis phase' starts upon:
   a. Entry of the disease agent in the human host
   b. Interaction between agent, host and environmental factors
   c. Appearance of symptoms
   d. Appearance of toxic symptoms
6. Prevalence is related to incidence by equation:
   a. Prevalence = Incidence × Duration
   b. Incidence = Prevalence × Duration
   c. Prevalence = Incidence – Duration
   d. Incidence = Prevalence – Duration
7. The number of years of healthy life of a person lost due to premature mortality, mortality or disability is known as:
   a. HALE **b. DALYs**
   c. Sullivan's index d. QALY
8. The ability of an infectious agent to invade, multiply and produce infection in a host is known as:
   a. Infectivity b. Pathogenicity
   c. Virulence d. Prevalence
9. Which of the following disease has been eradicated globally?
   a. Cholera **b. Smallpox**
   c. AIDS d. Measles
10. Kwashiorkor is caused by severe deficiency of:
    a. Proteins b. Vitamins
    c. Minerals d. None of above
11. Night blindness is caused by deficiency of:
    a. Vitamin D **b. Vitamin A**
    c. Vitamin K d. Vitamin E

UNIT 2: Preventive Medicine

Long Answer Questions (10 Marks)

1. Write causative agent, clinical features, mode of transmission, clinical features, diagnosis, treatment, prevention and control of cholera.
2. What is SARS? Write causative agent, mode of transmission, clinical features, diagnosis, treatment, prevention and control of SARS.
3. Write causative agent, mode of transmission, clinical features, diagnosis, treatment, prevention and control of Ebola virus disease.

4. Write causative agent, mode of transmission, clinical features, diagnosis, treatment, prevention and control of influenza.
5. What is ARI? Write causative agent, mode of transmission, clinical features, diagnosis, treatment, prevention and control of acute respiratory infection.
6. Write causative agent, clinical features, mode of transmission diagnosis, treatment, prevention and control of malaria.
7. Write agent, clinical features, mode of transmission, diagnosis, treatment, prevention and control of chikungunya.
8. Write agent, clinical features, mode of transmission, diagnosis, treatment, prevention and control of lymphatic filariasis.
9. Write agent, clinical features, mode of transmission, diagnosis, treatment, prevention and control of dengue.
10. Write agent, mode of transmission, clinical features, diagnosis, treatment, prevention and control of pneumonia.
11. Define diabetes. Discuss the types, clinical features, diagnosis, treatment, prevention and control of diabetes.
12. Define cancer. What are the causes of cancer? Discuss clinical features, diagnosis and treatment of cancer.
13. Define psychoactive substances. Explain types of psychoactive substances.

Short Answer Questions (5 Marks)

1. Write laboratory diagnosis and control of cholera.
2. What are symptoms of cholera?
3. Discuss the mode of transmission of cholera.
4. Give the laboratory diagnosis tests for diagnosis of SARS.
5. Write preventive measures in the control of SARS.
6. What is the mode of transmission of SARS?
7. Write diagnostic methods for the detection of Ebola virus infection.
8. Write preventive measures in the control of Ebola virus disease.
9. What is the mode of transmission of Ebola virus infection?
10. Write the causative agent of influenza.
11. Write diagnostic methods for the detection of influenza.
12. Write preventive measures in the control of influenza.
13. What is the mode of transmission of influenza?
14. Define and classify ARI.
15. Name the pathogens causing acute respiratory infections.
16. Write clinical features of ARI.
17. Write mode of transmission of chikungunya.

18. Discuss prevention and control of malaria.
19. Write mode of transmission of dengue.
20. Discuss treatment and control of dengue.
21. Write mode of transmission of malaria.
22. Discuss prevention and control of malaria.
23. Write treatment and control of malaria.
24. Write warning signs of cancer.
25. Write prevention and control of lymphatic filariasis.
26. What are risk factors for hypertension?
27. Write preventive measures for hypertension.
28. Write treatment of hypertension.
29. Give types of diabetes.
30. Define cancer and describe the causes of cancer.
31. Discuss the symptoms of diabetes.
32. Discuss symptoms, diagnosis and treatment of cancer.
33. Discuss the diagnosis of cancer.
34. Discuss the diagnosis and treatment of diabetes mellitus.
35. What are modifiable and non-modifiable risk factors of hypertension?
36. Write about the prevention of hypertension.
37. What are warning signs of cancer?
38. Write screening tests for cervix cancer and breast cancer.
39. Write risk factors for cancer.
40. Write about the prevention of cancer.
41. What are types of diabetes?
42. Write about screening test for diabetes.
43. Write about self-care in diabetes.
44. Write preventive measures for diabetes.
45. Write risk factors for diabetes.

Very Short Answer Questions (2 Marks)

1. Define SARS.
2. Write the causative agent of cholera.
3. Write the causative agent of SARS.
4. Write the causative agent of EVD.
5. Write the causative agent of dengue.
6. What is lymphatic filariasis?
7. What is the incubation period of cholera?
8. What are the drugs of choice in cholera?
9. What is the preferred specimens for diagnosis of Ebola virus infection?
10. What is the incubation period of influenza?

11. Mention the portal of entry of influenza virus in the respiratory tract.
12. Name the drugs used in the treatment of influenza.
13. Name the vaccines available against the influenza virus.
14. Write about the prevention/control of pneumonia.
15. Name five viral diseases.
16. Write classification of communicable diseases.
17. Write preventive measures for SARS.
18. Differentiate between benign and malignant tumor.
19. Write screening tests for cervical cancer.
20. Write diagnosis of cancer.
21. Define hypertension.
22. Classify hypertension.
23. What is DASH diet?
24. Define drug addiction.
25. Define drug dependence.
26. What are psychoactive substances?
27. Give examples of psychedelics.

Multiple Choice Questions [right answers are bold]

1. The drug of choice in cholera is:
   a. Tetracycline b. Mefloquine
   c. Diethylcarbamazine d. All of above
2. Causative agent of cholera is:
   a. *Vibrio cholerae* b. *Salmonella typhi*
   c. Enterovirus d. Adenovirus
3. Latrines and surfaces contaminated with feces should be cleaned using:
   a. solution of 1 : 9 parts of household bleach with water
   b. Phenol
   c. UV rays
   d. Formaldehyde
4. Causative agent for SARS belongs to which family of virus?
   a. Orthomyxoviridae b. Paramyxoviridae
   c. Coronaviridae d. Picornaviridae
5. Causative agent for influenza belongs to:
   a. Orthomyxoviridae b. Paramyxoviridae
   c. Coronaviridae d. Herpesviridae
6. Chikungunya is a:
   a. Viral disease b. Bacterial disease
   c. Fungal disease d. None of above

7. Which of the following disease is transmitted by mosquitoes?
   a. Dengue b. Cholera
   c. AIDS d. SARS
8. Causative agent for Ebola Virus Disease (EVD) belongs to which family of virus?
   a. Paramyxoviridae b. Coronaviridae
   c. Herpesviridae **d. Filoviridae**
9. Incubation period for influenza is:
   a. 1–3 days b. 5–7 days
   c. 12 days d. 20 days
10. Incubation period for lymphatic filariasis:
    a. 12 days b. 1 month
    c. 30 days d. **6 months–1 year**

UNIT 3: National Health Programmes I

Long Answer Questions (10 marks)

1. When was the National AIDS Control Programme initiated and what activities were undertaken?
2. What are the major strategies of National AIDS Control Programme?
3. What is RNTCP? Write its goals, objectives, organization, laboratory network, and newer initiatives taken under it.
4. What is IDSP? Write its goals, objectives, components, organization structure, and its achievement.
5. Classify the types of disease surveillance in IDSP. Discuss the various methods of surveillance.
6. Write classification of surveillance and syndromes under surveillance.
7. What is NMHP? Write its aims, objectives and strategies.
8. Discuss the salient features of District Mental Health Programme.
9. What is Pulse Polio programme? Mention its success story.
10. What is National Programme for the Prevention and Control of Deafness (NPPCD)? Write its objectives, strategies and components.
11. What is National Leprosy Eradication Programme? Write the objectives, components, and activities done under it.
12. Write the major initiatives taken under National Leprosy Eradication Programme.
13. What is Leprosy Case Detection Campaigns (LCDC)? What are various activities under LCDC?

14. What is UIP? Discuss guiding principles of UIP.
15. Write objectives, strategy, components of National Programme for Control of Blindness and Visual Impairment.
16. Write National Immunisation Schedule.

Short Answer Questions (5 Marks)

1. What is sentinel surveillance for AIDS?
2. Write package of services provided under NACP-IV.
3. What is NACP? Write the phases of NACP.
4. When was the National Tuberculosis Programme (NTP) launched? What are the reasons for failure of NTP?
5. What are DOTS and DOTS plus?
6. What are main components of DOTS?
7. What is RNTCP? Write its objectives.
8. Explain the laboratory Network of the Revised National TB Control Programme (RNTCP).
9. Discuss the RNTCP endorsed TB diagnostics.
10. What is NIKSHAY?
11. What is Integrated Disease Surveillance Project (IDSP)? Write goals and objectives of IDSP.
12. Write key features of IDSP.
13. Write components of Integrated Disease Surveillance Project (IDSP).
14. Write key features of Integrated Disease Surveillance Project (IDSP).
15. Classify the types of disease surveillance in IDSP.
16. Discuss the various methods of surveillance.
17. Write syndromes under surveillance in IDSP.
18. What are behavioral surveillance surveys?
19. What is AFP surveillance?
20. What is NLEP? Write strategies of NLEP.
21. Write activities done under NLEP.
22. Write Disability Prevention and Medical Rehabilitation in leprosy.
23. Write role of ASHA in National Leprosy Eradication Programme.
24. What is NMHP? Write its components.
25. Write the main components of District Mental Health Programme.
26. What is NPPCD? Write its objectives.
27. What are leprosy control units?
28. What are SET centers under NLEP and what are their functions?

29. Expand DPT, OPV, TT, BCG.
30. Name diseases protected by vaccination under UIP.
31. Discuss vaccines under UIP.
32. Discuss syndromes under surveillance in IDSP.
33. Which vaccines under UIP are given to children during first year of life?
34. Write components of National Programme for Control of Blindness and Visual Impairment.
35. What is NPCB VI? Write its objectives.

Very Short Answer Questions (2 Marks)

1. What are National Health Programmes?
2. Name National Health Programmes for control of communicable diseases.
3. Name National Health Programmes for control of non-communicable diseases.
4. Name National Health Programmes related to health system strengthening.
5. Name National Health Programmes related to nutrition.
6. What is PPTCT in AIDS?
7. What is NACO? What is its purpose?
8. When was Revised National TB Control Programme (RNTCP) launched?
9. What is DOTS?
10. Which drug regimen is followed in DOTS?
11. What is Multi-drug Resistant Tuberculosis (MDR-TB)?
12. What is RNTCP and what are its goals?
13. What is Integrated Disease Surveillance Project (IDSP)?
14. Write goals of Integrated Disease Surveillance Project (IDSP).
15. Write objectives of Integrated Disease Surveillance Project (IDSP).
16. What is the difference between active surveillance and passive surveillance?
17. What is NLEP? Write objectives of NLEP.
18. Write components of NLEP.
19. What is NMHP? Write its aims.
20. What is Universal Immunisation Programme?
21. Write differences between vertical and horizontal health programmes.
22. What are key strategies of National AIDS control Programme?
23. What is active case finding and passive case finding to detect tuberculosis?

24. What is Acute Flaccid Paralysis (AFP) surveillance?
25. What is NPCB VI?
26. Name eye diseases identified for global elimination.
27. Name 5 diseases that can be prevented by immunisation.
28. What is Pulse Polio Immunisation (PPI)?
29. What is the immunisation schedule during pregnancy?
30. Define immunisation.

Multiple Choice Questions [right answers are bold]

1. DOTS treatment involves the use of drugs except:
   a. Isoniazid b. Rifampicin
   c. Pyrazinamide **d. Tetracycline**
2. Which disease is included in Universal Immunisation Programme?
   a. Tetanus b. Poliomyelitis
   c. Tuberculosis **d. All of above**
3. Revised National Tuberculosis Control Programme was launched as a national programme in:
   a. 1993 **b. 1997**
   c. 1998 d. 1994
4. MDT is used in the treatment of which disease?
   a. Leprosy b. Tuberculosis
   c. Malaria d. AIDS
5. NPPCD was launched by the Government of India in:
   a. 2006 b. 2004
   c. 2001 d. 2000
6. In which year the Pulse Polio Immunisation (PPI) program was launched by Government of India?
   a. 1993 **b. 1995**
   c. 1997 d. 1999
7. Main causes of blindness:
   a. Cataract b. Refractive error
   c. Glaucoma **d. All of above**
8. Route of administration of BCG vaccine is:
   a. Intramuscular b. Intravenous
   c. Intradermal d. Oral
9. DPT stands for:
   a. **Diphtheria, Pertussis and Tetanus Toxoid**
   b. Dengue, Pertussis, Tetanus Toxoid
   c. Diphtheria, Plague, Tetanus Toxoid
   d. Diphtheria, Plague, Tuberculosis

10. Route of administration of polio vaccine is:
    a. Intravenous
    b. Subdermal
    c. Intramuscular
    d. Oral

UNIT 4: National Health Programmes II

Long Answer Questions (10 Marks)

1. Define mother and child health services. Describe objectives and components of MCH services.
2. Describe salient features of antenatal care.
3. Describe salient features of neonatal care.
4. Discuss the various factors responsible for population explosion in India.
5. What do you mean by family planning? Enumerate its various activities.
6. Discuss the objectives and scope of family planning in India.
7. What do you mean by 'Contraception'? Compare the different types of contraception methods.
8. Discuss physical methods of contraception.
9. Discuss chemical methods of contraception.
10. Give a brief account of hormonal contraceptives.
11. What do you mean by vasectomy and tubectomy? Discuss their role in birth control.
12. Write a note on census of India.
13. What are the major gains of the National Family Welfare Programme?
14. Describe salient features of National Tobacco Control Programme (NTCP).
15. Discuss the implementation of National Tobacco Control Programme (NTCP) at central, state and district levels.
16. What are the main objectives and strategies under the NPHCE programme?
17. Discuss packages of services at different levels under NPHCE.
18. What is World Health Organization (WHO)? Discuss the functions of WHO.
19. What are strategic priorities of the WHO India Country Cooperation Strategy?
20. Write note on:
    a. Nirodh
    b. IUDs
    c. Copper T
    d. Rhythm method

e. Population explosion
f. Oral pills
g. Recommended family planning methods

Short Answer Questions (5 Marks)

1. What are the causes of maternal mortality?
2. What is preconceptional care? Discuss the main aspects of preconceptional care.
3. What is antenatal care and what are its main objectives?
4. What are special antenatal services provided by Government of India?
5. Explain intranatal care and write its objectives.
6. What are objectives of postnatal care?
7. Explain domiciliary midwifery service and give its advantages and disadvantages.
8. What is APGAR score?
9. Which drugs should a pregnant mother receive and for what duration?
10. What are barrier methods of contraception?
11. Briefly describe the modern oral pills for contraception.
12. Briefly describe the modern depot formulations for contraception.
13. What is the role of copper in contraception? Explain different types of copper devices.
14. Describe briefly the post-contraception methods.
15. What is a Mini pill?
16. What is a combined pill?
17. What is Mini Lap Tubal Ligation?
18. What is non-scalpel vasectomy?
19. What is Copper T?
20. What is the mode of action of an IUD?
21. What are the most common complications of an IUD?
22. What are injectable contraceptives?
23. What is Depot Provera and how does it act?
24. What are the functions of National Tobacco Control Cell (NTCC)?
25. What are the functions of District Tobacco Control Cell (DTCC)?
26. What are the functions of State Tobacco Control Cell (STCC)?
27. What is Annual Parasite Incidence and what is its importance?
28. What is the objective of the modified plan of operations in malaria?

29. What is a high-risk pregnancy?
30. How many visits should be made by a health worker during pregnancy?
31. How are congenital anomalies in fetus during pregnancy diagnosed?
32. What is the Reproductive and Child Health Programme?
33. What are the major gains of the National Family Welfare Programme?
34. What are functions of WHO?

Very Short Answer Questions (2 Marks)

1. What is the population of India?
2. Name the states having higher population in India.
3. Define maternal mortality.
4. What is the difference between family planning and family welfare?
5. Define maternal death.
6. Define child health.
7. What is meant by mother and child health (MCH)?
8. What are the objectives of mother and child health (MCH) services?
9. Define preconceptional care.
10. Define antenatal care.
11. Define postnatal care.
12. What is the Weight Height Product Index (WHPI)?
13. What are the major health achievements in India in recent years?
14. When is the World Health Day celebrated?

Multiple Choice Questions [right answers are bold]

1. WHO was established in:
   a. 1940 **b. 1948**
   c. 1953 d. 1925
2. Period starting from the time of conception to the onset of labor is known as:
   a. Prenatal period **b. Antenatal period**
   c. Intranatal period d. Postnatal period
3. National Family Planning Programme (NFPP) was launched in:
   a. 1945 b. 1956
   c. 1952 d. 1958

4. The function of Copper-T is to:
   a. Stop menstruation
   b. Stop growth of embryo
   c. To expel fetus
   d. Prevent fertilization
5. National Programme for Health Care of Elderly (NPHCE) was launched in:
   a. 2010
   b. 2012
   c. 2017
   d. 1983
6. The World Health Day is celebrated annually on:
   a. 7th April
   b. 7th May
   c. 10 June
   d. 5 June
7. Emergency contraceptive pills prevent pregnancy by:
   a. Preventing fertilization
   b. Preventing ovulation
   c. Inducing abortion
   d. Harming embryo
8. RMNCH+A Programme was launched in:
   a. 2014
   b. 1994
   c. 2012
   d. 2000
9. India became a party to the WHO constitution in:
   a. January 1948
   b. March 1949
   c. December 1950
   d. April 1952
10. The WHO country office for India is headquartered in:
    a. Chandigarh
    b. Bangalore
    c. **Delhi**
    d. Hyderabad

UNIT 5: Community Services

Long Answer Questions (10 Marks)

1. Discuss the major health problems in India.
2. Discuss various barriers to healthcare access in rural areas.
3. Discuss Rural Health Scheme.
4. Discuss the services provided by Sub-Health Centre (SHC).
5. Define 'Primary Health Care'. Enumerate the key elements of primary healthcare.
6. How is primary healthcare provided at village level?
7. Explain the Indian Public Health Standards (IPHS) for PHC.
8. Explain the functions of the PHC.
9. Discuss the various schemes launched to provide safe sanitation in rural areas.
10. Write salient features of National Urban Health Mission.
11. What are roles and responsibilities of ASHA?
12. What are the salient features of National Urban Health Mission?

13. What are the objectives and strategies of National Rural Health Mission (NRHM)? Write a note on the job responsibilities of ASHA under NRHM.
14. Discuss briefly about various levels of healthcare services.
15. Write in detail about National Rural Health Mission.
16. Define health education. Explain the principles of health education giving examples.
17. Enumerate objectives of school health programme.
18. Discuss main components of school health promotion.
19. Explain causes for reduction of maternal mortality in India.
20. Give full form of
    a. NACP
    b. NVBDCP
    c. NLEP
    d. lDSP
    e. RNTCP
    f. NBCP
    g. CCP
    h. MNREGS

Short Answer Questions (5 Marks)

1. Write about mission 'Healthy people 2020'.
2. Mention the elements of Primary Health Care.
3. How social stigma and privacy issues act as barriers to healthcare access in rural areas?
4. Write about different levels of healthcare services.
5. Write in short barriers in healthcare access in rural areas.
6. What is Village Health Guides Scheme (VHG-Scheme)?
7. What is the duration of training of a village health guide? What does she learn during her training?
8. What is the duration of training of a local dai? What does she learn during her training?
9. Discuss the role and responsibilities of Traditional Birth Attendants (TBA).
10. What is the duration of training of a Traditional Birth Attendants (TBA)? What does she learn during her training?
11. Discuss the role of Traditional Birth Attendants (TBA).
12. Discuss the role of Anganwadi Worker (AWW) at village level under rural health scheme.
13. What is Subhealth Centre? Write its functions.
14. How are antenatal care services provided in Subhealth Centre?
15. What is the role of sanitation in human health?

16. Define 'Safe water' and 'potable water'.
17. Write about the sources of water in rural areas.
18. Discuss different types of wells for supply of water.
19. What are the sources of refuse? Describe the different methods of disposal of refuse.
20. Write about transmission of infection through feces and role of sanitation barrier in transmission of various infections.
21. What are the different methods of excreta disposal?
22. Explain the construction and working of a bored hole latrine.
23. Explain the construction and working of RCA latrine.
24. Explain the construction and working of a septic tank.
25. Describe the essential components of a water carriage/sewerage system.
26. Write about the proper disposal of sewage.
27. Explain the construction and working of an Activated Sludge Unit.
28. Write about the modern sewage treatment plant.
29. Write objectives of Total Sanitation Campaign (TSC).
30. Discuss objectives of 'Nirmal Bharat Abhiyan' (NBA).
31. What is a Primary Health Centre?
32. What are the goals of National Health Mission?
33. What are main strategies of National Urban Health Mission?
34. Write goals of National Urban Health Mission.
35. Write a note on the job responsibilities of ASHA under NRHM.
36. What are main strategies of National Rural Health Mission?
37. Write goals of National Rural Health Mission.
38. Write a note on the job responsibilities of ASHA under NRHM.
39. Enumerate functions of multipurpose worker female.
40. Write in brief principles of school meal programme.
41. What are the essential elements of antenatal care?
42. What are the principles and elements of Primary Health Care?
43. Describe the job responsibilities of female health worker.
44. Write about School Health Programme.
45. Mention the objectives of postpartal care.
46. Discuss the specific health protection given to the antenatal cases.
47. What is three-tier system of healthcare delivery?
48. What are the recommendations of Bhore committee?
49. Describe 'ASHA's role and responsibilities under National Rural Health Mission.
50. What are the different aspects of school health services?

Very Short Answer Questions (2 Marks)

1. Define community services.
2. Define community health.
3. Name the states that have India's highest number of malnourished children.
4. Define malnutrition.
5. Name the various diseases that are prevalent in India due to malnutrition.
6. What is the mission 'Healthy people 2020'?
7. What are the causes for population explosion in India?
8. What are the duties of health guides under Village Health Guides Scheme?
9. What is the role of traditional birth attendants (TBAs)?
10. What is SHC?
11. What is NHM?
12. Write recommendations of Bhore Committee.
13. What is Urban-Primary Health Centre (U-PHC)?
14. What is Urban-Community Health Centre (U-CHC)?

Multiple Choice Questions [right answers are bold]

1. The World Health Organization's (WHO) defined the concept of Primary Healthcare (PHC) at:
   a. Geneva b. India
   c. Alma Ata conference d. France
2. Rural Health Scheme was launched by Government of India in:
   a. 1970 b. 1980
   c. 1998 **d. 1977**
3. Which is true regarding an *Anganwadi* worker?
   a. Part time worker
   b. Under go four month training
   c. Selected from the community itself
   d. All of the above
4. *Anganwadis* are under:
   a. Ministry of Health and Family Welfare
   b. Ministry of Labor
   c. ICDS scheme
   d. None of above
5. Central Rural Sanitation Programme (CRSP) was launched in:
   a. 1986 b. 1982
   c. 1990 d. 1987

6. NRHM was launched by the Prime Minister on :
   a. 12th April 2005 b. 12th April 2006
   c. 12th June 2009 d. 22nd April 2001
7. Each Local *Dai* undergo a training for:
   a. 2 Months **b. 1 Month**
   c. 3 Months d. 1 Year
8. Which is true regarding Primary Health Centre?
   a. Provide basic laboratory workers.
   b. Educate community about health.
   c. Provide maternal-child health including family planning.
   d. All of above.
9. As per norm one U-PHC is required for approximately:
   a. 10,000–20,000 urban populations
   b. 50,000–60,000 urban populations
   c. 10,000–20,000 rural population
   d. 50,000–60,000 rural populations
10. The first contact point between the community and the primary healthcare system is:
    a. Village Health Guide **b. Subcentre**
    c. Child care centre d. None of above

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Social and Preventive Pharmacy

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meets the requirements of undergraduate students in pharmacy and provides an up-to-date knowledge in the field as envisaged by the Pharmacy Council of India (course BP 802T). Witten in a simple language, easy-to-understand text is the outstanding feature of this book.

Figures and tables have been incorporated liberally to facilitate the learning objective of social and preventive pharmacy. Abbreviations will help the readers in easy comprehension and recall of the subject matter. Glossary serves as a handy compilation of definitions of common terms. Revision questions will help the students in self-assessment of the grasp of the subject matter.

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