

HIGHER SECONDARY COURSE
HOME SCIENCE



Government of Kerala
Department of General Education

Prepared by
State Council of Educational Research
and Training (SCERT), Kerala

2026

THE NATIONAL ANTHEM

Jana-gana-mana adhinayaka, jaya he
Bharatha-bhagya-vidhata
Punjab-Sindh-Gujarat-Maratha
Dravida-Utkala-Banga
Vindhya-Himachala-Yamuna-Ganga
Uchchala-Jaladhi-taranga
Tava subha name jage,
Tava subha asisa mage,
Gahe tava jaya gatha
Jana-gana-mangala-dayaka jaya he
Bharatha-bhagya-vidhata
Jaya he, jaya he, jaya he,
Jaya jaya jaya, jaya he.

PLEDGE

India is my country. All Indians are my brothers and sisters.

I love my country, and I am proud of its rich and varied heritage. I shall always strive to be worthy of it.

I shall give my parents, teachers and all elders, respect and treat everyone with courtesy.

To my country and my people, I pledge my devotion. In their well-being and prosperity alone, lies my happiness.

Prepared by

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FOREWORD

Home Science is an essential subject that helps learners understand the principles of healthy living, personal well-being, and social responsibility. This Home Science Text Book for Plus One is carefully designed to give awareness on the core areas of Child Development and Nutrition, in accordance with the prescribed curriculum. The unit Child Development introduces students to the different stages of human growth namely Infancy, Childhood, Adolescence, and Old Age. Through this unit, learners gain a basic awareness of physical, emotional, and social development at each stage of life. The content helps children understand the importance of care, love, respect, and healthy habits throughout the life cycle. It also promotes positive attitudes towards family members of all ages. The unit Nutrition focuses on the importance of food for growth, health, and energy. Students are introduced to the concept of a balanced diet, the role of different food groups, and simple ideas related to diet therapy, food preservation, and food safety. This unit aims to create awareness about healthy eating habits and the wise use of food resources in daily life. This text book is prepared using simple language and structured questions suitable for the cognitive level of Plus One students. It encourages observation, understanding, and expression in a stress-free learning environment. The questions are framed to support continuous assessment and help teachers evaluate students' learning outcomes effectively.

As an organisation committed to systematic reform and continuous improvement in the quality of its products, SCERT welcomes comments and suggestions for further revision and refinement.

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Do you know?

Gives extra information for students. It is not meant for evaluation.



Let us do

“Let us do” includes activities related to the lesson.



Check your progress

“Check your progress” includes questions to check students’ understanding of the lesson.



Lab activity

Lab activity is meant for doing practicals in laboratory as a part of practical evaluation.

THE CONSTITUTION OF INDIA

PREAMBLE

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a ¹**[SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC]** and to secure to all its citizens :

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity; and to promote among them all

FRATERNITY assuring the dignity of the individual and the ²[unity and integrity of the Nation];

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949 do **HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.**

1. Subs. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Sovereign Democratic Republic" (w.e.f. 3.1.1977)
2. Subs. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Unity of the Nation" (w.e.f. 3.1.1977)

1

HOME SCIENCE : CONCEPT AND SCOPE



Our contemporary world is characterized by transitions from industrial to knowledge-based culture and globalized economy and the consequent effects on society and culture. The information age is complex, diverse and unpredictable, yet it retains certain elements of society that are necessary for sustainable development. This is where Home Science becomes relevant and deserves renewed attention.

Home science is referred world over by different names. But, in terms of content, nature and view point they are all similar. The names given to it are *Domestic Art, Household Science, Household Art, Household Economy, Household Administration and Euthenics*. In America it is termed *Home Economics*, in Britain and India as *Home Science*. The science of the home is concerned with the maintenance and enhancement of human relationship through the development and judicious use of all available human and material resources to achieve maximum satisfaction for all members of the family. It is a need based, professionally oriented education to inculcate life skills to individuals, families and society for holistic development which ultimately results in National Development. It is the education for better living and the core of this education is the family ecosystem.

The interdisciplinary field of Home Science can contribute to the benefit of families and the community at micro and macro level to gear for change and development towards the desired direction. It takes an action oriented, empowerment approach that enables students to build capacity for critical and creative approaches to decision making and problem solving related to all aspects of life. The different branches of Home Science correspond not only to the basic needs of humans but also family, human resource development and national development.

Home Science has unique features which distinguishes itself from other subjects. It is a dynamic and ever growing subject having maximum practical application throughout life. Home Science as a field in education has gone a long way. It deals with reciprocal relations between the family in its natural and manmade environments. Home Science education helps the students to explore different means to live happily with their families, social groups and communities. Home is a place where life begins and school is the place where formal education begins. Hence, only the values generated at home can be further enriched at school.

From times immemorial, down the ages of civilization, “Home and Family” have been the core of all human development and the society at large. By catering to the physical, psychological, social, cultural and spiritual needs of the members, home gives meaning to life and refines the life of citizens, resulting in a developed nation. It explores the possibility of establishing perfectionism in the social orders starting from the home to the community. In a nutshell, the goals of Home Science can be spelled out as an education which is “value oriented” and “resourceful” for leading a happy, healthy and contented life.



Do you know?

Ellen Henrietta Swallow Richards (1842 - 1911) was the first woman to attend Massachusetts Institute of Technology and later became the first female instructor. Her pioneering work in sanitary engineering and experimental research in domestic science, laid the foundation for the new science of Home Economics. She was the founder of the Home Economics movement with the modern and scientific approach in routine household tasks in America. She was the first to apply chemistry to the study of nutrition. She was not only a great educationist, but also a founding ecofeminist, who believed that women's work within the home was a vital aspect of the economy.



1.1 Definition of Home Science

In 1961 Dr. Devadas R.P defines Home Science as a synthesis of all the fine arts and sciences, interwoven together harmoniously, to foster and nurture the physical, social, cultural and spiritual development of the individual, family and community. Home Science is the study of food, shelter and clothing and their management aimed at promoting the well being and overall human development of individuals and families.

The present nomenclature of Home Science is also termed as Community Science. The change from Home Science to Community Science happened as the focus of the discipline expanded from improving the well being of individual families to addressing the needs and development of entire communities.

1.2 History of Home Science in India

The teaching of Home Science in India is not very far back. It began between 1920 to 1940, under the British administration; it was introduced in schools and colleges as Domestic Science, Home Craft, and Domestic Economy. The Princely state of Baroda was one of the first to introduce Home science in secondary schools. The Avinashlingam Home Science College, Coimbatore headed by Dr. Devdas R.P contributed greatly towards the expansion of interdisciplinary courses at various levels, primary to higher education. Here is the journey of Home Science in India over the years.

1. 1932- Lady Irwin College was established in Delhi.
2. 1935- Agricultural Institute of Allahabad started Diploma in Home Science. Later it grew into a University Department.
3. 1938- Madras University, Queen Mary' College and Women's Christian college started Home Science at Degree Level.
4. 1950- Baroda became a nucleus for development of this discipline. Coimbatore, Ludhina, Mumbai, New Delhi, Udaipur and Tirupati established Home Science Institutions.
5. 1960-1970 – Agricultural Universities established all over the country. Teaching of Home Science as a subject was recognized.
6. 1980 Onwards- Prestigious Institutions in India offering B.Sc., M.Sc. and Ph.D in Home Science started.

The Home Science Association of India

Established in 1951 with its roots at Baroda under the guidance of Dr. Flemmie P. Kittrell, Dr. Leela Shah and Ms. Dorothy Pearson, the association has the broad objectives as 'Raise the standard of Home Science education in schools and colleges' and 'Make homes and families healthier and happier'. The First convention of Home Science Association of India took place in the year 1952; the association publishes "The Indian Journal of Home Science" quarterly and is represented at the International Federation of Home Economics.



Let us do

Collect more information about the History of Home Science and prepare a note on it digitally.

1.3 Concept of Home Science

Home Science is an interdisciplinary field of study that focuses on improving the quality of life that integrates scientific knowledge with practical skills related to home management, nutrition, textiles, child development, human relationships, and resource management improving family and individual wellbeing. The key aspects of Concept in Home Science are as follows:

- **Interdisciplinary:** Encompasses Science, Social science, and Humanities.
- **Life-oriented:** Trains in soft skills, personality, and family welfare.
- **Skill-based:** Equips in multitasking with practical competencies for household and professional roles.
- **Human-centered:** Focuses on enhancing the well-being of individuals and families.
- **Philosophy:** Rooted in the idea that scientific knowledge can enhance everyday life, promote self-reliance, and strengthen families.
- **Principles:** Covers resource management, nutrition, human development, textiles, and family relationships — all aimed at better living.

Scope of Home Science education

The scope of Home Science education begins from the conception till the death of the individual. Home Science education is vast and the curriculum is intrinsically weaved with both arts and science subjects and covers a wide range of areas. Students are given insight and are trained in skills to manage self, home and community. Home Science education encourages development and use of personal, social, material, and natural resources to meet human needs as consumers/producers.

The development of Home Science education reflects cultural and social pressures that are evident. It is need-based, professionally oriented and focused on holistic education to assist and train families and communities towards improved living. In the context of growing pressures in the work environment and external world, the family takes the responsibility and plays a significant role in shaping the citizens of tomorrow. The subject highlights the importance of home and its ecosystem for making better human beings. The family is the main factor which protects the individuals from all external forces and provides the right type of atmosphere for children to grow into strong and independent personalities. Home Science, then becomes the key subject in shaping individuals.

The importance and significance of Home science education can be summarized as follows:

1. Use of scientific knowledge in managing home life

Immense progress has been made in the areas of health, nutrition, textile and clothing, human development, housing and managerial skills, which the home maker requires in day-to-day life of managing and maintaining the household. Hence, it is necessary that such knowledge and skills are made available to every home maker to create a healthy, happy and enriched family life.

2. Use of available services and facilities

Nowadays society has changed a great deal in terms of availability of various services to each and every household. Therefore, a formal and systematic approach of understanding and utilizing these services has become necessary as a preparation for home making. Moreover, use of modern technologies, its maintenance and management also is of great importance, which Home Science education fulfill. Home Science education empowers an individual to make the best use of available knowledge and skills for the optimum functioning of homes and betterment of family members.

3. Managing day to day family affairs

Human relations have been undergoing drastic changes during the last few decades. Due to the breakdown of joint families the traditional values like sense of belongingness, and family values are greatly affected these days. People are becoming more and more self-centered in nature, contrary to our Indian collectivism. Children are growing up in a very complex psychological environment which leads to many problems. Today family problems are on the rise, leading to various types of domestic violence, abuse, crimes etc. Home Science education tries to educate and help acquire the ability to manage this crisis at the right time with proper emphasis.

4. Preparing for a healthier and purposeful life

Happiness, peace, content, sense of security and belongingness in the family are the ultimate goals of purposeful family life. Home Science education tries to create an environment and outlook, which will enable people to live happily and to lead a more purposeful life. It tries to provide wholesome knowledge and attitudes towards promoting optimum family health, nutrition, child care, use of clothing, elderly care and management during risk and eventualities. It tries further to enrich the lives of each and every member of the family through better understanding of the human relationships for leading a successful life.

5. Offering family life education

Home Science education helps in preparing for home making, in the development of right values, appreciation, and understanding for better family life. It enables the children to understand the functions of parenthood, responsibilities of family membership and management of one's resources. It helps them develop a sound philosophy of personal and family living. Understanding oneself and others is the basic essence of family life. Moreover, it helps us in careful weighing of and balancing competing demands and making intelligent decisions. Home Science recognizes homes as the foundation of human development and integrity of family as an inevitable requisite for the establishment of homes.

1.4 Knowledge Domains of Home Science



Home Science was founded for the purpose of helping individuals and families relate to change its uniqueness lies in the holistic view of daily living of individuals and families. Income and employment, health and population, nutrition, education, housing, social welfare and extension activities always remain key developmental indicators and priorities to any government: these indicators correspond to the curriculum and knowledge domains of Home Science.

Following are the conventional knowledge domains of Home Science and new ones are added on as reflected in career opportunities.

1. Food and Nutrition

Food and Nutrition studies cover core areas like Biochemistry, Physiology, and Microbiology, combined with practical subjects such as Human Nutrition, Dietetics, Food Chemistry, Food Safety, and meal planning, exploring how nutrients affect health, disease, food science, processing, and public health. Specialized electives often include Sports Nutrition, Clinical Nutrition, Food Product Development, and Sustainable Food Systems, bridging science with real-world application in health, industry, and policy.

2. Human Development and Family Studies

The study of Human development covers the biological, psychological, emotional, social, and cognitive changes across the entire lifespan from conception through old age. The common behavioural problems of children, gifted children with special needs, Early childhood care and education, Child development theories, etc. are also dealt within this area. Geriatrics, counselling, dynamics of marriage and family relations, psychometric assessment, etc. are also covered in this area.

3. Family and Community Resource Management

The area deals with the management of time, money, energy, space, and human/material resources for better living. Sustainable practices for resource conservation are also a part of the study. Other topics include consumer education with information regarding food safety, safety against adulteration, common adulterants and its health hazards, Consumer Protection Act, etc. Basic principles of design are also included.

4. Textiles and Clothing (Apparel and Textile Science)

Textile Science focuses on the study of classification and properties of textile fibres, fibre identification methods, yarn processing, and types, methods of fabric construction, principles of dyeing and printing, textile finishes, etc. In the clothing part, anthropometry, application of elements and principles of design to clothing, garment construction, fashion terminology, chemistry of textile engineering, woven textile designing, pattern making and draping, etc. are included.

5. Extension Education and Communication Management

Extension Education is a community oriented subject and looks in detail at the various programmes implemented by the Government for community development, programme planning, communication skills, study of audio- visual aids, social work, applied nutrition, leadership development, etc.

The following table provides information about the new/allied specializations of the domains discussed:

Major Domains	New / Allied Domains
Food and Nutrition	Nutrition & Dietetics, Clinical Nutrition & Dietetics, Public Health Nutrition, Sports & Exercise Nutrition, Food Safety & Quality Assurance, Nutraceuticals & Functional Foods, Clinical Dietetics, Food Biotechnology, Nutrition Counselling & Lifestyle Coaching, Hospital Food Service Management.
Human Development and Family Studies	Early Childhood Care & Education (ECCE), Special Education, Child Guidance & Counselling, Gerontology & Elder Care, Developmental Therapy, Family & Marriage Counselling, Inclusive Education, Child Rights & Protection Studies, Disability Studies.
Textiles and Clothing	Fashion Technology, Apparel Production & Merchandising, Textile Science & Nanotechnology, Fashion Communication & Styling, Costume Designing, Sustainable & Eco-Friendly Textiles, Technical Textiles, Garment CAD/CAM Technology.
Family and Community Resource Management	Interior Design & Space Planning, Ergonomics & Human Factors, Facility & Property Management, Event Management, Consumer Studies & Service Management, Home Furnishings & Décor Technology, Sustainable Housing & Green Design, Household Equipment & Appliance Technology.
Extension Education and Communication Management	Community Development & Social Work, Health & Wellness Communication, Rural Development Studies, Digital Communication & Media for Development, Programme Planning & Development Management, Women's Studies & Gender Empowerment, Training & Capacity Building, NGO Management & CSR Activities.

Table 1.1 Allied Domains of Major Domains in Home Science

1.5 Career Opportunities in Home Science

The scope in the field of Home Science is vast as there are a wide range of areas that the students are trained in. Students are given insight into the disciplines of Home Science, namely Food and Nutrition, Human Development, Family and Community Resource Management, Textiles and Clothing and Extension Education. The employment opportunities for Home Science Specialists are continuously growing. There are excellent careers one can pursue in hospitals as dietitians or at clinical child development centres.

After the specialization in Home Science, one can either join various industries like production industry, hospitality industry, service industry or teaching, technical, sales or opt for further studies. The curriculum has been adapted to the changes in the industry and Home Science students now have a wider scope for research and employment. The career choice in Home science will depend on the social and educational aptitude of the student. It is important that the students choose an area which interests them the most. The curriculum is planned to prepare students to be effective managers of the family and the community by managing the human and material resources effectively. It should also enable them to develop professional competence for jobs in the private and public sector.

Specialization	Career Prospects
Food and Nutrition	Dietitian, Clinical Nutritionist, Community Nutritionist, Food Analyst, Quality Control Officer, Food Service Manager, Nutrition Educator, Research Assistant, Freelance Diet/Nutrition Consultant, Research Dietitian, Banquet supervisor, Catering, Health and Wellness Consultant.
Human Development and Family Studies	Child Development Specialist, Preschool/Nursery School Teacher, Special Educator, Counsellor, Social Worker, Rehabilitation Worker, Elderly/Disabled Caregiver, NGO Worker, Geriatric Care Manager, Developmental Therapist.
Textiles and Clothing	Fashion Designer, Textile Designer, Apparel Merchandiser, Quality Control Supervisor, Boutique Owner, Costume Designer, Fabric Technologist, Garment Export House Professional.
Family and Community Resource Management	Interior Designer, Event Planner, Consumer Advisor, Ergonomics Specialist, Facility Manager, Entrepreneur in Home Decor or Services, Event Manager, Front Office Assistant, Financial Planner.

Extension Education and Communication Management	Community Development Officer, Programme Coordinator, Rural Extension Officer, Health Educator, Communication Specialist, Project Assistant in Government Schemes, NGO/ Development Agency Worker, Content Writers, Content Creators, Community Media Analyst, Project Associates in Govt. and non Govt. bodies, Skill Development Officers, Gender Consultants.
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Table 1.2 Career Prospects of Home Science

General to All Categories

- Teachers in schools/ colleges/ catering colleges/ nursing colleges/ non- governmental organizations
- Agricultural research centres, Social Justice Departments, Krishi Vigyan Kendras
- National agencies like Indian Council of Medical Research (ICMR), National Institute of Nutrition (NIN) and International agencies like United Nations International Children's Emergency Fund (UNICEF), Food and Agricultural Organization (FAO), Co-operative for American Relief Everywhere (CARE)
- Project fellows in various projects (UNICEF, International, National level community projects)
- Integrated Child Development Scheme (ICDS) Supervisor, Child Development Project Officer (CDPO)
- Entrepreneurial or self employment
- For all Union and State Public Service Commissions according to eligibility.



Let us do

Conduct a seminar on 'Employment opportunities in Home Science' with a focus on self employment.



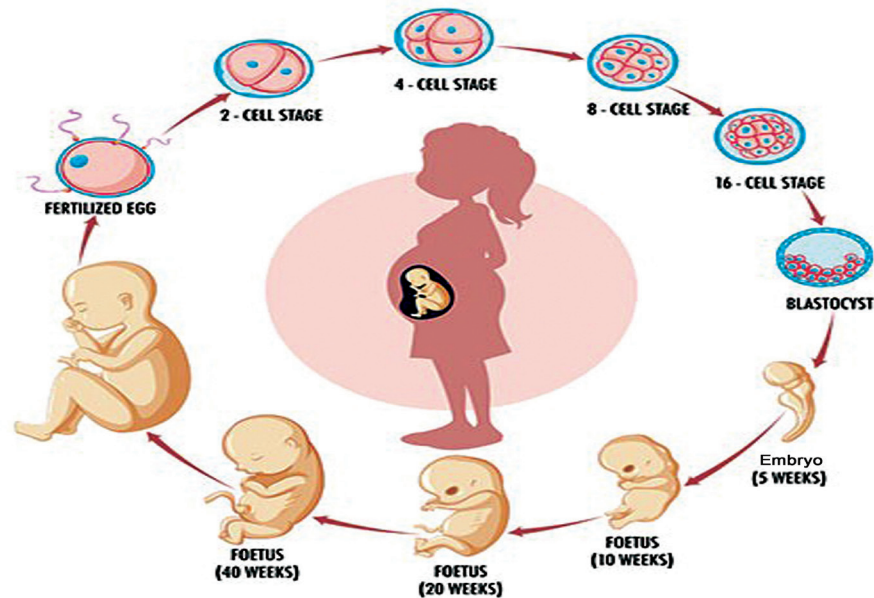
Check your progress

1. Analyze the significance of Home Science education.
2. Expand the following
 - a. ICMR
 - b. UNICEF

2

UNDERSTANDING HUMAN DEVELOPMENT

Observe the illustration and explain what it depicts:



Early stages of prenatal development

You can observe the transformations that have happened from conception to a full-grown baby. Human development in general can be divided into prenatal (before birth) and postnatal (after birth). Interest in human development is widespread largely because of curiosity about our beginnings and a desire to improve the quality of human life. Let us examine characteristic features of prenatal stage in detail in this chapter.

2.1 Prenatal Development

It begins from conception to birth and lays the foundation for later growth and development. A typical pregnancy lasts about 40 weeks (280 days) from the first day of the last menstrual period (LMP).

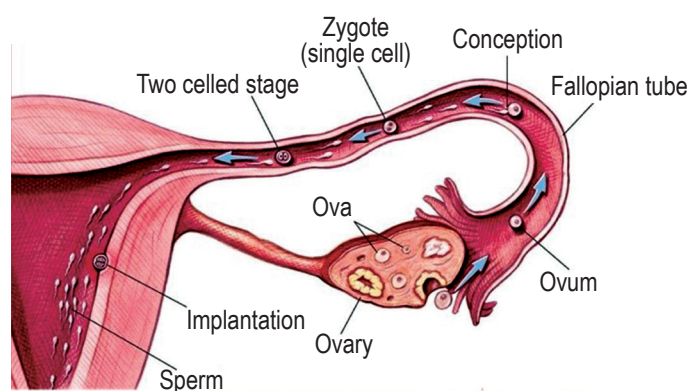
Stages of prenatal development

Stages of prenatal development can be divided into 3 major stages namely, the germinal stage, the embryonic stage and the foetal stage. Conception occurs when sperm fertilizes an egg and forms a zygote. The Germinal stage (first 2 weeks) starts with fertilization and ends when the zygote implants in the uterus. Next is the embryonic stage (weeks 3–8), when major body structures and organs begin to form. During this period, the baby is referred to as an ‘embryo’. Finally, the foetal stage (from week 9 to birth) is when the baby grows and develops major organs and systems until delivery. In this period it is referred to as a ‘foetus’.

Characteristics of prenatal stage

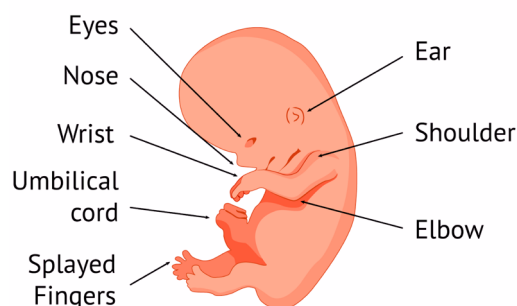
i. Germinal stage (0 - 2 weeks)

- This initial stage lasts from conception to two weeks.
- A sperm fertilizes the egg to form a zygote, which then undergoes multiple cell divisions (mitosis).
- The resulting blastocyst travels to the uterus and implants in the uterine wall.
- During this period, the foundations for the placenta, umbilical cord, and amniotic sac are formed.



ii. Embryonic stage (3 - 8 weeks)

- Occurring from the third to the eighth week, this stage is marked by rapid growth and development.
- Major organs and body systems begin to form, including the heart, which starts to beat.
- The amniotic sac and placenta are fully formed, providing protection and nourishment to the embryo.



- The embryo is particularly sensitive to harmful environmental factors during this time, as all vital structures are forming.
- Sex organs develop well enough to distinguish the gender of the embryo.

iii. Foetal stage (9th week till birth)



- This last stage begins in the ninth week and continues until birth.
- The organs and body systems keep growing and become ready to work.
- The foetus grows quickly, and features like eyelashes, nails, and hair appear.
- The brain becomes more active, senses develop, and the foetus practises movements and breathing.

Each stage helps the baby grow properly and prepares it for birth.

2.2 Postnatal Development

Postnatal development means all the growth and changes that happen after birth as a child grows into an adult. It includes different stages, each with important physical, mental, social changes etc. The changes in each stage are explained in the following chapters.

SL.NO	STAGE	AGE RANGE
1	Infancy	0-2 years
2	Childhood	3-12 years
	a. Early Childhood	3-6 years
	b. Late Childhood	7-12 years
3	Adolescence	13-19 years
4	Adulthood	20-60 years
	a. Early Adulthood	20-40 years
	b. Middle Adulthood	41-60 years
	c. Late Adulthood	60 + years

Table 2.1 Post natal stages of human development



Let us do

Prepare slides on prenatal stages for a digital presentation.



Check your progress

1. Name the first stage after conception and what happens in it?
2. Define prenatal development and explain the three major stages of prenatal development with their characteristics.

2.3 Aspects of Human Development

The process of human development encompasses various aspects of growth throughout the lifespan. Let us discuss the major aspects of human development.

i. Physical development

Physical development refers to the growth and development that take place in an individual's body as they grow. It includes changes in height, weight, bone structure, coordination, and overall body functions. Physical development has two parts: **anatomical and physiological growth**. Anatomical growth means the growth of bones, increase in height and weight, and the development of the control of muscles and physical coordination. Physiological growth refers to the development of internal organs such as the heart, lungs, liver, and muscles. Together, these changes help the individual gain strength, coordination, and better functioning of the body.

ii. Motor development

Motor development is the process by which individuals learn to control their body movements. It happens through the coordinated activity of the brain, nerves, and muscles. It is the process by which a person learns to use and manipulate muscles to move the body in the desired way. A motor skill is the ability to use muscles to perform a specific movement, which become smoother and better coordinated over time as a result of several factors such as practice, development of arms and legs, and genetics. Motor development includes **gross motor skills and fine motor skills**. This development helps an individual move independently and perform daily activities effectively.

iii. Speech and language development

Speech and language development is the process by which individuals learn to understand, produce and use words and sentences to communicate effectively. It includes the development of speech (the ability to articulate sounds clearly and fluently) and language (the ability to comprehend and express meaning through words, grammar and social use of communication).

iv. Emotional development

Emotional development refers to the individual's ability to express and control their emotions. It includes recognizing their own feelings such as anger, fear, joy, and sadness, and understanding the emotions of others. As children grow, they learn to manage their emotional reactions and respond appropriately in different situations.

v. Social development

Social development involves the individual's ability to interact with others and behave according to social expectations. It includes learning to share, cooperate, make friends, and participate in group activities. Through social experiences, children learn social rules, responsibilities, and acceptable behaviour. This development also shapes their personality, self-confidence, and the way they relate to society. Through social interactions, psychosocial development occurs.

vi. Cognitive development

Cognitive development is the process through which an individual learns to think, reason, and solve problems. It is also characterized as sensation, perception, and cognition. Sensation is receiving information through the senses, perception gives meaning to what is sensed, and cognition involves thinking, understanding, remembering, and decision-making. Through cognitive development, children learn to identify objects, develop memory, understand relationships, and think logically. Cognition leads to intelligence.



Check your progress

1. Write a short note on cognitive development.
2. An individual's ability to interact with others is called.....

2.4 Growth and Development

Is there any difference between growth and development? Let us discuss.

From the time of conception itself, the person is undergoing changes. Physical and mental changes cannot be made artificially—they happen naturally through growth and development. As students, it is important to understand these natural changes.

Growth and development are the two important concepts in the study of human development. Both have significant contribution in the development of the personality of the individual. The period of growth and development extends throughout the life cycle, however, the period in which the principal changes occur is from conception to the end of adolescence.

Growth is the increase in height or weight, whereas development refers to the increase in skill or ability to function. Both happen side by side. Growth generally refers to the physical aspect; it is quantitative, indicating changes in body size, shape and proportions of body parts such as internal and external body organs. Development is qualitative, including maturation, learning and capacities of the individual.

Difference between growth and development

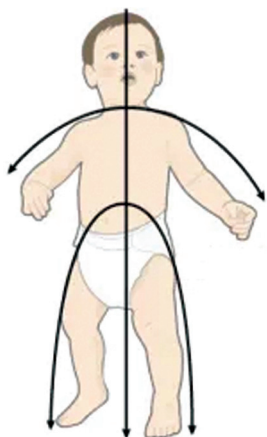
Growth	Development
It generally refers to an increase in size, length, height and weight.	Development refers to overall changes in an individual; growth is one of its parts.
Changes in the quantitative aspects.	Changes in qualitative or quantitative aspects.
Growth may or may not lead to development. For example, a child may grow fat, but this growth may not bring functional improvement or development.	Development is possible without growth. For example, some children may not gain in height, weight or size but they may show functional improvement or development in physical, emotional or intellectual aspects.
Growth does not continue throughout life; it stops when maturity is attained.	Development is a continuous process and does not end with the attainment of maturity.

Growth refers to changes that take place in particular aspects of the body.	Development describes changes in the organism as a whole and not merely changes in parts of the organism.
The changes produced by growth can be measured and are observable in nature.	Development brings qualitative changes that are difficult to measure directly.
Growth is not directional.	Development is progressive and sequential.
Growth is not significantly affected by learning.	Learning and experience greatly affect development.

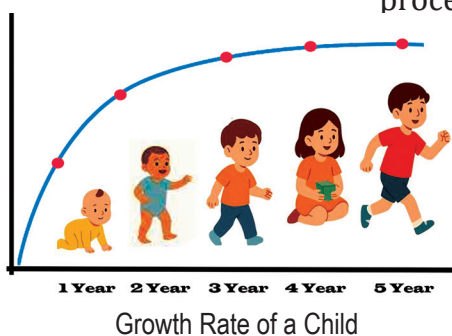
Principles of growth and development

There are certain principles behind growth and development. Let us now discuss these sets of principles in detail.

1. **Principle of continuity:** Development is a continuous process from the time of conception to death. But it occurs at different rates, sometimes slowly and sometimes rapidly. For example, babies are born with undeveloped teeth under their gums, which gradually emerge over several months and years in a specific sequence.



2. **Principle of developmental direction:** Development generally follows an orderly sequence for most children. Two basic sequences exist: **Cephalocaudal** and **Proximodistal**. In the cephalocaudal sequence, children improve structure and function first in the head region, then in the trunk, and last in the legs. In proximodistal development, children grow from the centre of the body outward toward the extremities. For example, babies use their arms before they control finger movements.



3. **Uniformity pattern:** Although development does not proceed at a uniform rate and shows marked individual differences, it follows a definite sequence or pattern. For example, the motor development and language development in all children seem to follow a definite sequence.

4. **Principle of lack of uniformity in the developmental rate:** As children grow, each area of development proceeds at

its own rate and reach maturity in its own time period. For example, the heart, liver and digestive organs grow slowly in childhood, but rapidly during the early years of adolescence.

5. Principle of individual differences: There are wide individual differences among children with respect to their growth and development in various dimensions. Each child grows at his/her own unique pace. For example, two children of the same age may develop at different paces—one may learn to speak early but take longer to running, while the other may excel physically but develop language more slowly.

6. Development proceeds from general to specific responses: In all phases of a child's development, general activity comes before specific activity. For instance, when a new-born cries, the whole body is involved. As the child grows, crying becomes limited to the vocal cords, eyes, and so on.

7. Principle of integration: Development usually goes from general to specific, but as children grow, both general and specific responses work together in different areas of growth. For instance, child first starts to learn hand movement, then finger movement and then learns the movement of both hand and fingers together.

8. Principle of interrelation: Various aspects of one's growth and development are interrelated. If growth in one area is stopped, it can hold back growth in other areas. For example, children with high intelligence often have better physical and social development, too. Children with poor physical development may also struggle socially, intellectually, etc.

9. Development is predictable: With the help of rate of growth and development of a child, it is possible to predict the range within which maturity will occur. For example, we can predict the particular age at which children will learn to walk, speak and so on.



Child learning to walk

- 10. Development is spiral and not linear:** The child does not proceed straight, in a constant or steady pace on the path of development. The child makes advancement during a particular period, but then takes rest in the following period to consolidate his development. In next period, he turns back and then moves forward again, like a spiral.
- 11. Development depends on maturation and learning:** Maturation refers to the biological and physical changes that occur as a result of ageing. For example, a baby's ability to walk depends on muscle and nervous system maturation. On the other hand, learning involves the acquisition of knowledge, skills, etc. through experiences. For example, a child learns to speak by listening and practising words.
- 12. Growth and development is a joint product of environment and heredity:** The child, at every stage of growth and development is a joint product of heredity and environment. The child's growth and development in any dimension at all times is directly or indirectly influenced by the forces of heredity and environment.



Let us do

Create a chart using real life examples for each principle of growth and development.



Check your progress

1. Define development.
2. How is growth different from development?
3. Why do two children of the same-age walk or talk at different times?

Factors influencing growth and development

What are the factors that influence growth and development?

Growth and development depend on a combination of many interdependent factors. The typical pattern of growth and development is mainly influenced by heredity and environment.

1. Heredity: Heredity forms the basis of an individual's overall personality. It refers to the genetic transfer of traits from parents to children. Hereditary influences determine physical characteristics such as height, skin tone, and eye colour, potential for intelligence, personality traits, and susceptibility to certain diseases.

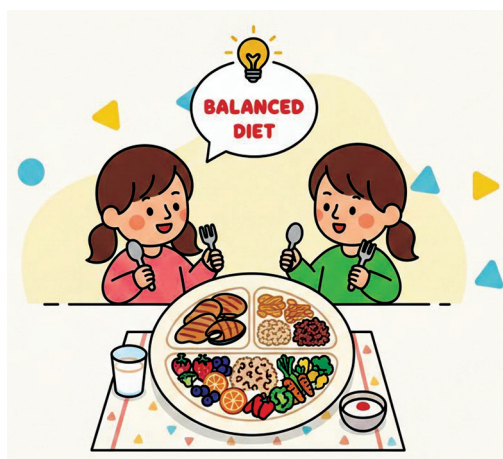
- **Genetic factors:** Genetic factors play a major role in the differences between male and female growth patterns.
 - After birth, male infants are generally taller and heavier than female infants.
 - Girls mature earlier and reach spurt of growth earlier than boys, making them taller on average during that time.
 - During the prepubertal growth spurt and afterwards, boys become taller than girls.
 - Bone development is more advanced in girls than in boys.
 - Permanent teeth erupt earlier in girls than in boys.

2. Environment: The term “environment” refers to all of the outside factors and circumstances that have an impact on a person’s growth from conception to adulthood. A child absorbs a lot from the parents, home, surroundings, school, friends and the neighbourhood. Although each human being at birth has a genetically determined physical, mental, and biochemical potential, this potential may not be reached because of the influence of the environment. The influences of heredity and environment are so interrelated that they are inseparable. The following are the environmental factors-

- **Prenatal environment:** Prenatal period creates an environmental setting that affect the child’s growth. The uterus shields the foetus from the full impact of external adverse reactions and thus the intrauterine environment has a great influence on the future development of the child.

- **Cultural influences:** Groups of human beings create their own cultures, whereas each child is influenced or shaped by the culture of which the child is a part. The culture of a group consists of shared ways of behaving, feeling and knowing. After birth the child is cared for according to the culture. The child is fed the diet that is dictated and given by health care as defined by the culture. The behaviours expected of the child at each stage of growth and development is culturally defined.

- **Socio-economic status of the family:** Families with lower socio-economic status may have less access to modern healthcare and a healthy environment. They may lack money for proper health care and nutritious food, which can affect a child’s growth and development.



• **Nutrition:** A healthy diet with enough carbohydrate, proteins, vitamins, minerals, and fibre is very important for a child's growth. During times of rapid growth, children need more protein and energy. Poor nutrition or a lack of specific nutrients can slow down growth and development.

• **Deformities and impairment:** Conditions like visual impairment, hearing impairment, speech impairment and physical deformities bring a developmental delay. These challenges hinder movement and sensory experiences, which delays learning, self-care, and social interactions. With limited exploration, children often achieve developmental milestones later than peers with good physical abilities.



• **Ordinal position in the family:** A child's place in the family—whether firstborn, middle, or youngest—can affect their development, especially in intelligence and personality. Younger siblings often develop some skills faster because they watch and learn from their older brothers or sisters.

• **Hormones:** The proper functioning of hormones, secreted from different glands that are situated in specific parts of our body, play a major role in the normal physical growth and development of the children. If these hormone-secreting glands cannot function properly, children may suffer from growth defects, behavioural problems and some other diseases.

• **Intelligence:** Physical, social, emotional and language development of the child is greatly influenced and controlled by the level of his or her intelligence. It affects the social behaviour, moral judgement and emotional control.



Check your progress

1. How does birth order influence a child's development?

2.5 Hereditary Disorders

Hereditary disorders are genetic conditions passed down from parents to their children through genes. These disorders occur due to mutations or abnormalities in one or more genes, which can affect the body's normal development and functioning. Let us discuss the different types of hereditary disorders.

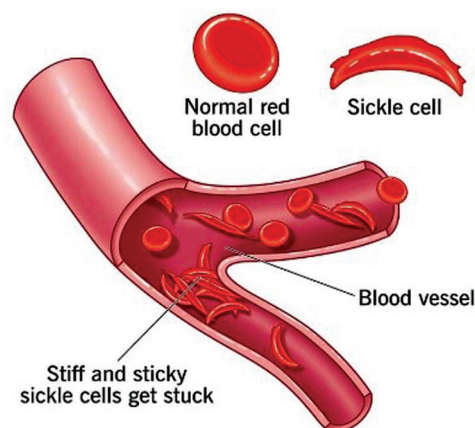
1. Albinism

Albinism is a genetic condition characterized by the lack of melanin pigment in the skin, hair, and eyes. Individuals with albinism are sensitive to sunlight, particularly in the eyes. There are two basic types of albinism, namely, oculocutaneous albinism (OCA) and the other, ocular albinism. OCA causes decreased pigment in the skin, hair and eyes, as well as vision problems. Ocular albinism mostly affects the eyes, causing vision problems. It usually occurs only in males.



2. Sickle cell disease

Sickle-cell disease is a serious inherited blood disorder caused by a gene mutation. It leads to abnormal, sickle-shaped red blood cells that don't move easily through blood vessels. They are stiff and sticky and tend to form clumps and get stuck in blood vessels, thereby obstructing blood flow and reducing oxygen transport. This causes severe health problems, such as anaemia, jaundice, low resistance to infection, and damage to various organs.



Do you know?

A genetic mutation is a change in a sequence of DNA. DNA sequence gives the information they need to perform their functions.

3. Cystic fibrosis

Cystic fibrosis is a genetic disorder that affects the lungs and digestive system. It causes thick, sticky mucus, which makes it hard to breathe and digest food. In the lungs, the mucus clogs the airways and traps germs, like bacteria. This leads to infections, inflammation, respiratory failure, and other complications. In the pancreas, mucus builds up and prevents the release of the digestive enzymes that help the body absorb nutrients.

4. Down syndrome

Typically, the nucleus of each cell contains 23 pairs of chromosomes, half of which are inherited from each parent. Down syndrome occurs when an individual has a full or partial extra copy of chromosome 21. It results in learning difficulties and affects thinking, judgment, and how a person understands events. A few of the common physical traits of Down syndrome are flattened face, a small nose with flat bridge, low muscle tone, small stature, an upward slant to the eyes, and a small head.

5. Hereditary hemochromatosis

Hereditary hemochromatosis is a genetic disorder where too much iron builds up in the body. Excess iron accumulates in critical organs, such as the liver, pancreas, heart, joints, skin, and pituitary gland, leading to cellular dysfunction. The symptoms of hemochromatosis typically appear in adulthood and may include fatigue, joint pain, and skin darkening.



6. Muscular dystrophy

Muscular dystrophy (MD) refers to a group of genetic diseases that cause progressive weakness and degeneration of skeletal muscles. Depending on the type, muscular dystrophy can affect the ability to move, walk and perform daily activities. It can also affect muscles that help the heart and lungs function. Some forms of muscular dystrophy are present at birth or develop during childhood. Other forms develop during adulthood.

7. Haemophilia

Haemophilia is a rare disorder in which the blood doesn't clot in the typical way because it doesn't have enough blood-clotting proteins (clotting factors). If one has haemophilia, they might bleed for a longer time after an injury or surgery. Other symptoms of haemophilia include bruising easily, joint pain, stiffness and swelling. This disease primarily affects males and rarely occurs in females, who usually act as carriers and can pass the condition on to their sons.

8. Phenylketonuria (PKU)

An individual with PKU cannot properly process the amino acid phenylalanine, which is found in most foods with protein. This is because the enzyme needed to break down phenylalanine, called phenylalanine hydroxylase, does not work correctly or is missing. The signs and symptoms of PKU vary from mild to severe. The most severe form of this disorder is known as classic PKU. If not treated, it can cause intellectual disability and other serious health problems. Less severe forms of this condition, called variant PKU and non-PKU hyperphenylalaninemia, have a smaller risk of brain damage.

9. Gout

Gout is a painful type of arthritis that usually affects the joints of the big toe. It is caused by high levels of uric acid in the blood, which form crystals that settle in the joints. Uric acid is produced when the body breaks down waste products, especially those containing purines or alkalis. When these crystals build up, they cause inflammation, redness, and swelling in the joint. Gout is most commonly found in men under the age of 30 and is rarely seen in women.



10. Colour vision deficiency

Colour vision deficiency, commonly known as colour blindness, is a condition where individuals have a difficulty in accurately interpreting certain colours. Most colour blindness is congenital, which means one is born with it. It is usually passed from mother to son making it more prevalent in males compared to females. Colour vision deficiencies are due to partial or complete lack of cone cells in the retina. The most common type of colour vision deficiency makes it hard to tell the difference between red and green.

11. Myopia

Myopia, or short-sightedness, is a vision condition where people can see nearby objects clearly, but distant objects appear blurry. It is a refractive error of the eye, meaning that light focuses in front of the retina instead of directly on it. Generally, myopia first occurs in school-age children. However, myopia may also develop in adults due to visual stress or health conditions such as diabetes.

**Let us do**

Collect information about hereditary disorders in Kerala from the Internet.

**Check your progress**

1. Match the following.

A (Disorder)	B (Key Feature)
1. Albinism	A. Extra chromosome 21
2. Cystic Fibrosis	B. Iron accumulation
3. Down Syndrome	C. Lack of melanin pigment
4. Haemophilia	D. Thick, sticky mucus in airways
5. Hereditary hemochromatosis	E. Lack of clotting proteins

2. Compare any two hereditary disorders with respect to their causes and symptoms.



THE JOURNEY OF EARLY LIFE



Observe these pictures and identify the three developmental stages you went through.

3.1 Post Natal Stages – Infancy and Childhood

The period that occurs immediately after childbirth is the post natal period. Post natal period begins with infancy and progresses through distinct stages. These stages include infancy, early childhood, late childhood, etc. Let us go through the characteristics of infancy and childhood.

Infancy

Infancy is the initial stage of life immediately following birth and lasts until about 2 years of age. It includes the neonatal stage, which is the first 4 weeks after birth. Infancy is the shortest of all developmental stages. The term originates from the Latin word *infans*, meaning “unable to speak,” which reflects the child’s early dependence and limited communication abilities. The first 2 years after the birth bring dramatic changes in growth and development.

Childhood

Childhood stage extends from 3 to 12 years of age and is generally divided into two stages, the early childhood stage and the late childhood stage.

Early childhood

Early childhood often referred to as the preschool stage (ages 2–6), is a period of remarkable physical, mental and social development. During this period, children display intense curiosity about their surroundings and develop an eagerness to gain knowledge through exploration. Because they constantly investigate their environment—touching, observing, and experimenting with objects—this stage is called the exploratory stage. Their curiosity leads them to ask many questions such as “what,” “why,” and “how,” the period is often called the questioning age.

Children at this stage like to copy what adults and others do, and that is why, the time is called the imitative age. Playing is also very important during this period. Through play, children use their imagination, pretend, and come up with new ideas, so it is also known as the creative age.

Late childhood

Late childhood, also called the latency period or pre-adolescence, lasts from about 7 to 12 years of age. Children grow physically, but not as quickly as before. Their muscles get stronger and coordination improves, letting them join sports and activities. Their thinking becomes more logical, helping them learn better at school. They form more complex friendships and manage their emotions better.

Children at this stage often want more independence and may resist their parents. Going to school becomes important, and they start learning basic skills for adult life. Friends become very important, and children often form groups, which is why it is also called the gang age.

3.2 Aspects of Development

Each child develops at their own pace, and many factors including age, genetics and the environment, can affect how and when a child develops. Boys and girls are similar in their patterns of growth during the early years. Child development can be divided into a number of different aspects. Let us go through each one.

I. Physical development

Humans experience a prolonged period of physical growth and development. Physical development encompasses the increase in size and maturation of the body and its parts, including muscle and motor development. Physical development is primarily observed through changes in body size, body proportions, muscle growth, fat accumulation, bone growth, and brain development.

A. Body size

Humans experience growth for approximately 20% of their lifespan. The most rapid growth occurs during the first two years of life. They have growth spurts in height and weight, and their sleep, feeding, and behaviour also change.

In the first year, babies grow about 50% taller, and by age two, they are about 75% taller than at birth. During the first few months, babies grow about one inch a month, then about half an inch each month later on. Their weight also increases quickly at first, and then slows down. In the first few months, babies gain about 28 grams a day, slowing to 20 grams at four months, and about 10 grams or less after six months. Children grow at their own pace, but the average birth weight is 3.3 kg for boys and 3.2 kg for girls.

During early childhood, children typically grow about 2–3 inches in height and gain about 1.8–2.7 kilograms in weight each year. The growth rate between the ages of 2 and 6 is slower than that of infancy and is accompanied by a reduced appetite. This phase is critical because it prepares the body for the major growth spurts that happen later in childhood.

During late childhood, children experience a steady but slower growth rate. On average, children will grow about 2 inches per year during this period. The body also begins to take on more adult-like proportions, with limbs lengthening and the trunk elongating.

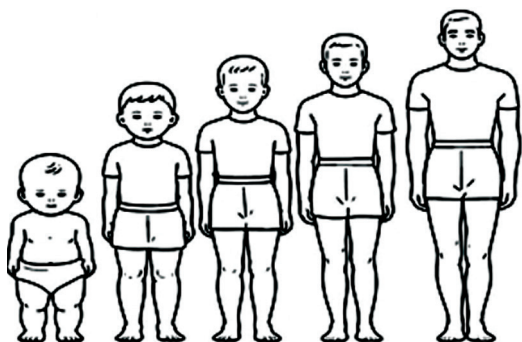


Do you know?

Normal weight range of a new-born baby in India is about 2.5 kg to 3.5 kg.

B. Body proportions

As children grow, their body parts develop at different rates, which means that infants and young children are not simply, the scaled-down versions of adults.



During infancy, the head is disproportionately large—about one-fourth of total body length. The large head size is necessary to accommodate the brain, which is growing rapidly during infancy. The trunk is relatively long, and the arms and legs are short and rounded, giving infants a chubby appearance that helps with temperature regulation and energy storage.

During early childhood, young children lose their babyish appearance. Their body fat decreases and their signature “pot-bellies” flatten as the muscles in their stomachs gain strength. The head becomes more proportionate to the rest of the body, and children develop a leaner, more balanced appearance.

By late childhood, growth occurs at a steady rate, and the body takes on a more adult-like form.

C. Muscles, fat and bones

Other important features of physical growth takes place inside the body, with the development of muscles, fat, and bones. Virtually, all the body's muscle fibres are present at birth. During childhood, muscles become longer and thicker as individual fibres fuse together.

Near the end of pregnancy, a layer of fat forms under the baby's skin to help control body temperature, like insulation in a house. After birth, babies quickly gain more fat, known as “baby fat”. During the preschool years, children become slimmer, but gain some fat again in early elementary school. Girls usually have more body fat, and boys have more muscle. Body fat is highest in infancy and decreases as children grow older.

Bone development starts before birth and continues as the child grows. During the prenatal stage, formation of the bone begins from a soft tissue called cartilage. In the embryonic period, the centre of this tissue hardens and turns into bone.

As children grow, bone development involves three main changes:

- Increase in size : bones grow longer and thicker
- Change in number : some bones that start separate (like in the skull or hands) later fuse together

- Change in composition : bones become stronger and denser as minerals like calcium are added



Do you know?

Changes in physical development from one generation to the next are known as secular growth trends.

D. Teeth

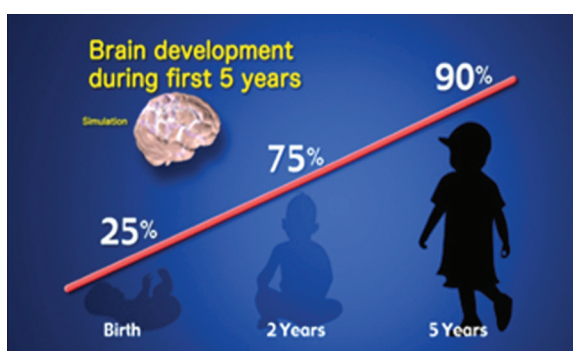
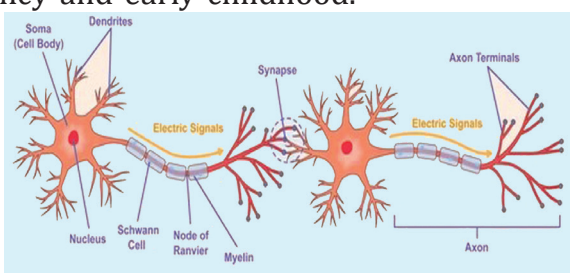
Teeth development is an important part of a child's growth and starts before birth. Around the sixth week of pregnancy, teeth buds form, which later become primary and permanent teeth. Although primary teeth are mostly formed at birth, they stay under the gums. Teeth usually start to come in around six months old, beginning with the lower front teeth, followed by the upper front teeth. By the age of three, most children have all 20 primary teeth. These teeth help to chew, speak and guide the permanent teeth. Around age six, children start to lose their primary teeth, which are replaced by permanent teeth. This process continues into late childhood.

E. Brain growth

One of the most important areas of physical development during early childhood is brain development. The brain grows more rapidly than other parts of the body during infancy and early childhood. At birth, the baby's brain is about one-quarter of adult size, but it rapidly doubles in size during the first year.

When a child is born, the human brain is equipped with a certain number of brain cells, also known as neurons. The connections between the neurons called synapses develop rapidly. By age two, a child's brain has formed a vast number of neural connections, and is about 75% of its adult weight. By age 6, it is at 95% of its adult weight.

Two major brain growth spurts occur during middle/late childhood. Between ages 6 and 8, significant improvements in fine motor skills and eye-hand coordination are noted. Then between 10 and 12 years of age, the frontal lobes become more



developed and improvements in logic, planning, and memory are evident. The myelination of neurons that are essential to early physical development is mostly complete by 40 months of age.

However, when life experiences are limited or the environment is highly stressful, myelination and overall brain growth will be slowed and can hinder brain development.



Do you know?

Myelination is the process where a fatty layer called myelin forms around nerve fibres, helping messages travel faster between the brain and the rest of the body.

II. Motor development

Motor development means the development of control over bodily movements through the co-ordinated activity of the nerve centres, the nerves and the muscles.

As children develop, their perceptual abilities will also develop. But there is still a long way to go in terms of motor skills and co-ordination and substantial progress will take place over the next few years.

In infancy, motor skills start as reflexes and slowly become voluntary as the brain develops—like holding their heads up, rolling over, and crawling. During early childhood, children typically learn such culture-specific motor skills as riding a tricycle and throwing and catching a ball. In late childhood, coordination and fine motor skills improve, allowing for more complex physical activities.

Observe the following table and understand the sequence of motor development that takes place during infancy.

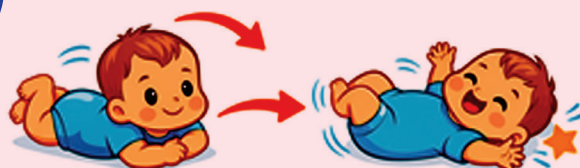


2nd Month

Babies begin to lift their head and shoulders when lying on their stomach.
Moves both arms and both legs.

3rd Month

Rolls over from stomach to back.
Holds head steady when being carried.





4th Month

Grasps small objects.
Brings hands to mouth.

6th Month

Leans on hands to support themselves when sitting.
Sits without support.
Stands holding onto something.



7th Month

Rolls from back to stomach.
Begins to crawl or creep.

9th Month

Pulls self up to standing position.
Walks holding onto furniture.



10th Month

Sits without support for long periods.
Walks with help

11th Month

Stands alone.
Turns pages of book.



12th Month

Drinks from a cup alone.
Walks well alone.



14th Month

Builds towers using blocks.
Scribbles.

15th Month

Walks sideways and backwards.
Tries to feed themselves some food.



17th Month

Walks up stairs.
Gets on and off furniture themselves.

18th Month

Runs clumsily.
Kicks a ball forward.



These milestones demonstrate the progressive refinement and increasing complexity of motor abilities that support children's independence, coordination, and cognitive and social development throughout infancy.



Do you know?

Developmental milestones are things most children can do by a certain age.

Through the process of motor development in early childhood, children gain control over their movements and learn various motor skills. Typical motor skill development follows a predictable sequence. This pattern allows children to gain control of larger, more central muscles before refining coordination in smaller, distal muscles. Thus, motor skills develop from the 'inner body' (head, neck, arms, legs) and then move to the 'outer body' (hands, feet, fingers, toes).

The various motor skills are categorised as gross motor skills and fine motor skills.

a. Gross motor skills involve the coordination of large muscles, bones, and nerves to make large body movements, like running, jumping or walking. Gross motor skills develop through activities that strengthen arms, legs, and core muscles.



b. Fine motor skills involve the coordination of small muscles, bones, and nerves to produce precise movements, like picking up small objects with the hands and fingers. These skills often rely on visual-motor integration and hand-eye coordination, as the movements require accuracy and control.

As children enter late childhood, they become increasingly skilful in using multiple muscles at the same time. They develop greater flexibility in various parts of the body, such as the trunk, wrists, and legs. Their speed of movement and balance also improve significantly.



Children develop a variety of skills during this stage, which can be grouped into four categories: self-help skills, social-help skills, school skills, and play skills. These skills may also differ slightly between boys and girls.

- **Self-help skills:** These are the skills children need to take care of themselves. By late childhood, children can eat, dress, bathe, and groom themselves almost as efficiently as adults.
- **Social-help skills:** These involve helping others, which makes children more sociable at home and school. They learn to assist in daily household activities, help teachers in the classroom, and share responsibilities with peers during play.
- **School skills:** These are the skills required for academic activities. Reading, writing, drawing, and colouring become more refined and skilful during this period.
- **Play skills:** These skills help children engage effectively in various physical activities.



They develop the ability to throw and catch balls, ride bicycles, skate, and swim.

The development of motor skills happens gradually as children grow, and it can be divided into four main stages. Each stage builds on the one before it, helping children move from simple, automatic movements to complex, controlled actions. These stages include:

- **Reflexive stage:** Newborns show automatic reflexes, such as sucking or grasping, which help them react to their environment.
- **Rudimentary movement stage:** Babies begin to control simple movements like holding objects, sitting, standing, and walking.
- **Fundamental movement stage:** Children learn basic movement skills such as running, jumping, throwing, catching, and balancing. These skills are the foundation for more advanced ones.
- **Specialised movement stage:** Older children refine their skills and learn more complex, purposeful movements like playing sports, dancing, or writing neatly.



Check your progress

1. Why is early childhood often referred to as the “imitative age”?
2. List the three main changes that occur in bone development as children grow.
3. Outline and briefly describe the four main stages of motor skill development.

III. Speech and language development

Speech development is the process by which humans acquire the ability to produce sound and communicate. Language development is the ability to understand and use words to express thoughts, needs, and emotions. It involves learning sounds, building vocabulary, and forming sentences.

It begins in infancy with simple coos and babbles, eventually leading to the formation of words and, later, full sentences. Children between ages 2 and 3 can use about 450 words (expressive vocabulary) even though they can understand many more (receptive vocabulary). By age 6, childrens’ expressive vocabularies will grow to about 2,600 words and their receptive vocabulary will be an impressive 20,000 plus words.

Child language development occurs through both expressive and receptive language skills, where receptive language helps children understand words and meanings, and expressive language enables them to communicate their thoughts, needs, and feelings. These skills develop together through daily interaction, listening, speaking, and practice, allowing children to communicate effectively as they grow.



Do you know?

Fast mapping refers to the ability of children to learn new words very quickly and easily around age two. Children can pick up words and phrases with very little exposure to them because they are constantly absorbing the entire world around them.

Stages of speech and language development

Language acquisition is often described as a magical journey that enables communication with others. This process is said to help children express thoughts and emotions and connect with those around them. Each stage is considered essential for developing lifelong language and communication skills. Let us go through these stages to see what they entail.

1. The prelinguistic stage (0 to 12 months)

The cute sounds that infants make are basically their attempts to communicate. This stage usually starts with cooing and other similar sounds, leading then to babbling and incorporating vowels and consonants.

2. The holophrastic stage (12 to 18 months)

During this time, their language skills usually have increased enough for them to say single words that describe objects or identify their basic needs. For instance, a child in this stage might say “dada” or “mama” as a way of getting their parent’s attention. This stage is also known as one-word stage.



3. The two-word stage (18 to 24 months)

During this stage, the child can speak two-word sentences that usually have some meaning. They group words together that they learned during the holophrastic stage. Example may include saying “more food” at the table.

4. The telegraphic stage (24 to 30 months)

This is the first step towards building full sentences. Children can speak phrases that are not only longer but also have more than two elements. The child also develops the ability to understand basic instructions, including two-part orders like “go to your table and get your books.”

5. The multi-word stage (30 months to 4 years)

The stage when children start to expand their vocabulary and begin to use more and more words in their sentences. Later on, the child continues to learn new words and start mastering their grammar, will begin building full and more complex sentences.

6. The mature stage (5 years onwards)

Finally, the child will reach the mature stage of language acquisition around 5 years old. This is where their grammar is better, their vocabulary more expansive, and their confidence in their communication skills more pronounced. They should be able to communicate and speak fluently and clearly with the people around them, with minor mistakes or difficulties.



Do you know?

Mutual exclusivity is a language development strategy where a child assumes an object can only have one name. When a child is introduced to a new word for an object they already know, they will not assign the new word to the whole object.

Tasks involved in learning to speak in infancy and childhood

Learning to speak involves three closely connected processes — learning to pronounce words, developing vocabulary, and forming sentences. These processes are interdependent; therefore, difficulty in one area can affect overall speech development. With proper opportunities and guidance, children usually make quick progress in all three areas during childhood.

1. **Pronunciation:** The first step in learning to speak is learning how to pronounce words. Children acquire pronunciation mainly through imitation — they “pick up” the way words are spoken by listening to the people around them. By late childhood, pronunciation becomes more accurate, and errors are less frequent.

2. **Vocabulary building:** Vocabulary development involves learning to connect sounds with meanings. Children in this stage expand their vocabulary by learning many new words and discovering new meanings for familiar ones. This task is more challenging than pronunciation because many words have multiple meanings, and some words that sound alike may have different meanings.
3. **Sentence formation:** Sentence formation involves combining words into grammatically correct and meaningful sentences. In the early stages, children often use one-word sentences accompanied by gestures to express complete thoughts. Between the period of 12 and 18 months, children typically use single-word sentences, and by the age of two, they begin to combine words to form simple sentences. By around six years of age, most children can use nearly all types of sentence structures.

IV. Cognitive development

The world is a complicated place. It is full of objects, some natural and others human-made. It is also full of people and activities. Have you ever thought about how children make sense of it all, learn what the world has to offer, and then use this knowledge in productive and satisfying ways?

Cognitive development is the term used to describe the mental changes that occur as children acquire the knowledge and intellectual skills that enable them to understand and act effectively in everyday life. It is the process of growing and improving how they think, learn, and understand the world.

The period of infancy and childhood is marked by significant steps in cognitive development. Their brain undergoes amazing changes during the first 3 years.

Children at the age of 2 believe that everyone shared their thoughts and feelings but at age 6 they realise that different people have different minds, different thoughts and beliefs. Three-year-olds who count, “one, two, three, seven, five, ten,” can do simple addition by age 6.

The famous theory of cognitive development stages was developed by Swiss psychologist Jean Piaget, proposing four universal stages that children progress through to understand the world, emphasising how thinking, reasoning and understanding evolve from infancy to adolescence.



Jean Piaget (born August 9, 1896, Switzerland—died September 16, 1980) was a Swiss psychologist who was the first to make a systematic study of the acquisition of understanding in children. He proposed then theory of childhood cognitive development in 1969.

Stage	Age	Thinking
Sensory motor	Birth to 18-24 months	Object permanence
Preoperational	2 to 7 years	Symbolic thought
Concrete operational	7 to 11 years	Logical thought
Formal operational	Adolescence to adulthood	Scientific reasoning

Table 3.1 Stages of Cognitive Development

Let us discuss the first three stages of cognitive development in children during infancy and childhood years.

A. Sensory motor stage

The sensorimotor stage is the first stage in Piaget's theory of cognitive development, lasting from birth to about two years of age.

- During this period, infants learn about the world through their senses and physical actions such as looking, touching, grasping, and moving.
- They discover that their actions can produce specific results (such as making sounds or causing movement).
- They learn that things continue to exist even when they cannot be seen (object permanence).
- Through repeated sensory and motor experiences, infants gradually build mental frameworks that help them understand their surroundings.

B. Pre operational stage

In the pre operational stage (2 to 7 years), children start using symbols and language but struggle with logical thinking. Their thinking has certain characteristics -

- They may be **egocentric**, that is, they see the world and the experiences of others from their own viewpoint. It means they find it difficult to see things from others' perspectives. eg., if a little boy at this stage is afraid of animals, he may assume that all children share this fear.
- A child can think **symbolically**. Children begin to develop increased skills with pretend play. During pretend play, a broom becomes a horse or a cardboard box becomes a car.

- **Animism** is the belief that inanimate objects have feelings, thoughts, or intentions like living things. Young children may say a teddy bear is happy or a doll is sad because they attribute life-like qualities to things around them.
- **Centration** is the tendency to focus or centre on only one aspect of a situation and ignore other important aspects.
- **Irreversibility** is very difficult for the child to 'think backwards,' or imagine how to reverse the steps in a task.
- **Conservation** is the principle that the amount or number of something remains the same even if the arrangement or appearance is changed, as long as nothing is added and nothing is taken away. eg., if a child is shown two identical containers, filled with the same amount of liquid and the liquid is poured into two different containers, the child will think that one holds more liquid— not understanding that the same amount of liquid is held in each container. This concept applies to things like volume, number, length, or the mass of a substance.



C. Concrete operational stage

Between the ages 7 and 11, children become more logical in their thinking. The characteristic features of this stage includes:

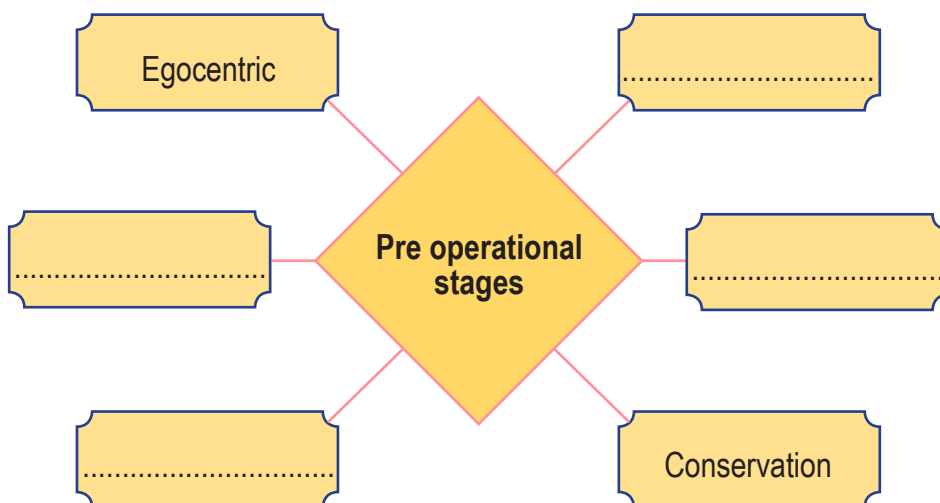
- **Decentration** is the process where they consider multiple aspects of a situation simultaneously, rather than just one. Like recognising that their friend might not want the same birthday gift as they would, because everyone has different likes and interests.
- **Reversibility** allows the child to understand that a process can go in both ways. eg., The child is able to understand that subtraction is the reverse of addition. A child is now able to look forward to the consequences of what he or she is doing.

- They can understand concepts like **conservation**, that something stays the same in amount, even if its appearance changes.
- They can group items logically by multiple features, such as sorting toys by both colour and size simultaneously. This is called **classification**.
- **Seriation** is the ability to arrange objects in a logical order according to a specific attribute, such as size, length, weight, or colour. e.g., a child can line up sticks from shortest to longest.



Check your progress

1. List the three closely connected processes involved in learning to speak.
2. Explain the principle of conservation.
3. Fill in the blanks.

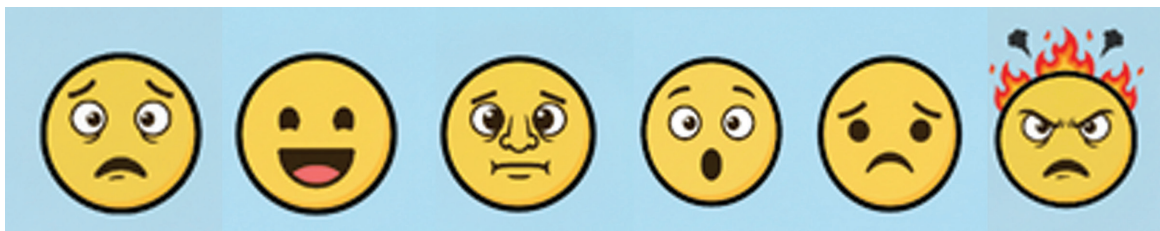


V. Emotional development

Emotions have a strong influence in our daily lives. Emotional development is the process through which a person learns to recognise, express, and manage emotions in a healthy way.

We make decisions based on whether we are happy, angry, sad, bored, or frustrated. We also choose activities and hobbies based on the emotions they incite. Understanding emotions can help us navigate life with greater ease and stability.

Emotions are natural reactions that humans experience in response to different events or situations. The kind of emotion a person feels depends on the situation that triggers it.



Emotional development begins at birth and it involves a child's ability to express, recognise, and manage emotions. During childhood, children learn to identify emotions, understand their causes, and express them appropriately. As brain development continues, children gradually gain better emotional control, empathy, and emotional intelligence, helping them form healthy relationships and make thoughtful decisions.

When Do These Emotions Show Up?

Some emotions like interest and joy are already present at birth. Others like anger or fear show up in the first two years of life.

Philosophers have suggested that we have two sets of emotions – basic and learned emotions.



Learned emotions

Carroll Izard (2007), in his development of the Discrete Emotions Theory, considers interest, joy/happiness, sadness, anger, disgust and fear as truly 'basic' emotions. A baby may show anger by crying loudly or flailing their arms when a toy is taken away. That reaction is natural — not taught. The baby doesn't need to learn

them. 'Learned' emotions are those that are more complex and not seen as developing until the second year of life. These include feelings such as pride, jealousy, shame, guilt and empathy. These are learned behaviours that build upon the basic emotions to provide more complex, more long-lasting adaptations to the environment. For instance, a baby might get upset or cry when they see their caregiver paying attention to someone else, which is a simple start to feelings like jealousy that develop later.



Do you know?

What makes us emotional?

Emotions occur in response to some kind of stimulus (actual, imagined, or re-lived) such as:

- a physical event
- a social interaction
- remembering or imagining an event
- talking about, thinking about, or physically reenacting a past emotional experience

Positive and negative emotions

Emotions can be broadly categorised into two types —positive and negative emotions. It can be basic or learned.

Positive emotions are emotions that we typically find pleasurable to experience. Example; joy, love, affection, curiosity and sympathy. Positive emotions not only make people feel happy in the moment but also improve their well-being over time. This means their benefits can last into the future.

Negative emotions are emotions that feel unpleasant and usually can be difficult to experience. For example; fear, anger, jealousy, grief and disgust. Negative emotions are not “bad” or “wrong,” and often signal that something needs attention or change in our life. Sometimes they affect health and relationships if they are intense or long-lasting.

Stages of emotional development

- 1. Infancy (Birth–2 years):** During infancy, children begin developing emotional awareness by expressing and responding to feelings. They communicate emotions mainly through crying, facial expressions, and body movements.

Infants gradually recognise emotions in others and respond accordingly, helping them form strong emotional bonds with caregivers. Smiling, cooing, or crying in response to others' emotions builds attachment and trust. As children grow, they experience a wider range of emotions and show growing independence, though frustration may lead to tantrums. These stages lay the foundation for emotional understanding and secure relationships.

- 2. Early childhood (2–6 years):** In early childhood, children become more independent, social, and emotionally aware. They learn to express and manage a wider range of emotions, including joy, anger, pride, guilt, and empathy. Children observe and imitate adults' emotional responses, making positive guidance important. Although emotional regulation is still developing and outbursts may occur, children gradually learn social rules, build relationships, and develop a clearer sense of self and others.
- 3. Late childhood (6–12 years):** Late childhood is a stage where children show greater emotional maturity and self-awareness. Children in this stage begin to manage their feelings more effectively and express them in socially acceptable ways. They understand that emotions can be complex and that it is possible to feel more than one emotion at a time — for example, feeling both happy and nervous about a school performance. They develop stronger relationships with peers; learn teamwork, and value friendship, approval, and belonging. As they spend more time in school and group settings, they also start to compare themselves with others, which may affect their confidence and self-esteem. Children in late childhood learn empathy and fairness, showing concern for others' feelings. They also begin to rely less on parents for emotional comfort and more on friends.

VI. Social development

Social development refers to the gradual process by which a child learns to interact with others, form relationships, and develop a sense of self in relation to others.

Did you know that newborn babies are familiar with their mother's voice and respond to it with great affection? They are also naturally drawn to face, often engaging with them and imitating observed behaviours.

School becomes a big part of middle and late childhood, and it expands their world beyond the boundaries of their own family. Peers start to take centre-stage, often prompting changes in the parent-child relationship. Peer acceptance also influences children's perception of self and may have consequences for emotional development beyond these years.



Do you know?

Socialisation is the process of learning the skills, attitudes, and behaviours which enable individuals live easily with other members of the family and society.

In the late childhood, the development phase is marked by the child's growing comprehension of social rules, which becomes essential in guiding appropriate social conduct. Let us discuss the different characteristics of late childhood.



- 1. Formation of childhood gangs:** In this stage, children want to make friends with same-age children and build relationships with them while creating a gang. This is why late childhood is often referred to as the gang age.
- 2. Peer interactions:** Children use their friends as testing grounds for the values and attitude they have learned at home. Peers have the potential to influence each other for good or bad.
- 3. Sex antagonism:** Children choose friends of their own sex and show hostility towards members of the opposite sex. At this age, boys love playing with boys and the girls with girls.
- 4. Troublesome age:** Before this development period, children are willing to do what their parents tell them, but in this stage, they are quite influenced by their peers rather than their parents. Children begin to resist authority and are less willing to obey adults, often testing boundaries.
- 5. Responsibility:** They start to be more aware of their actions and their consequences, learning to follow rules and meet expectations both at home and school. Children become capable of managing tasks such as homework, chores, and self-care with increasing independence.

- 6. Social Insight:** There is an increased awareness to social norms and rules, both in school and the society.



Let us do

Create 10 scenarios: 5 showing positive emotions and 5 showing negative emotions.



Check your progress

1. Differentiate between basic emotions and learned emotions with examples.
2. Children in late childhood often choose friends of their own sex and show hostility towards the opposite sex; this is known as -----

3.3 Role of Parenting

How does parenting affect the social development of children?

From infancy, children's dependence on parents for basic childcare as well as emotional and behavioural regulation declines progressively.

Two dimensions of parents' interactions with their children are particularly important for the development of both social and cognitive competence: warmth and control.

Parental warmth refers to how supportive, nurturing, and responsive parents are to their children's needs. How caring are they? To what extent do they put the needs of their children ahead of their own? Warm, caring parents promote better social, emotional, and academic development. Their children show greater respect and positive relationships. In contrast, cold or rejecting parenting can lead to insecure attachments, aggression, and difficulties with peer relationships and school adjustment.

Parental control refers to the extent to which parents monitor and regulate their children's behaviour and activities. Appropriate control involves setting firm, consistent rules and enforcing them fairly. Parents who are involved and aware of their children's activities use discipline to guide behaviour, encouraging appropriate actions and discouraging inappropriate ones, which supports healthy development.

Clearly, parenting is fraught with many complexities. One of the most challenging tasks for parents is how to discipline their children appropriately. Children of even the wisest and most vigilant parents are bound to misbehave, so discipline is necessary.



Let us do

Conduct a debate in the class on the topic “Strict rules and monitoring are the only ways to discipline a child.”

3.4 Discipline

The word discipline means to impart knowledge and skill. However, it is often equated with punishment and control. Real discipline, however, involves teaching. The word discipline comes from the Latin word *disciplina*, which means “teaching or learning.”

According to Elizabeth B. Hurlock, discipline is “the means by which children are taught to behave in ways approved by the social group.” The purpose of effective discipline is to help children organize themselves, internalize rules and acquire appropriate behavioural patterns.

Infants need a schedule around feeding, sleeping and play or interaction with others. The schedule helps regulate autonomic functions and provides a sense of predictability and safety. Many parents’ initial attempts at discipline consist of slaps, spankings, harsh words, and angry expressions. The baby interprets this to mean that the parent is angry with him, not at the thing he has done, and this makes him feel unloved and unwanted.

Preschool children naturally test independence and control, so parents should stay patient but set clear limits for safety. Simple actions like saying “no”, removing the child or object, and redirecting attention work best. As children gain independence, parents should guide them with consistent rules, supervision, and positive role modelling while allowing autonomy. School-age children still need adult decision-making support. Praise and suitable rewards encourage good behaviour.

How does one shape and guide a child’s behaviour? What do they need from their caregivers to grow into capable, resourceful, confident young people?

Reward and punishment

A reward is a positive stimulus or recognition given to encourage a desired behaviour or achievement. Rewards encourage good behaviour. Praise, appreciation, or small rewards help children feel valued and motivate them to continue behaving well. It involves nurturing trust and connection, sharing skills, and creating an environment where one's child can develop feelings of capability and confidence. It is built on teaching, understanding, encouraging, and communicating—not on punishing. Punishment is intended to make children “pay” for what they have done. It may seem to “work” in the short term. But over time, it creates rebellion, resistance, and children stop to believe in their own worth and capability. Punishment helps children understand that wrong actions have results. It should be fair, mild, and never harsh. The goal is to correct behaviour, not to hurt or frighten the child.

Techniques of discipline

What do you understand from the figure?



Disciplining children is one of the most important yet difficult responsibilities of parenting. The different techniques used to develop discipline among children include:

- **Authoritarian technique of discipline:** In this style of parenting, children are expected to follow strict rules established by the parents. Authoritarian parents tend to be less caring, maintaining high expectations with limited flexibility.

Children raised by authoritarian parents often exhibit well-behaved behaviour as they have undergone the consequences of misbehaviour. Mistakes often lead to punishment.

- **Authoritative technique of discipline:** It is characterized by a close, nurturing relationship between parents and children. Parents give clear rules and guidelines but explain the reasons and listen to their children's views. This balanced approach helps children grow confident, self-controlled, independent, and socially skilled. This technique is also known as Democratic Parenting Style.
- **Permissive technique of discipline:** It portrays parents that are kind and caring. They frequently behave more like friends than as superiors, giving them a lot of freedom. And these children may struggle with self-discipline, encounter academic difficulties, and show poor emotional control.
- **Uninvolved technique of discipline:** It involves neglectful or uninvolved parents show low levels of both responsiveness and demand. They provide little guidance, caring, or attention, often due to stress, disinterest, or lack of awareness.



Let us do

Using the descriptions given above, try to identify the parenting style and fill in the blanks.

Scenario Description	Parenting style
Caregivers are on their phones and do not notice the child drawing on the walls.	
The child makes a mistake. The parent explains the rule and gives a fair warning.	
The child asks, "Why?" The parent replies, "Because I said so!"	
The parent acts more like a "friend" than a parent and sets no rules.	

3.5 Habit Formation

Habit, in psychology, is any regularly repeated behaviour that requires little or no thought and is learned rather than innate.

Habit formation is the process that leads to developing new habits. It is a central component of how individuals learn and adapt to

our environment. There are several factors that can influence the formation of new habits, including the level of motivation, the degree of difficulty, and the potential rewards of the behaviour.

Key strategies for habit formation

Some of the factors which influence the formation of new habits are:

1. **Establish routines:** Create consistent daily schedules for activities like eating, sleeping, and chores. Predictability and stability help children adopt new habits.
2. **Set clear expectations and rules:** Establish simple, realistic family rules and explain the benefits of good behaviour and the consequences of inappropriate actions.
3. **Ensure consistency:** Repeatedly practicing the desired behaviour is crucial. Inconsistency can undo progress, so help your child perform the good habit as many times as possible.
4. **Use positive reinforcement:** Praise your child for engaging in the desired habit and offer rewards like extra playtime or treats to motivate them.
5. **Encourage responsibility:** Teach children to take care of their belongings and complete tasks, fostering responsibility and discipline.

Why habit formation is important?

Habit formation is crucial because it helps to promote:

- **Character development:** Positive habits shape a child's moral compass, leading to better decision-making as they grow.
- **Responsibility:** Consistent routines teach children the value of time management and commitment.
- **Lifelong success:** Instilling good habits early provides a strong foundation for success in various aspects of life, from academics to personal well-being.



Check your progress

1. Habits are _____ rather than innate.
2. Analyze the different techniques of discipline and their impact.
3. Why habit formation is important?

3.6 Behaviour Problems

What might the boy in the picture be thinking? Do you know why he seems upset?



A behaviour problem is the child's way of gaining satisfaction or of avoiding annoyance. Hence, the child may perceive it as logical, rational and even necessary. No child grows up without displaying some form of problematic behaviour at some point. Breckenridge and Vincent, the prominent psychologists defined behaviour problems as those forms of behaviour which indicate that something is wrong with the child himself or with the environment in which he lives.

Usually, the behaviour problems appear as:

- Thumb-sucking,
- Nail-biting,
- Bed-wetting,
- Aggression,
- Destructiveness,
- Jealousy,
- Temper tantrums.... etc.

Causes of behavioural problems

There are many reasons which cause behaviour problems in children. Some of them are:

- Due to the absence of care and attention from home, the child develops a feeling of insecurity
- Fear of punishment by telling truth
- To attract others and show themselves off
- Physical punishment at home and in schools
- Lack of fulfilment of general, mental and physical necessities
- Family conflict or parental separation

How can one manage a child with problem behaviour?

Children are more likely to cope effectively with their difficulties and develop into healthy, intelligent, and useful members of society in families and settings where they are guaranteed respect for their feelings.

Therefore, parents and guardians must do the following:

1. Respond calmly upon the behavioural problems of the child.
2. Consistently show your strong dislike towards their bad or unlikely behaviour.
3. Have open, friendly communication to make them understand the unpleasant atmosphere created due to their unwanted style of response.
4. You must appreciate them for every single positive behaviour.
5. Parents must inform the teachers about the problem, so that the child will get special care at school.
6. Help the child to earn and get what they need and want.
7. They should be provided with a good environment, proper entertainment, education, etc.



Let us do

Aside from the examples in the book, create a list of actions that you would classify as 'behaviour problems.'

3.7 Early Childhood Care and Education (ECCE)

There is a need to take care of young children in the early childhood period and prepare them for formal schooling. The health and nutrition services and the learning experiences provided to the children of early childhood years are collectively known as early childhood care and education. The defined period of ECCE is between 0 - 6 years.

According to UNESCO, ECCE is not only about school readiness but also about building a strong foundation for lifelong learning and emotional well-being. It is also stressed that the neglect of children in these years of life impairs their learning capacity even when the conventional intelligence is within normal range.

Objectives of early childhood care and education

The general objectives of ECCE can be described as follows.

- Laying the foundation for a healthy, productive and satisfying life in the future by enabling the child to develop his/her maximum potential.
- Preparing the child for entry into and success in primary school.
- Providing support services to women and girls to enable them to enter/continue education, training and participation in the work force.

The following points bring out the significance of ECCE in the present scenario:

- i. Learning begins at birth:** Early childhood experiences create the base for all subsequent learning. It is the foundation stage.
- ii. Smooth transition to primary school:** Good health, nutrition and a nurturing environment are the strong early foundations which can ensure a smooth transition to primary education.
- iii. Foundation for personality development:** An individual's habits, attitudes, interest and trust in people and the world are all moulded by early childhood experiences.
- iv. Helpful to disadvantaged sections of people:** Programmes in the preschool such as feeding, health care, activities for hand and head help, the children of poor families to overcome the disadvantaged circumstances.

- v. **Reduction in poverty:** Children are provided with free meals, immunization and free education at ECCE centres which enable the family members to go for work; they need not stay at home to look after the children of 0-6 years.
- vi. **Manipulation of objects:** Early childhood care and education can provide opportunities for young child to manipulate objects and materials and understand the world.
- vii. **Emotional support:** ECCE helps to inculcate positive emotions and channelize the negative emotions into right direction by organizing various activities such as clay modeling, finger printing, crayoning, etc.
- viii. **High returns of investment:** Children who participate in quality ECCE programmes are likely to obtain a higher level of education and get a better paying job.
- ix. **Expert care:** Children grow under the expert care of trained teachers and learn the rules of co-operative living with fellow peers.
- x. **Compensate inadequacies of home:** It provides suitable environment for children from families living in small apartments or in a single room or from slum areas where there is hardly any space for a child to move around, run and play.

Early childhood care

Care for infants, from about three months to three years, takes place in settings such as infant schools, day care, day nurseries, or crèches.

- i. **Fostering** is an arrangement whereby a child lives, usually on a temporary basis, with an extended or unrelated family member. Such an arrangement ensures that the birth parents do not lose any of their parental rights or responsibilities. The goal is to reunite children with their biological families once circumstances improve. The programme is managed by child welfare authorities, such as District Child Protection Units and Child Welfare Committees.
- ii. **Babysitters** play an important role in child care by looking after children in the absence of parents. A good babysitter creates a safe, nurturing, and stimulating environment that builds trust and security in children, maintains routines that

provide structure, and encourages social skills through play and interaction.

- iii. **Proprietary Child Care Facilities**, commonly called crèches, are commercial day-care centres run by corporations, business people, or individual proprietors aiming to provide custodial care, especially for children of working mothers during the day. The primary purpose of creches is to substitute maternal care by offering a safe, supervised environment where children can engage in age-appropriate activities.

Early childhood education

Preschool education refers to the learning during early childhood, from infancy until entry into primary school around ages five to seven. For older preschool children, education is provided through nursery schools, montessori schools, and kindergartens.

- i **Nursery school** is an educational institution for young children, usually between the ages of about 2.5 to 5 years old. Through play-based activities, story telling, music, art, and group interactions, nursery schools help children learn basic concepts like numbers, alphabets, and shapes while fostering self-help skills, independence, and socialization.

- i. **Kindergarten** is an early childhood educational stage designed for children typically between the ages of four and six. Kindergarten aims to nurture children's emotional, social, cognitive, and motor skills by encouraging self-expression, creativity, cooperation with peers, and foundational academic skills such as literacy and numeracy, making it a crucial stage in early development.



Maria Montessori (born August 31, 1870, Italy—died May 6, 1952) was an Italian educator and originator of the educational system that bears her name. In 1907 Montessori opened the first preschool for children age three to six from the San Lorenzo slum district of Rome. Her successes led to the opening of other Montessori schools, and for the next 40 years she travelled throughout Europe, India, and the US lecturing, writing, and establishing teacher-training programs.

- iii. **Montessori schools** run on the philosophy of Maria Montessori of Italy. The most important goal of the Montessori education is to recognise the unique needs and capabilities of each individual child. Montessori believed that 'the hands lead the mind'; that is, children learn from self-chosen activities and games that give them a sense of accomplishment and responsibility. The teachers demonstrate how to use manipulative objects, but then provide more guidance only if the child asks.

- iv. **Anganwadi** is a child care centre in India, as part of integrated Child Development Services (ICDS) which is a centrally sponsored scheme of the ministry of Women and Child Development, Govt. of India. ICDS provides a package of services namely Supplementary Nutrition, Pre-School Non-Formal Education, Nutrition & Health Education, Immunization, Health Check-Up and Referral Services. Target group of the scheme are children below 6 years, pregnant and lactating mothers and women in the age group of 15 to 45 years.



Let us do

- Montessori school use sensory materials to teach children different concepts. Prepare a few sensory objects to be displayed in your classroom. You may also use digital tools for support.



Check your progress

1. Distinguish between nursery schools and kindergarten.
2. Explain the role of babysitters in child care.

3.8 Play

“Play is children’s work” – This is how important early childhood education pioneers, Friedrich Froebel and Maria Montessori, described play. They believed that for young children, play is their way of learning and working.

Play is a natural and spontaneous activity that children engage in for enjoyment, exploration, and learning. Through play, children express creativity, imagination, and curiosity, allowing them to explore their environment and develop essential life skills.

All children take part in different types of play, but some types are more common at certain ages. Babies often play by exploring and through social games like ‘peek-a-boo’. As children’s imagination develops, older children start to take part in manipulative play, pretend play, and play with language. The play activities of children differ according to their developmental stage.

Play may be divided into two broad categories: active play and passive play. These two forms of play offer different benefits and support different areas of a child’s growth.

Active play

Active play is when a child is involved in playing and interacting with others and/or with objects. Active play is one of the most critical components of a child's physical, emotional, and cognitive development. A child needs to be involved in active play a majority of the time because children learn by actively playing.



1. Physical play. This kind of play involves movement and activity. Physical play helps build strong muscles and bones. It also improves balance, coordination, and motor skills. eg., Riding a bicycle, dancing, climbing, or throwing a ball.

2. Exploratory play. Also called investigative play, this involves using the five senses—touch, smell, taste, sight, and hearing—to explore the world. Children learn by touching, feeling, smelling, or playing with different textures and materials. It helps them understand how things work. eg., Playing with sand, water, clay, leaves etc.



3. Imaginative play. Also known as pretend play, this is when children use their imagination to create stories or roles. This kind of play helps develop creativity, problem-solving, and emotional understanding. eg., Dressing up, acting out stories, pretending to cook, or playing house.

4. Creative play. Creative play allows children to express themselves through art, music, or movement. It builds confidence and lets children show how they feel or what they are thinking. It also encourages original thinking and imagination. eg., Drawing, painting, singing, dancing or making crafts.



5. Social play. Social play happens when children play with others. It teaches them how to communicate, share, and work as part of a team. It also helps them understand social rules and build friendships. eg., Playing group games, pretending with friends, team sports, etc.

6. Collecting. Children enjoy gathering and organising objects. It helps them learn sorting and grouping, and gives them a sense of responsibility. It can also build attention to detail. eg., Collecting stamps, shells, stones, stickers, or trading cards.



7. Manipulative play. This type of play involves using hands and fingers to move or control objects. It helps children develop fine motor skills and learn patterns, shapes, and problem-solving. eg., Building with blocks, solving puzzles, threading beads, or arranging objects in order.

Passive play

Passive play is play where children are not involved in active physical movement and active personal involvement. A child who is passively participating in play with a toy may be entertained; however, they are typically sitting back and observing the toy. Eg., watching an electric train go round and round the tracks while listening music.



While children do learn through passive play too, what is critical to keep in mind is that they should not be allowed to engage in passive play for long periods of time – especially by just watching screens. Children need a healthy balance of active and passive play to support their physical, social, and cognitive development.

The types of toys children use can play a big role in supporting different areas of development. Toys serve not only as objects of play but as catalysts for learning, creativity, and interaction. Overall, toys can support intellectual growth and social skills when thoughtfully selected and used in play settings.

Significance of play

Play is an essential part of a child's growth and development. It is not just a source of fun and enjoyment, but also a vital way through which children learn, explore, and understand the world around them. The significance of play can be explained as follows:

- **Natural way of learning:** Play is the child's natural method of exploring and understanding the world.
- **Promotes physical health:** It develops muscles, coordination, and overall fitness.
- **Improves mental abilities:** Play builds concentration, memory, creativity, and problem-solving skills.
- **Encourages imagination:** Creative and pretend play help children think beyond reality and use imagination freely.
- **Supports emotional growth:** It helps children express feelings, reduce stress, and build confidence.
- **Develops social skills:** Group play teaches sharing, cooperation, teamwork, and respect for others.
- **Builds communication skills:** Play encourages talking, listening, and learning new words.
- **Teaches moral values:** Through play, children learn fairness, honesty, and empathy.
- **Helps in personality development:** It promotes independence, decision-making, and leadership qualities.
- **Provides joy and relaxation:** Play gives happiness, refreshes the mind, and maintains emotional balance.



Let us do

Create a short video demonstrating examples of active and passive play.



Check your progress

1. Passive play involves high levels of physical movement and personal interaction with others. (True/False)
2. What social skills do children learn through social play?
3. Give two examples of creative play.
4. How does play assist in a child's personality development?

4

TEENAGE YEARS : TRANSITION AND TRANSFORMATION



Haven't you observed students playing basketball? Which age group do they belong to?

Write it down.....



Do you know?

The word 'adolescence' is derived from a the Greek word '*adolescere*', which means '*to grow to maturity*'.

4.1 Adolescence

Adolescence is a dynamic stage of discovery, change, and new possibilities in the journey to adulthood. What key developments unfold during this period? Let us explore them in detail.

The World Health Organization (WHO) and the United Nations define 'adolescents' as individuals in the age group of 10-19 years.

Until the age of 18, adolescents are protected under the Rights of the Child. Since this period of adolescence covers the teenage years (13 to 19 years of age), adolescents are also called 'teenagers'. The essence of the word adolescence is growth, and it is in this sense that adolescence represents a period of intensive growth and change in nearly all aspects of development.

Adolescence refers to the stage of growth between childhood and adulthood, while an adolescent is the individual who is experiencing that stage. Adolescence begins with the onset of physiologically normal puberty and ends with the beginning of adulthood. This is the transitional period of physical, intellectual, social, and emotional development that occurs between childhood and adulthood. In other words, the period of life when the body undergoes changes leading to reproductive maturity is called adolescence.

Characteristics of adolescence

Adolescence has certain characteristics that distinguish it from other periods. They are:

- **Transitional period:** Adolescence is a transitional period from childhood to adulthood marked by rapid physical, cognitive, emotional and social changes, preparing individuals for adult roles through developing identity, independence and complex reasoning. During this period, the individual's status is vague, and there is confusion about the roles the individual is expected to play. The adolescent at this time is neither a child nor an adult.
- **Rapid development:** During this stage, there is a rapid development in physical, psychological, emotional and social aspects of an individual along with a change in values, attitude, interest, skills and behaviour.
- **Egocentric and problematic age:** Egocentrism is characterized by exaggerated self-awareness and the inability to differentiate between one's own perceptions and perceptions of others. It is considered a 'problem age' due to rapid physical and psychological changes leading to characteristics like mood swings, risk-taking behaviours, and desire for independence.
- **Formation of identity:** During this period, adolescents begin to search for their identity and try to develop individuality in their own way, which sometimes leads to an identity crisis in some adolescents.

- **Unrealistic aspirations:** During this period, the aspirations, desires, goals, etc., are more idealistic rather than realistic. They frame unrealistic, false and illogical concepts which sometimes hurt and disappoint them in life.
- **Period of intense emotions:** The emotions during this period are very intense due to hormonal changes, brain development, environmental influences, etc.
- **Storm and stress:** This stage is often marked by emotional turbulence, mood swings and identity exploration due to elevated hormones, changes at school and in their personal lives, increased sense of independence, etc.
- **Threshold of adulthood:** They want to create an impression that they are like adults. So they try out socially unacceptable adult behaviours like smoking, drinking, using drugs, engaging in sex, etc.
- **Attraction towards complementary sex:** It means the sexual, romantic or emotional attraction to people of the opposite sex or gender.

4.2 Developments During Adolescence

During this period, rapid development takes place in physical, intellectual, emotional and social aspects. Let us know what they are.

A. Biological and physical development

During the adolescent period, significant biological and physical changes occur. The marked change is the attainment of puberty, characterized by a growth spurt, physiological changes and sexual development.

Puberty (between 8 and 13 in females and 9 and 14 in males):

The changes that occur both inside and outside the body during adolescence happen through a process called 'puberty'. This process is triggered by the release of specific hormones (chemicals) in the brain. These physical changes in adolescents shift them from their childhood bodies to their adult bodies. The primary function of puberty is to produce sexually mature adults capable of reproduction. Thus, puberty is the process of physical maturation where an adolescent reaches sexual maturity and becomes capable of reproduction. During puberty, both sexes experience a rapid increase in height and weight (referred to as a growth spurt) for

about 2-3 years, resulting from the simultaneous release of growth hormones, thyroid hormones, and androgens.

Changes at puberty: The major changes which occur during puberty are as follows;

- **Increase in height and weight:** Males experience their growth spurt about two years later than females. For girls, the growth spurt begins between 8 and 13 years old (average 10-11), with adult height reaching between 10 and 16 years old. Boys begin their growth spurt slightly later, usually between 10 and 16 years old (average 12-13), and reach their adult height between 13 and 17 years old. Both nature (i.e., genes) and nurture (e.g., nutrition, care, medications, and medical conditions) can influence both height and weight. The increase in height and weight varies in different individuals. Some may grow suddenly at puberty and then slow down, while others may grow gradually. Even all the parts of the body may not grow at the same rate. Sometimes the arms, legs or hands and feet of adolescents look oversized and out of proportion with the body. But soon the other parts also grow, and the body becomes proportionate.
- **Changes in body shape:** Many changes occur in the body shape during puberty. These changes are different for boys and girls. In boys, shoulders become broader, and the chest becomes wider. The body muscles grow more prominently than in girls, so the body of boys looks more muscular. Generally, the peak growth of muscle mass is typically around the age of 14 to 16 years.

In girls, hips gain weight, and the region below the waist (pelvic region) becomes wider. The development of breasts also begins during this period. As bones increase in size, the cartilage begins to calcify, making the bones harder, denser and brittle. The ossification process speeds up at puberty and during late teenage it is completed. The trunk also grows to its full length. Facial features also change due to the eruption of permanent teeth.
- **Physiological changes:** There is a great change in the internal systems of the body. All systems as respiratory, circulatory, digestive, blood pressure, heart and pulse rate, acquire their full growth. The brain is fully developed by the age of 18 years of age.

- **Change in voice:** At Puberty the voice box or larynx begins to grow. Boys develop larger voice boxes. The growing voice box in boys can be seen from the outside in the neck. This protruding part of the throat is called Adam's apple. The voice of boys becomes hoarse and high-pitched, and girls' voices become sweet and shrill. In girls, the voice box is hardly visible from the outside because of its small size.
- **Increased activity of sweat and sebaceous glands:** In human beings, the skin has two important glands, namely sweat and sebaceous glands. The sweat glands produce sweat, and the sebaceous glands produce oil or sebum, which keeps the skin oily. During puberty, due to the increased activity of sweat and sebaceous glands, the secretion of sweat and oil increases. Due to this, adolescents get acne and pimples on the face.
- **Sexual development:** The growth spurt is followed by the development of sexual maturity. Sexual changes are divided into two categories: Primary sexual characteristics and secondary sexual characteristics. Primary sexual characteristics are changes in the reproductive organs (Girls: uterus, ovaries, vagina; Boys: enlargement of testes, penis, prostate gland and seminal vesicles). Secondary sexual characteristics are visible changes not directly linked to reproduction, but signal sexual maturity.

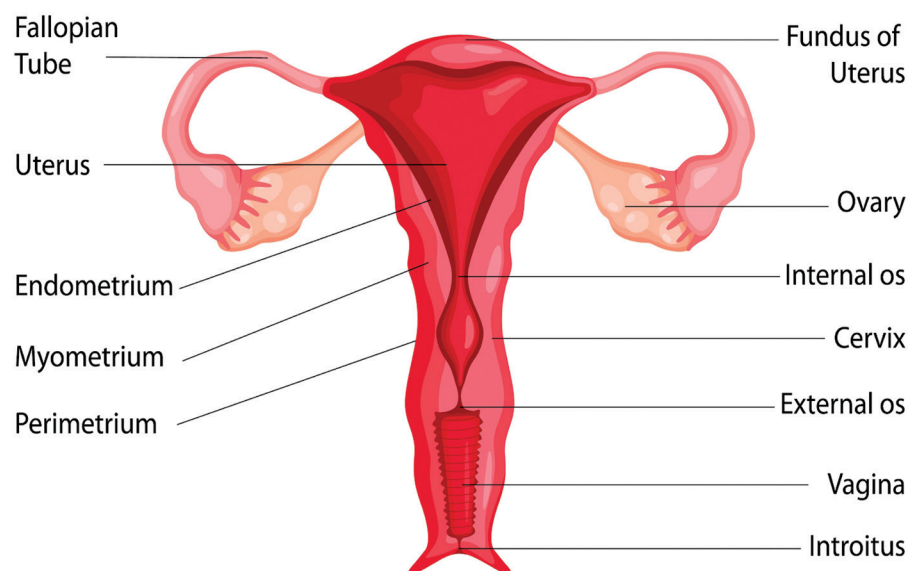
The two major systems involved in puberty are the reproductive and endocrine systems. The hypothalamus, pituitary gland, adrenal glands, ovaries, and testes all produce hormones involved in the changes of puberty. However, these hormones produced during puberty affect nearly every system within the body, causing both internal and observable changes. During puberty, increases in estrogen and testosterone bind receptors in the limbic system, which stimulates the sex drive and increases emotional volatility and impulsivity.

The development of male and female sex organs takes place as follows:

Development of sex organs in females

Aspect	Scientific Description
Thelarche	Thelarche is the beginning of breast development and is usually the first visible sign of puberty in girls, occurring around 9–10 years of age.

Pubarche	Pubarche refers to the appearance of pubic hair about six months after thelarche; axillary hair develops roughly two years later due to androgen hormones.
Menarche	Menarche is the first menstrual cycle, triggered by increased secretion of Follicle Stimulating Hormone (FSH) and Lutenizing Hormone (LH), and usually occurs 1.5–3 years after thelarche.
Ovarian Development	Rising gonadotropin levels stimulate estradiol production, leading to ovarian growth, secondary sexual characteristics, and maturation of reproductive organs.
Uterus Size	Estrogen causes the uterus to change from a teardrop to a pear shape as the uterine body increases in size and thickness.
Vaginal Changes	Enlargement of the labia majora and minora occurs, and clear or white vaginal discharge may appear before menarche.



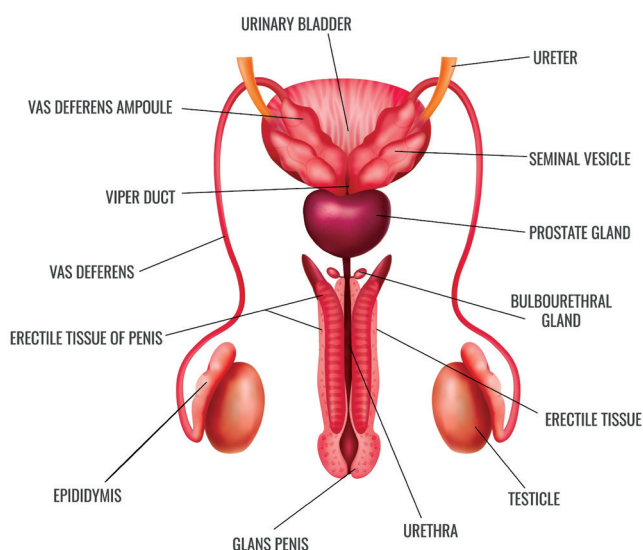
Do you know?

Menstrual Hygiene materials: There are a lot of menstrual hygiene products available in the market such as sanitary napkins, cloth pads, tampons and menstrual cups etc. To get more information about menstrual hygiene materials refer:

<https://share.google/mn9ytsDeNyENYDDVS>

Development of sex organs in males

Aspect	Scientific Description
Testicular Size	Enlargement of the testes is the first sign of male puberty, accompanied by thinning and darkening of the scrotal skin.
Ejaculation and Fertility	The first ejaculation usually occurs about one year after testicular growth begins, while fertility develops around one year later.
Pubarche	Pubic hair appears at the base of the penis, followed by axillary, chest, and facial hair about two years later.
Penis Size	Penis growth follows testicular enlargement, increasing first in length, then in width, along with enlargement of internal structures.



Do you know?

Puberty disorders : Puberty disorder is defined as when a person goes through puberty earlier or later than expected, based on their age. The following are the types of puberty disorders.

Premature (precocious) puberty: Premature (precocious) puberty or early development of secondary sexual characteristics is defined as the appearance of secondary sexual characteristics before the age of eight in girls or before the age of nine in boys.

Delayed puberty: Delayed puberty occurs when pubertal changes happen later than expected. Development may be absent, or secondary sexual characteristics may be incomplete. Delayed puberty in boys is considered a period longer than four years between the first signs of testicular enlargement and the end of puberty or the absence of testicular growth by 14 years old. Delayed puberty in girls is considered the absence of breast growth by 13 years of age or more than four years between thelarche and menarche.

B. Cognitive development

You know that teenagers' thinking or problem-solving skills are different from a late childhood child. Have you ever thought about what allows them to make these complex changes?

Just as in infancy and childhood, the brains in adolescence undergo a lot of growth and development. These changes will reinforce adolescents' abilities to make and carry out decisions that will help them thrive now and in the future. The brain grows and strengthens itself in three ways.



- **Growing new brain cells:** Adolescence is one of the few times in which the brain produces a large number of cells at a very fast rate.
- **Pruning some of the extra growth:** As adolescents go to school, live and work, the brain trims down the extra growth based on the parts of the brain the adolescent's activities use. This pruning process produces a brain structure that enables adolescents to easily access the information they use most.
- **Strengthening connections:** The connections between brain cells help the information stored in the brain to be used in daily life. The brain strengthens these connections by wrapping special fatty tissue around the cells to protect and insulate them. These changes help adolescents recall information and use it efficiently.

Different sections of the brain develop at different times, with the part of the brain responsible for abstract thinking, planning and decision making developing last. Overall, the brain is not fully developed and protected until people are in their mid-20s. The changes in the adolescent brain affect adolescent's thinking skills. Specifically, young people gain these advantages as the brain grows, prunes and strengthens connections.

The final phase in Jean Piaget's theory of cognitive development typically emerges around the age of 12 and continues into adulthood. This stage is called the **Formal Operational Stage**. During this stage, individuals demonstrate advanced cognitive abilities characterized by abstract thinking, hypothetical reasoning, and systematic problem-solving. Here are some key features of the Formal Operational Stage.

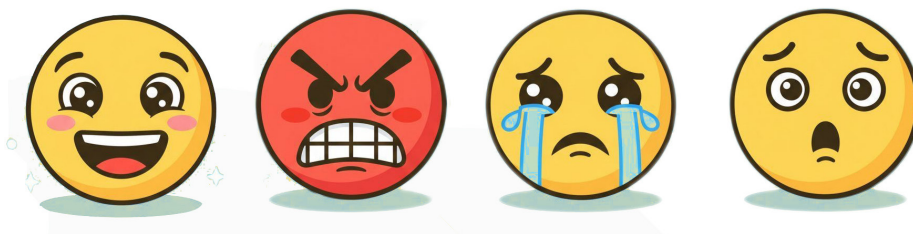
- **Abstract thinking:** Abstract thinking is the ability to understand ideas and concepts that are not concrete or physically present. During adolescence, individuals can think beyond immediate experiences and understand concepts such as justice, democracy, love, and freedom. This ability supports higher reasoning, creativity, problem-solving, and learning in subjects that require conceptual understanding.
- **Hypothetical-deductive reasoning:** Hypothetical-deductive reasoning is the ability to form hypotheses, predict possible outcomes, and test them logically. Adolescents can consider many possible solutions to a problem and evaluate each systematically. This type of reasoning is central to scientific thinking and helps in decision-making, planning, and problem-solving.
- **Propositional thought:** Propositional thought involves logical reasoning based on verbal statements rather than real-life situations. Adolescents can analyze “if-then” statements and judge their logical validity. This allows reasoning about abstract ideas, variables, and relationships without depending on direct experience or concrete examples.
- **Systematic problem-solving:** Systematic problem-solving refers to the ability to approach problems in an organized and logical manner. Adolescents identify variables, form hypotheses, and test solutions step by step. This skill reduces trial-and-error approaches and supports effective problem-solving in scientific, mathematical, and real-life situations.
- **Metacognition:** Metacognition is the awareness and control of one's own thinking processes. During adolescence, individuals can reflect on how they learn, monitor their understanding, and adjust strategies to improve performance. This ability enhances planning, self-regulation, decision-making, and independent learning.

- **Moral reasoning:** Moral reasoning develops as adolescents begin to think abstractly about ethical issues. They can evaluate right and wrong based on principles such as justice, fairness, and intentions rather than only consequences. This growth helps them predict outcomes, make responsible choices, and understand social and moral responsibilities.

Overall, the Formal Operational Stage represents a remarkable milestone in cognitive development, characterized by the ability to think abstractly, reason hypothetically, and engage in systematic problem-solving. These improved cognitive abilities enable individuals to tackle complex intellectual challenges, pursue higher education and professional careers, and contribute to scientific inquiry and creative endeavours.

C. Emotional development

Write down the emotions of the emojis.



List some of the emotions (both positive and negative) you have experienced during the last few days.

During adolescence, individuals experience a wide range of intense emotions, including happiness, love, anger, anxiety, and sadness. These emotions are often exaggerated, leading to emotional instability and unpredictable behaviour. Healthy emotional development involves learning to understand, manage, and regulate emotions, influenced by biological changes, cognitive growth, and environmental factors. Factors that affect how well adolescents handle the process of emotional development include:

1. **Self-management:** By self-management of emotions, adolescents can establish positive goals and gain foresight into how their emotions can influence their goals and futures. In order to improve their ability to manage emotions, adolescents must first learn to recognize and describe intense, complex emotions. However, because the brain's frontal lobe—which

is responsible for reasoning, planning, and problem-solving as well as emotions— doesn't fully develop until the mid-twenties, adolescents may find it difficult to manage their emotions. Gradually and with the support of parents and mentors, adolescents can develop reasoning and abstract thinking skills. This will enable them to step back, examine their emotions, and consider consequences before acting rashly.

- 2. Hormones:** Hormones are critical chemicals in the brain that bring about physical changes and also affect adolescents' moods and heighten their emotional responses. Adolescence is also a time of stressful changes in peer relationships, school expectations and family dynamics. The body responds to stress by activating specific hormones and activities in the nervous system so that the person can respond quickly and perform well under pressure. The stress response kicks in more quickly for adolescents than it does for adults whose brains are fully developed. Not all stressors are bad. Positive experiences can trigger a stress response that enables adolescents to approach a challenge with alertness and focus.

Emotional regulation in adolescents

Emotional regulation refers to the ability to recognize, understand, and effectively manage one's emotions to achieve desired results. It includes processes such as identifying emotional triggers, modulating emotional responses, and using coping strategies to regulate intense feelings. Effective emotional regulation enables adolescents to steer interpersonal relationships, cope with stress, and make thoughtful decisions.

Strategies for promoting healthy emotional regulation

Encouraging adolescents to identify and label their emotions fosters self-awareness and emotional intelligence. Therapeutic interventions such as cognitive-behavioral therapy (CBT) and mindfulness practices teach adolescents to recognize emotional triggers, understand the connection between thoughts and feelings, and express emotions constructively. The following methods can be adopted to regulate emotions.

- 1. Coping skills development:** Developing skills to understand and accept one's own emotions without guilt. Teaching adaptive coping skills helps adolescents manage stress and

regulate emotions effectively. Techniques such as journaling, creative activities, and physical exercise reduce emotional intensity and promote well-being.

- 2. Social support and relationships:** Supportive relationships with family, peers, and teachers provide emotional security and guidance. These connections reduce stress, strengthen resilience, and encourage healthy emotional expression.
- 3. Mindfulness and meditation:** Mindfulness practices help adolescents become aware of their emotions without reacting impulsively. This promotes emotional balance, self-acceptance, and improved mental well-being. Techniques such as deep breathing helps to maintain emotional balance.
- 4. Parental and caregiver support:** Parental support through open communication and empathy creates a safe space for emotional expression. Consistent guidance, positive reinforcement, and clear boundaries help adolescents develop effective emotion regulation skills.



Do you know?

Emotional Intelligence (EI) refers to a set of cognitive and behavioral competencies involved in the perception, appraisal, regulation, and utilization of emotions in oneself and others. It encompasses processes such as emotional awareness, emotional regulation, empathy, and social functioning. Emotional Quotient (EQ) represents the quantitative assessment of these competencies, obtained through standardized psychometric instruments. While EI denotes the underlying emotional and social capacities, EQ reflects their measurable expression and serves as an empirical indicator of emotional functioning.

D. Social development



You might have experienced a similar situation in your life as shown in the picture. What are the values you think that you can inculcate through such peer relationships?

Social development in adolescence is essential due to various reasons. It capacitates individuals to form and maintain healthy relationships, develop empathy, and navigate social complexities. Adolescents who have strong social skills are more likely

to have positive self-esteem, experience a sense of belonging, and have a higher level of overall satisfaction in their lives.

Moreover, adolescence serves as a crucial period for identity formation. Through social interactions, adolescents explore different roles, values, and belief systems, which contribute to the development of their unique identities. Peer relationships, family dynamics, and the influence of societal expectations all play significant roles in moulding an adolescent's social development.

Thus, we can say that this period of transition from childhood to adulthood is marked by major changes in social interactions. Generally, this transition includes:

- 1. Expanding their social circles:** Apart from family, adolescents' networks also include people from team sports, student organizations and other activities. As their social circles expand, adolescents spend less time with their families and may focus more on their peers. They also develop a greater capacity to form stronger relationships with adults outside of their families who may function as mentors.
- 2. Expanding their social roles:** The changes adolescents experience in their brains, emotions, and bodies prime them to take on more complex social roles. Cognitive and emotional development work together to help adolescents have deeper conversations and express their emotions better. Physical development signals that adolescents are becoming adults and that they may be entrusted with greater responsibility. Adolescents may assume new roles, such as taking on a leadership position in school, on a team, serving as a confidante, or being a romantic partner.

Key factors influencing social development

Several factors influence social development during adolescence. These include cognitive changes, peer relationships, family dynamics, and the impact of social media and technology. Let us analyse them.

- 1. Cognitive changes:** During adolescence, significant cognitive changes occur, including the development of abstract thinking, increased self-awareness, and enhanced ability to form outlook. These cognitive changes enable adolescents to understand social cues, anticipate consequences, and engage in more complex social interactions.

- 2. Peer relationships:** During adolescence, individuals spend more time with peers than with family, often in unsupervised settings. Friendships become more intimate, focusing on sharing thoughts and feelings, and peer groups gradually move from single-sex to mixed-sex. This stage supports the development of close friendships and short-term romantic relationships, which play an important role in identity formation, emotional adjustment, and emerging sexuality, including the recognition of diverse sexual orientations and gender identities.

Crowds represent an important level of peer relationships during adolescence. Unlike close friendships or cliques, crowds are defined more by shared social identities, reputations, or images than by direct interaction. Peers play a dual role in adolescent development: negative peer pressure may encourage risky or problematic behaviour, while positive peer relationships provide social support, companionship, and guidance. Adolescents with healthy peer connections tend to be happier, emotionally well adjusted, and socially competent compared to those who experience isolation or peer conflict.

- 3. Role of parenting:** One of the crucial changes during adolescence involves a renegotiation of parent-child relationships. As adolescents, they seek more independence and autonomy during this time. So different aspects of parenting becomes more important. For example, parents' distal supervision and monitoring become more important as adolescents spend more time away from parents and in the presence of peers. Parental monitoring encompasses a wide range of behaviours, such as parents' attempts to set rules and know their friends, activities, and whereabouts. Another



aspect of parenting is psychological control, which involves manipulation and intrusion into their emotional and cognitive world through invalidating their feelings and pressuring them to think in a particular way. This becomes more salient during adolescence and is related to more problematic adolescents. These, in turn, lead to conflicts between them and the parents. Generally, the

issues are concerned with dress and appearance, friendship, privacy, dating, etc. Despite these conflicting issues, parents and adolescents agree more regarding core values linked to education, politics and spirituality.

Positive parenting during this period provides support, guidance, and helps them reach their full potential. Positive parenting is associated with an array of positive developmental outcomes, such as higher academic achievement.

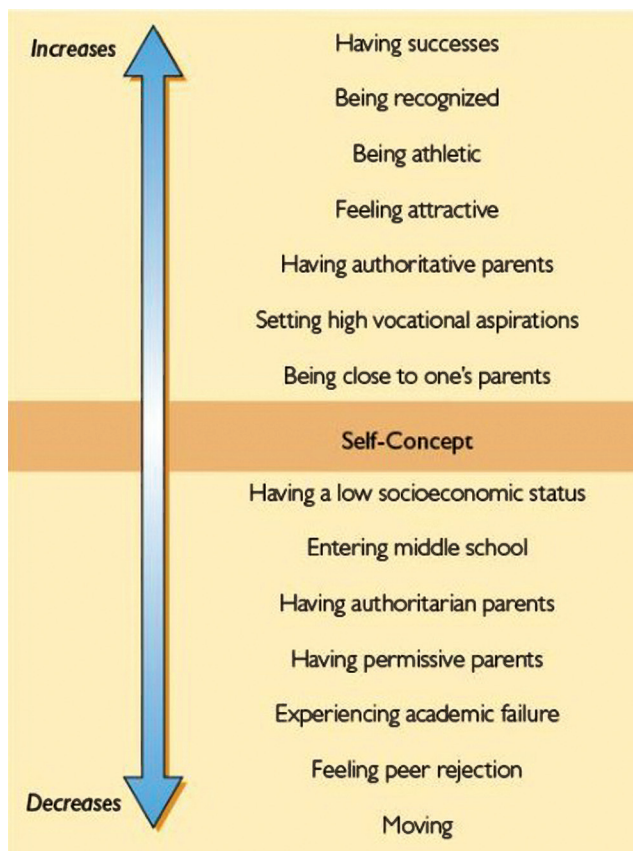
- 4. Social media and technology:** In today's digital age, social media and technology play a complex role in adolescent's social development. Social media platforms provide positive opportunities for self-expression, connection, access to global awareness and information-sharing. However, excessive use of social media can lead to social comparison, cyberbullying and online harassment, and decreased face-to-face interactions, negatively affecting an adolescent's social skills and mental health, including social isolation. Finding a balance between virtual and real-life interactions is crucial for healthy social development.

E. Identity development

Identity refers to an individual's sense of uniqueness, individuality, and continuity within the social environment, encompassing personal qualities, beliefs, and self-expression. In psychology, identity is viewed as a process of identity development rather than a fixed formation, involving continuous changes in how individuals understand themselves. Adolescence is a crucial period for identity development because physical growth, cognitive maturity, and social expectations come together for the first time, enabling individuals to reevaluate childhood identifications and plan for adulthood. Erikson (1968), a famous Psychologist described identity formation as the central developmental task of adolescence and a key stage in the life cycle. However, identity develops across the lifespan, beginning in infancy and evolving into old age. During adolescence, individuals experiment with different roles, behaviours, and appearances to discover who they are. This process is challenging and influenced by family, environment, and social status. Disruptions in identity development may result in role confusion, disorientation, or the adoption of negative identities.

Aspects of identity development

1. **Self-concept:** The idea of self-concept is known as the ability of a person to have opinions and beliefs that are defined confidently, consistently and with stability. During adolescence, several factors contribute to the formation of self-concept. The first factor is personal experiences and achievements. Adolescents' perceptions of their abilities, skills and accomplishments contribute to their sense of self-worth and self-efficacy. The second factor is the cultural and societal norms that influence adolescents' self-concept by shaping their beliefs, values and attitudes. The third factor is the influence of family and peers.
2. **Self-esteem:** Self-esteem refers to an individual's thoughts and feelings about their self-concept and identity. Most psychological theories suggest that people across all ages and genders strive to maintain and enhance their self-esteem. During adolescence, self-esteem is influenced by family relationships, peer acceptance, academic achievement, and social environment. Adolescents with authoritative parents, parental closeness, recognition for achievements, high aspirations, physical competence, or positive body image tend to have higher self-esteem. In contrast, experiences such as peer rejection, academic failure, school transition, relocation, low socioeconomic status, or authoritarian and permissive parenting styles can lower self-esteem. Gender differences are also evident during adolescence.



Girls tend to develop higher self-esteem through supportive friendships and social approval, while lack of peer acceptance can reduce their self-worth. Boys often derive self-esteem

from independence, peer influence, and success in social or romantic relationships. Difficulties in forming or maintaining such relationships may contribute to lower self-esteem in adolescent boys.

Identity crisis

The period during which teenagers build up a feeling of identity is a difficult stage. They experience identity formation as a long period of disclosure or getting themselves. During this period, teenagers grasp changes and make adjustments with changes to be followed in the upcoming phase of their lives. But adoption of such changes is not an easy task, and some adolescents find it difficult to adjust to change. They feel unable to know who they are, where they belong to, and what the motive of their lives is. They fail to make rational choices in life and deviate from normal behaviour patterns in life. Sometimes, adjustment to bodily change seems difficult for them, and they fail to push a confident self-identity. Once the inability to reconcile with self-image creates a hindrance in the development of a healthy self-image, it leads to an identity crisis. This is known as an identity crisis.

Strategies to overcome identity crisis include exploring new interests and experiences, journaling, self-reflection and building a strong support system of family, friends and mentors. Seek professional help if needed. Practising mindfulness techniques like meditation and yoga can help to increase self-awareness and reduce anxiety.

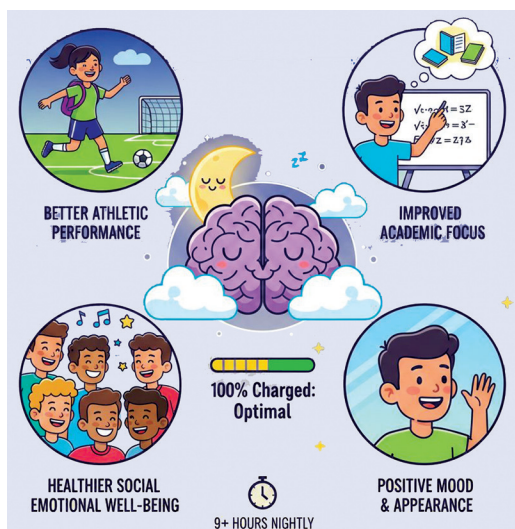
Now you have a comprehensive knowledge about various aspects of development during adolescence. In this connection one common factor associated with the proper development of all the above aspects is 'adequate sleep'. Let us know its significance.

Importance of sleep during adolescence

If you could gain two extra hours in your day, would you spend them sleeping or doing something else? Why?

Sleep is vital for people of any age. In the case of adolescents, physical, cognitive, social, and emotional development requires quality sleep. Sleep contributes to the effective function of virtually every system of the body. Sleep is fundamental in regulating the hypothalamic-pituitary-adrenal axis, which is involved in growth hormone (GH) release. During deep sleep, there is an increase in

growth hormone secretion. This peak of growth hormone during sleep is essential for growth and muscle development, as well as tissue regeneration and repair. Growth hormone has a strong association with brain activity during deep sleep and plays a role in maintaining tissue homeostasis. Furthermore, growth hormone has been identified as being one of the potential mechanisms that link sleep to body composition. Sleep benefits the brain and promotes attention, memory, and analytical thought. It empowers the immune system, helps regulate hormones, and enables muscle and tissue recovery.



What happens if sleep is insufficient?

Insufficient or poor quality of sleep can have a significant impact on the development, learning, behavior, and overall health of adolescents including a detrimental effect on their physical and mental well-being. Other effects include difficulties with concentration, increased irritability, growth impairment, weakened immune function, anxiety, and depression. Sleep deprivation can affect the development of the frontal lobe, a part of the brain that is critical to control impulsive behaviour. Studies have

found that adolescents who don't get enough sleep are more likely to engage in more high-risk behaviours.

Why is it hard for adolescents to get good sleep?

Do you get enough sleep? Why?

There are many reasons for sleep insufficiency among adolescents. They are:

- 1. Biological pressures:** There are two systems that control when we sleep and wake. The first is the homeostatic sleep system. This system acts like a pressure system for sleep. Studies suggest that sleep pressure builds more slowly in older adolescent brains compared with younger adolescents. The second system is the circadian system. This system is our body's timekeeping system – or our internal clock. Our internal clock represents what time our body thinks it is. We can figure out what time our body thinks it is by measuring the hormone melatonin. In general, when melatonin levels are high, our body thinks it is nighttime. When melatonin

levels are low, our body thinks it is daytime. Melatonin levels begin to increase about 1-3 hours before we go to sleep. This increase in melatonin indicates that the brain is getting ready for sleep. During adolescence, melatonin begins to rise later. The combination of a slowed buildup of sleep pressure and a later circadian clock makes many older adolescents want to stay up later.

What does an adolescent do at night when they are not ready to go to bed? They study, watch television, play video games, and socialize. Many of these activities occur on some sort of screen (even homework!). The greater access adolescents have to media screens (TV, cell phone, computer, video games), the fewer hours of sleep they are likely to get. Looking at the blue light from screens before bedtime can shift the circadian clock later. It can also increase alertness.

- 2. Psychosocial pressures:** In addition to the blue light, the social component of screens encourages teens to stay up later. One study shows that interactive activities (texting or playing a game) impact more than watching television.
- 3. Societal pressures:** As adolescents get older, they are forced to get up early in the morning due to reasons like to carry out personal activities, tuition, getting ready for school, covering traveling time, etc. Thus they will not be able to get the right amount of sleep. Thus the adolescents were starting their day before their brains were ready. Sleeping in on the weekends is not enough to fix the problem. This may actually make the problem worse. Sleeping in on the weekends can shift the circadian clock later. This will make it even harder to wake up on Monday morning.

Strategies to improve sleep hygiene of adolescents

- Keep a consistent sleep schedule.
- Get exposure to light in the morning.
- Avoid caffeine (coffee, tea, energy drinks, etc.) in the afternoon.
- Start a bedtime routine.
- Leave phone in another room before and during sleep.
- Use a traditional alarm clock instead of a phone alarm.
- Adolescents struggling with sleep should seek professional help.

4.3 Specific Issues and Concerns During Adolescence



Adolescent disorders

Adolescent disorders are an umbrella term used to describe a range of mental, emotional and behavioural disorders that appear during adolescence. These conditions can significantly impact a young person's development, learning, relationships and daily functioning. Moreover, these disorders often intersect with family dynamics, cultural backgrounds and socioeconomic factors, requiring a holistic approach to care. Let us discuss some of the adolescent disorders.

i. Eating disorders

Kerala teen dies after following extreme diet plan

She reportedly died of severe anorexia nervosa, a psychiatric condition, in which individuals lose the natural reflex for hunger and thirst



A-17 year-old girl from Meruvambayi, Kuthumparamba suffering from the severe anorexia nervosa, a psychiatric condition, in which individuals lose the natural reflex for hunger and thirst, died while undergoing treatment at the Thalassery Cooperative Hospital.

The news highlights the fatal risk of anorexia nervosa. Do you think the behaviour of the adolescent is normal? No, it is a disorder. Let us know more about such disorders and issues concerning adolescents.

Eating disorders are characterized by irregular eating habits and severe distress or concern about body weight or shape. The most common forms of eating disorders include Anorexia Nervosa, Bulimia Nervosa and Binge Eating Disorder. Eating disorders are complex conditions that often stem from a combination of genetic, psychological, and environmental factors. Adolescence is a particularly vulnerable time for the development of eating disorders, as young people may face societal pressure about body image, peer influences, and changes in their physical appearance. Eating disorders can have serious physical and emotional consequences, including malnutrition, organ damage, and difficulties with self-esteem. So early

intervention and support are crucial for recovery.

The most common eating disorders in adolescents are:

A. Anorexia nervosa

The person suffering from anorexia nervosa will typically have an obsessive fear of gaining weight, refusal to maintain a healthy body weight and an unrealistic concept of body image. Many people with Anorexia will ferociously limit the quantity of food they consume and view themselves as overweight even when they are clearly underweight. This disorder is characterized by severe restriction of food intake and excessive exercise. Adolescents with anorexia may struggle with body dysmorphia, seeing themselves as overweight even when they are critically underweight.



Causes of anorexia nervosa

The following are the causes of anorexia nervosa:

- 1. Biological factors:** Genes play a significant role in triggering anorexia nervosa. Neurodevelopment disorders and the complication of pregnancy are also pertinent risk factors for anorexia nervosa.
- 2. Psychological factors:** People who have low self-esteem and self-evaluation are more likely to be diagnosed with anorexia nervosa. Mood disturbances affect the onset of this condition. People who experience anxiety and depression also have a contributing influence.
- 3. Environmental factors:** Insecure attachment, inappropriate parental behaviours or unstable family environment can be the perpetuating factors of anorexia nervosa. Meanwhile, peer relationships, eating habits, or horrible experiences like past trauma are hard to forget and can also be risk factors of anorexia nervosa. People who dislike healthy food and follow an unbalanced diet are more likely to get anorexia nervosa.

Consequences of anorexia nervosa

Immediate effects of anorexia nervosa include dizziness, headaches, brain fog, cold, nausea, weakness and blurred vision. Studies reveal

a reduction in life expectancy. Also, these patients have a mortality rate for all causes of death six times higher than that of the general population. Other long-term effects are:

1. **Psychiatric disorders:** Psychiatric co-morbidity is common in eating disorders. Depression and anxiety are the most common psychiatric disorders among patients with anorexia nervosa.
2. **Cardiovascular disease:** It is reported that cardiac complications appear in 80% of patients with eating disorders.
3. **Fertility and pregnancy:** The neuroendocrine anomalies which occur in anorexic patients have both short-term and long-term consequences for their reproductive health. It includes cessation of the normal menstrual cycle and amenorrhea.
4. **Osteoporosis:** Anorexia Nervosa has a profound influence on bone metabolism. Adolescent girls suffering from anorexia nervosa do not acquire the usual linear increase in bone mass during puberty. This lowers bone mineral density, leading to osteoporosis.
5. **Gastrointestinal problems:** Many severe metabolic disturbances are seen in patients with anorexia nervosa, including electrolyte abnormalities.

Management of anorexia nervosa

1. **Nutrition intervention:** Nutritional intervention is among the most well-known therapies to alleviate anorexia nervosa since the patients are malnourished in general.
2. **Cognitive behavioural therapy:** Cognitive behavioural therapy is a highly recommended and adapted therapeutic approach to cure anorexia nervosa. It has proved to be highly effective in dealing with mental disorders that bring people faulty evaluations of themselves.
3. **Family-based therapy:** Family-based therapy works in a family as a whole, through the coordination of family relationships so that each family member understands and corrects the possibly existing pathological emotional structure of the family, improves family functioning and produces therapeutic results.

4. **Pharmacological treatment:** There is a specifically designed pharmacological treatment for anorexia nervosa, but antipsychotic drugs have been shown to have an effect in treating the same.
5. **Surgical treatment:** The abnormalities in brain function and structure offer the possibility of neuromodulatory surgical interventions in anorexia nervosa.

B. Bulimia nervosa

Bulimia nervosa is an eating disorder characterized by repeated binge eating followed by behaviours that compensate for the overeating, such as forced vomiting, excessive exercise or extreme use of laxatives or diuretics. Persons suffering from bulimia may fear weight gain and feel severely unhappy with their body size and shape. The eating and purging cycle is typically done in secret, creating feelings of shame, guilt and lack of control.

Cause of bulimia nervosa

Females are more likely to have bulimia nervosa than males. Bulimia often begins in late adolescence or young adulthood. Factors that contribute to bulimia nervosa are:

1. **Family history and genes:** Persons with first-degree relatives- siblings, parents or children- who are diagnosed with an eating disorder may be more likely to have an eating disorder. This proposes a possible genetic link.
2. **Mental health and emotional issues:** Mental health and emotional problems, such as perfectionism, depression, anxiety or substance abuse, are linked closely with eating disorders. People with bulimia may feel bad about themselves, especially if they are bullied about weight or shape.
3. **Dieting:** People who are in strict dieting are more likely to have eating disorders. Many people with bulimia drastically limit calories between binge-eating sessions. This may cause them to binge eat again and then purge. Other causes for binge eating include stress, intense emotions, having a distorted or negative body image and boredom.
4. **Environmental Pressures:** Social media, being highlighted with cultural ideals of thinness and constant peer comparison, may also be a risk factor.

Consequences of Bulimia Nervosa

1. **Dental complications:** Dental erosion is related to self-induced vomiting, and gastroesophageal reflux occurs due to the acidity of the gastric juice.
2. **Digestive system complications:** Vomiting causes injury to the gastrointestinal tract. The oesophagus may have lesions ranging from mild erosion of the oesophagus to rupture of the oesophagus. Constipation is quite common.
3. **Hepatic and pancreatic complications:** During the course of bulimia Nervosa, the mechanisms of elimination and malnutrition cause hepatic and pancreatic changes. Malnutrition also causes morphological and functional pancreatic complications.
4. **Metabolic and electrolytic complications:** As a consequence of the repeated episodes of vomiting and the abuse of diuretics, there will be a decrease in total body potassium. Malnutrition causes a decrease in the total content of sodium, too. Electrolyte imbalances can naturally cause severe disturbances of the heart rhythm.
5. **Dermatological complications:** It includes skin dryness and Russell's sign (scarring on the knuckles), which is calluses on the back of the hands caused by the introduction of the fingers in the throat.
6. **Effects of laxative abuse:** Abuse of laxatives can be responsible for complications in the acid-base and electrolyte balance.

Management of bulimia nervosa

Apart from the medical treatment by medical professionals, the following therapy is also needed :

1. **Enhanced Cognitive Behavioural Therapy (CBT-E):** This therapy has been shown to reduce binge-purge episodes by restructuring harmful thought patterns.
2. **Family-based Therapy (FBT):** Family-based therapy involves parents directly, putting them in control to help the teen establish normal eating patterns.
3. **Dialectical behaviour therapy:** This therapy helps teens regulate intense emotions, reduce impulsive behaviour and

build coping skills when facing challenging situations and triggers.

C. Binge-eating disorder

Binge-eating disorder is a severe, life-threatening eating disorder characterised by frequent and recurrent binge eating episodes with associated negative psychological and social problems, but without subsequent vomiting. Unlike bulimia, this disorder is characterized by consuming large amounts of food in a short period without purging afterwards. Feelings of distress and loss of control often accompany these episodes.

Causes of binge-eating disorder

The causes of binge-eating disorder are likely due to a variety of risk factors, which include the following:

1. **Genetics:** People with binge eating disorder have increased sensitivity to dopamine, which is responsible for feelings of reward and pleasure. There is also strong evidence that this disorder is inherited.
2. **Changes in the brain:** There are indications that people with binge eating disorder have changes in brain structure that result in heightened responses to food and less self-control.
3. **Body size:** It has been found that almost 50% of people with this disorder and 25 to 50% of patients seeking weight loss surgery meet the criteria for binge-eating disorder. Weight problems may be both a cause and a consequence of this binge eating disorder.
4. **Body image:** People with binge eating disorders have a very negative body image.
5. **Emotional trauma:** Stressful life events, such as death, the separation of a family member or a car accident, are risk factors. Childhood bullying due to weight may also contribute to this disorder.
6. **Other psychological conditions:** Almost 80% of people with binge-eating disorder have at least one other psychological disorder, such as phobias, depression, post-traumatic stress disorder, anxiety or substance abuse. Also, an episode of binge eating can be triggered by stress, dieting, negative feelings related to body weight or body shape, the availability of food or boredom.

Consequences of binge-eating disorder

People with binge eating disorders experience the following effects.

1. **Obesity:** Overeating of food can definitely lead to weight gain, and obesity is a serious health problem.
2. **Emotional problems:** Binge-eating disorder is commonly associated with depression, which can be both a risk factor for the eating disorder and a consequence of it.
3. **Poor self-image, feelings of shame and guilt:** Adolescents who binge eat often struggle with poor self-image as well as feelings of shame and guilt about the behaviour. These negative feelings can become so severe that binge eating interferes with relationships, sleep and overall quality of life. It has been found that suicide attempts were more common with all types of eating disorders, including binge eating disorder.

Management of binge-eating disorder

Treatment for Binge-eating disorder is available, and recovery is possible. A multidisciplinary approach is used in the treatment of this disorder.

1. **Counselling:** Cognitive behavioural therapy, interpersonal psychotherapy and Dialectical behaviour therapy are the counselling therapies usually adopted for managing binge eating disorder.
2. **Relaxation techniques:** Relaxation techniques like deep breathing exercises can help ease stress related to depression.
3. **Exercises:** Exercises can help to maintain a healthy body weight, reduce the risk of certain health conditions like diabetes and heart disease. This can also help relieve stress and symptoms of depression.
4. **Diet counselling:** A dietician can create awareness about how the eating patterns can be harmful and how the feelings affect the eating patterns. Keeping a food diary will be helpful.
5. **Medication:** Antidepressants, anticonvulsants and anti-obesity medications can also be given.
6. **Surgery:** Bariatric surgery is another approach towards its treatment.

ii. Mood Disorders

All of you are familiar with the term 'mood'. Sometimes you may say, "I have no mood for doing things". What do you mean by 'mood'?

Mood is defined as a pervasive and sustained feeling tone that is endured internally and that impacts nearly all aspects of a person's behaviour in the external world. Mood disorders or affective disorders are described by marked disruptions in emotions (severe lows called depression or highs called hypomania or mania). These are common psychiatric disorders leading to an increase in morbidity and mortality.

Students in the teenage stage are now regularly referred for psychiatric counselling because of a mood issue. In recent years, mood problems have become a serious issue in students' lives throughout their teenage years. This issue may hurt a child's social, intellectual, and psychological development.

The most common mood disorders in adolescents include:

- **Major depressive disorder:** A depressed or irritable mood, lasting at least two weeks.
- **Persistent depressive disorder (dysthymia):** A chronic, low-grade, depressed or irritable mood for at least 1 year.
- **Bipolar disorder:** Periods of persistently elevated mood followed by periods of depressed or flat emotional response.
- **Disruptive mood dysregulation disorder:** A persistent irritability and extreme inability to control behaviour.
- **Premenstrual dysphoric disorder:** This includes depressive symptoms, irritability, and tension before menstruation.
- **Mood disorder due to a general medical condition:** Many medical illnesses, including cancer, injuries, and chronic medical illnesses, can trigger symptoms of depression.
- **Substance-induced mood disorder:** Symptoms of depression due to drug use, the effects of a medication, or exposure to toxins.

According to the Diagnostic and Statistical Manual of Mental Disorders, major depressive disorder is diagnosed by the presence of 5 out of the 9 symptoms- sad mood, insomnia, feelings of guilt, decreased energy levels, decreased concentration, decreased appetite, decrease in pleasurable activities (anhedonia), increased

or decreased psychomotor activity and recurrent suicidal ideation/ acts of self-harm/ suicide attempt- existing over a period of 2 weeks.

Causes of mood disorders

1. **Biological factors:** Serotonin and norepinephrine are the neurotransmitters that play an important function in mood disorders, which are decreased in episodes of depression. Dopamine has also been implicated in mood disorders that it may be decreased in depression and increased in mania. Consumption of certain drugs and medications can lead to symptoms stimulating a mood disorder.
2. **Genetic factors:** Persons, who have a strong positive family history of a mood disorder are more likely to develop mood disorders themselves. The parental mood disorder is a crucial and constant risk factor for developing mood disorders in their children.
3. **Hormonal factors:** Increased Hypothalamic- pituitary-adrenal (HPA) axis activity is associated with stress and depression. Increased Thyroid Stimulating Hormones (TSH) has been shown to be associated with depression.
4. **Psychosocial factors:** Stressful life situations, (death of significant others, parents, siblings, etc.) traumatic events and childhood abuse have been found to be major risk factors for the development of mood disorder later in life, especially depressive disorder.
5. **Neuroimmunological factors:** Research shows that mood disorder leads to the altered release of cytokines. Recent research has found a crucial role of nitric oxide (altered level) involved in causing the inflammatory process that leads to signs and symptoms of mood disorder.

Consequences of mood disorders

1. **Poor academic performance:** Difficulty in concentrating, making decisions and a drop in energy, etc., can lead to poor academic performance.
2. **Physical impairment:** The adolescents complain about unexplained headaches, troubled sleep, changes in appetite and feeling sluggish.

- 3. Emotional and behavioural consequences:** A significant risk is the presence of suicidal thoughts/attempts or self-harm behaviour. Some may engage in rebellious acts, run away or exhibit impulsive and potentially dangerous behaviour like substance abuse and delinquency.
- 4. Impairment in interpersonal relationships:** Mood disorders can cause trouble with family and friends, making it difficult to maintain relationships.
- 5. Impairment in social functions:** Adolescents may withdraw from friends and family, leading to social isolation.

Management of mood disorders

Mood disorders can be treated with evidence-based treatments, especially with early recognition of the problem. A personalized treatment plan designed by specialists may include:

- 1. Individual therapy:** The specialist uses a variety of techniques to manage the symptoms of mood disorder, including:
 Cognitive behavioural approach: This involves changing problematic thoughts, feelings and behaviours that the adolescent may be experiencing.
 Interpersonal therapy: This technique focuses on building social skills and helping children with difficult relationships in their lives.
- 2. Family therapy:** Families play a vital supportive role in any mood disorder. Families, including parents or guardians, can learn methods to help their children manage mood and behaviour problems.
- 3. Medications:** A variety of medications are very effective in treating mood disorders by altering the brain chemicals involved.

From the above explanation, it is understood that emotional and behavioural consequences of mood disorders can lead to suicidal behaviour, substance abuse and delinquency. Let us discuss in detail.

A. Suicidal behaviour

Suicide is a major public health issue that warrants immediate attention. It is one of the leading causes of death in adolescents

and youth worldwide (American Academy of Child and Adolescent Psychiatry, 2021; World Health Organization, 2021). The suicide rate among Indian adolescents has increased steadily over the last 20 years, with a sharp increase observed in recent years. It is also reported that older adolescents (15- 19 years) are more vulnerable than younger age groups. The most frequently reported methods of suicide among adolescents are poisoning and hanging.

Suicide means the deliberate killing of oneself. It is described as the act of taking one's own life. Suicidal behaviour intends to permanently end one's life.

The following are the risk factors that lead to suicide.

1. **Personality variables:** Antisocial personality disorder and borderline personality disorder are closely linked with suicidal behaviour. Persons with suicidal tendencies tend to be more rigid, and their decisions are influenced by external events.
2. **Psychiatric disorders:** Bipolar illness and depressive disorders with comorbidity are the most common mood disorders that are associated with suicidal behaviour. Attention-Deficit Hyperactivity Disorder, conduct disorder and substance abuse are also risk factors for suicidal behaviour.
3. **Hopelessness:** Hopelessness leads to the feeling of being defeated, which makes the adolescents see no escape from their worries.
4. **Previous suicidal behaviour:** A previous suicide attempt is one of the best predictors of death by suicide.
5. **Neurological factors:** Deficient serotonergic function plays an important role in the high comorbidity between impulsive aggression and suicide.
6. **Psychosocial factors:** Drug and alcohol abuse affects the affective, cognitive, social, familial and behavioural functioning and acts as an immediate reason to suicide. Stressful life events are also linked with increased suicidal behaviour.



Do you know?

Comorbidity: In medicine, comorbidity refers to the simultaneous presence of two or more medical conditions in a person.

Prevention of suicide

Paediatricians can play an important role in the primary and secondary prevention of adolescent suicide.

1. Primary prevention strategies

These strategies target the risk factors to mitigate the suicidal behavior in clinical and community settings and are detailed below:

- i) **Fostering resilience:** During annual health and medical visits, pediatricians can highlight the adolescent's strengths, encourage self-efficacy, teach effective problem-solving skills, and identify protective factors to promote resilience.
- (ii) **Promoting school, peer and family connectedness:** Pediatricians can screen for family, school and peer connectedness and teach strategies of authoritative parenting, assertive communication and conflict resolution to strengthen these. Gender equality and discrimination issues can also be discussed. Partnerships with Non-Governmental Organizations and medical social workers can be established to enable economic help for deprived families.
- iii) **Intervening on parent psychopathology:** Pediatricians should refer parents (of adolescents) with mental disorders to mental health professionals at the earliest. Pediatricians can partner with schools to plan and implement effective school-based interventions. The school-based interventions include adolescent life skill education to promote overall mental well-being and interactive talks with adolescents, parents and teachers about causes and warning signs of suicide and mental disorders like depression and anxiety.

2. Secondary prevention strategies

Secondary suicide prevention efforts aim at helping those identified at risk for suicide, screening and treating mental disorders. In the outpatient setting, pediatricians can use screening questionnaires for suicidality and other mental health disorders. For those with mental disorders, psychotherapy in the form of cognitive behavior therapy, dialectical behavior therapy, interpersonal therapy, family therapy and psychopharmacology under the supervision of a psychiatrist are recommended.

B. Substance use

In India, the epidemic of substance use among the younger generation has assumed alarming dimensions. The stress and pressures of modern life have made them more susceptible to substance use. Besides, adolescence is a period of experimentation and identity formation. It is reported that substance use in most cases has its onset in adolescence, and 70% of adults are addicted to initiation during their teenage years. The earlier a child begins using drugs, the greater the likelihood of encountering severe health issues and developing substance use problems in adulthood.

The non-medical use of chemical substances to achieve alteration in psychological functioning has been termed substance use.

Causes of substance use

Substance use can progress due to several factors that influence substance-seeking behaviour. These factors are broadly classified under 2 major categories

1. Extrinsic factors

These includes;

- a. Individual factor:** Adolescents who are impulsive and aggressive and have low self-esteem are particularly vulnerable.
- b. Role of family:** A family history of abuse, neglect, attachment disorder and family discord can set the stage for a substance use disorder later in life.
- c. Role of school:** Early school failure, poor social connectedness, and truancy are some of the factors that can make children more vulnerable. Easy availability of drugs around the school premises and usage of drugs in hostels are the other factors.
- d. Role of community:** Role of community is one of the most important factors in India due to easy procurement of drugs. Lax law enforcement, media glamorisation, extreme poverty, slums, illiteracy and unemployment are the other reasons for the growing drug use menace.
- e. Peer influence:** Peer influence plays a pivotal role in the initiation of tobacco and drug usage. Bullying, both physical and cyber bullying, is another contributory factor. Delinquent

and violent peer groups make the teens easily susceptible to substance use. Peer pressure may be a factor not only in drug use but also in drug abstinence.

2. Intrinsic Factors

These includes;

- a. Conduct Disorders:** studies confer the increased risk for substance initiation among adolescents with conduct disorders.
- b. Anxiety:** Research in psychiatry has shown that anxiety disorders and substance abuse co-occur at greater rates than would be expected by chance alone.
- c. Stress:** There is a strong link between stress and substance use. Most of the adolescents cope with stress in their own ways, but some may resort to substance use to manage their stress.
- d. Depression:** Depression symptoms, such as low mood, can lead a person to substance use. At the same time, substance use can cause depression.



Do you know?

Substance: refers to any drug, medication or toxins that share the potential for drug abuse

Use- drinks, swallow, smokes, sniff or inject drugs

Drug misuse - The occasional, inappropriate or unintentional use of medication

Abuse- use for purposes of intoxication or for treatment beyond the intended use

Dependence- use despite adverse consequences

Addiction is a physical and psychological dependence on drugs of abuse in a way that affects the central nervous system, and withdrawal symptoms are experienced when the substance is discontinued.

Consequences of substance use

Consequences of teen substance use might include:

- a. Drug dependence:** Teens who misuse substances are at increased risk of serious use later in life.

- b. Poor judgment:** Teenagers who are addicted to substances have poor judgment in social and personal interactions.
- c. Sexual activity:** Substance use is associated with high-risk sexual activity and unsafe sex, and unplanned pregnancy.
- d. Mental Health disorders:** Substance use can complicate or increase the risk of mental health disorders such as depression and anxiety.
- e. Impaired driving:** Driving under the influence of any drug can impair a driver's motor skills, putting the driver, passengers and others on the road at risk.
- f. Changes in school performance:** Substance use can result in a decline in academic performance.

Management of drug use

The following are the measures to manage drug use:

- a. Screening:** Assessment of the severity of substance use and identification of the appropriate level of treatment.
- b. Brief intervention:** Creation of awareness and increasing insights about substance use among adolescents. Provision of motivation towards behavioral changes.
- c. Referral to treatment:** Providing speciality care to those identified for extensive treatment.

Although there is no cure for drug addiction, treatment can help to overcome an addiction and stay drug-free. Long-term follow-up is important to prevent relapse.

C. Juvenile delinquency (discussed in detail in chapter 6.)

Apart from the disorders discussed above, another major concern is the rise in problematic social media use among adolescents. This can develop as a pattern of behaviour characterised by addiction-like symptoms. So, we have to address it also. Let us see what it is.

D. Screen dependency

Excessive usage of screen devices has brought in various social problems across the world. This technological infiltration and dependency on screens have been quite remarkable in the lives of adolescents. The pleasure-inducing dopamine due to screen usage

activates the brain and puts one into an addictive state, and as a result, the individual is trapped in the cycle of screen addiction. The term “screen dependency disorder” has been coined by A. Sigman, an eminent Psychologist to describe the addiction-like behaviour and problematic manner of children engaged in a variety of screen activities. Screen dependency refers to an uncontrollable urge and obsessive use of screen-related devices for diverse activities. Screen dependency disorders are seen among people as a newly emerging disorder, who have an unhealthy dependency on social media and screen devices. Phones, tablets and computers have become an integral part of school, college and social life.

Diagnostic terms commonly used in the classification of screen-related dependencies are:

- Internet addiction disorder
- Internet gaming disorder
- Problematic internet use
- Compulsive internet use
- Pathological video game use
- Video game addiction
- Pathological technology use
- Online game addiction
- Mobile phone dependence
- Social network site addiction
- Facebook addiction
- Internet pornography addiction



Causes of screen dependency

1. **Social media addiction:** Social media platforms are deeply integrated into the lives of teenagers. They use these apps to connect, gain support from each other, find entertainment and get a point of reference for how they “should” dress, talk and live. These apps offer teens a sense of fulfilment and even promote the release of neurotransmitters like dopamine in the brain, making them intensely addictive.

2. **Technology addiction:** Nowadays, the younger generation has grown up in a world of technological advancements. Many of them have been entertained and pacified by digital devices since they were toddlers. As a result, many of them develop an unhealthy sense of dependency on their devices.
3. **Lack of real-world hobbies and socialization:** Technology has a lot to offer to the teens of today- unlimited entertainment, instant gratification and a sense of connection with their peers. But they take their time away from real-world hobbies and relationships. After many hours spent online, screen-free hobbies become dull and uninteresting, leaving teens reaching for their phones again.

Consequences of screen dependency

1. **On physical health:** The excessive use of screens can lead to physical health issues such as eye strain, sleep disorders and sedentary lifestyle-related problems like obesity.
2. **On psychological health:** On a psychological level, it can lead to anxiety, depression and other mental health issues, including suicidal behaviours.
3. **On social relationships:** Excessive screen time can lead to isolation, poor social skills and disconnection from the real world.
4. **Addictive screen time behaviour:** Growing use of applications in digital media and texting (mostly used on mobile devices) may lead to addictive behaviour.
5. **Predictive behaviour:** It is reported that exposure to violent content in TV and video games increases the risk for future violent behaviour in the same manner as growing up surrounded by real violence.
6. **Neglecting academic pursuits:** With the extremely addictive appeal of screens, many teens find it hard to focus on their academic work.

Management of screen dependency

A multidisciplinary approach involving parents, educators, healthcare professionals, and policymakers is necessary to tackle teenage internet addiction. Prevention efforts should focus on encouraging responsible internet use through instruction, parental

supervision, and school-based interventions. Cognitive behavioural therapy and mindfulness-based interventions have demonstrated effectiveness in treating internet addiction by focusing on underlying psychological factors and enhancing self-regulation skills. Besides, technological solutions, like time management apps and parental control software, can help limit teenage screen use and encourage healthier screen habits.

**Let us do**

Collect details of your classmates regarding screen time usage and sleeping pattern and present it in the class.

**Check your progress**

1. Differentiate eating disorders.
2. Evaluate the causes of mood disorders.
3. Explain the suicide prevention strategies.
4. Substance use can progress due to several factors.
Analyse the statement.
5. What are the consequences of screen dependency?

5

FROM MIDLIFE TO AGEING WITH GRACE



Can you identify the stages given in the picture? The pictures represent adults in various stages. This chapter explores the developmental tasks and the transformations of adulthood.



Do you know?

The word “adult” comes from the Latin word ‘adults’, the past participle of *adolescere*, which means “to grow up”. This Latin verb is formed from *ad* (“to”) and *alescere*, a derivative of *alere* (“to nourish”). Therefore, etymologically, “adult” means “grown up” or “having grown”.

The phase of adulthood is the longest period of the human life span, a dynamic period of significant physical, cognitive and psychosocial change that extends from the late teens or early twenties until the end of life. Far from being a static stage, adulthood is characterized by continuous development and adaptation to new roles and responsibilities. It is also important to emphasize that development does not stop after adolescence but continues throughout the entire life span.

5.1 Adulthood

For study purposes, adulthood can be divided into three main stages, each with its unique characteristics and developmental tasks.

A. Early Adulthood (approximately 20- 40)

B. Middle Adulthood (41- 60)

C. Late Adulthood (60+)

Definitely, this is only a rough breakdown, and there are substantial differences within each phase, but it does serve as a preliminary framework for the study of the longest period of human development – our adult lives. This is part of the challenge of studying adult development. Not only are the boundaries difficult to specify, but the experiences are widely varied, too.

Let us examine the characteristics of the development of each of the above stages of adulthood.

i. Early adulthood (20- 40 years)

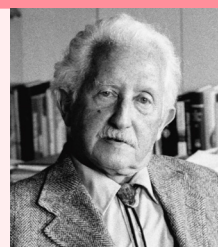
Early adulthood is the stage of our life between the ages of about 20-40 years old, who are typically vibrant, active and healthy, and are focused on friendship, romance, childbearing and careers. It is one of the hardest times in our lives after our teenage years.

By the time the individuals reach early adulthood, they have to spend a long time developing. Just as it is difficult to determine accurately when adolescence begins and ends, determining exactly when adulthood commences proved challenging. There are some rough formal markers, such as reaching a particular birthday, gaining the vote or becoming eligible to join the military services, but these indicators vary across and within societies. Other criteria, such as achieving financial autonomy, getting married or establishing a home, are met by different people at widely differing ages, if at all. In fact, no single event in and of itself establishes an individual as 'adult' in all areas of his or her life.



Do you know?

Erik Homburger Erikson (born Erik Salomonsen; 15 June 1902 – 12 May 1994) was a German-American child psychoanalyst and visual artist known for his theory on psychosocial development of human beings. He coined the phrase identity crisis.



Developmental tasks during early adulthood

Robert Havighurst has identified critical developmental tasks for early adulthood. They are:

1. **Selecting a mate:** In early adulthood, choosing a marriage partner becomes an important and often stressful task.
2. **Living with a partner:** After marriage, couples must learn to blend their lives, manage emotions, and build a happy, intimate relationship.
3. **Starting a family:** The arrival of a child brings major responsibilities. Young parents must learn childcare skills and adjust their routines to meet the child's needs.
4. **Managing a home:** A well-organized home is essential for a smooth family life, and its management becomes an important responsibility.
5. **Beginning a career:** Starting an occupation demands significant time and energy. Many young adults become so focused on work than other tasks, like finding a partner, may be delayed.
6. **Civic responsibility:** Young adults also begin contributing to the community by taking part in neighborhood, cultural, or social groups.
7. **Forming a social circle:** Marriage often changes old friendships. Couples may move away from previous social groups and need to build new friendships and leisure-time routines.

Development during early adulthood

Early adulthood is a period of peak physical performance and significant cognitive and social development. Let us see what they are.

A. Physical development

Early adulthood is characterized by peak physical strength, energy, and overall fitness. Individuals display maximum agility, coordination, and sharp sensory abilities, including vision and hearing. Full height is reached, muscle mass increases, some body fat accumulates, and reproductive maturity is attained. Although health is generally robust, the ageing process quietly begins. Around

age thirty, subtle changes appear, such as a slight vision decline. By the mid-thirties, hair may thin or grey, skin becomes drier, and fine wrinkles emerge. Metabolism gradually slows down, reproductive capacity declines, and healthy habits become essential to maintain wellbeing and support long-term physical resilience and daily functional independence.

B. Cognitive development

In early adulthood, fluid intelligence—our ability to solve new problems and adapt quickly—reaches its peak and then slowly begins to decline. In contrast, crystallized intelligence, which is built from knowledge, experience, and learned skills, continues to grow throughout this stage and even later in life. Working memory and processing speed are also at their strongest during early adulthood. Metacognition, or the ability to evaluate and manage one's own thinking, becomes more refined. The prefrontal cortex, which controls planning, decision-making, and impulse regulation, continues maturing until the mid-20s. At the same time, the brain's reward system remains highly active, which may increase the likelihood of risk-taking behaviours during this period.

C. Social and emotional development

According to Erik Erikson's theory of psychosocial development, early adulthood is defined by the stage of Intimacy versus Isolation. Forming and maintaining close, intimate relationships is the central developmental task. Friendships remain important, offering emotional support and a sense of belonging. Romantic relationships become more serious and long-term, with many individuals choosing marriage or cohabitation. Family roles change as people establish independent households and may become parents. Social networks expand through work, community, and shared interests. During this stage, individuals also strive for emotional and financial independence from their families of origin.

ii. Middle adulthood (40- 60 years)

Middle adulthood is the stage between early and late adulthood, often beginning around age 40, though it is difficult to define precisely. Individuals may be at very different points in personal development. This period is often called the sandwich generation, as adults may care for both their children and ageing parents. Middle adulthood involves physical, psychological, and social changes,

including career peak, reassessing life goals, balancing work and relationships, adjusting to age-related changes, and preparing for later life through healthy habits and social connections that support wellbeing and long-term resilience.

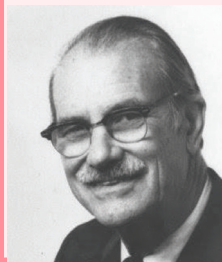
Developmental tasks during middle adulthood

The developmental tasks of middle age, as highlighted by Havighurst, are as follows:

- 1. Tasks relating to physical changes:** These include the acceptance of, and adjustment to, physical changes that normally occur during middle age.
- 2. Tasks relating to changed interests:** The middle-aged person often assumes civic and social responsibilities and develops an interest in adult-oriented leisure time activities which were not taken care of during early adulthood.
- 3. Tasks relating to vocational adjustments:** These tasks revolve around establishing and maintaining a relatively stable standard of living.
- 4. Tasks relating to family life:** The major tasks include relating oneself to one's spouse as a person, adjusting to ageing parents, and assisting teenage children to become responsible and successful adults.



Do you know?



Robert James Havighurst (1900-91) was a professor, physicist, educator and ageing expert. He proposed that all individuals progress through a series of developmental stages, each comprising a series of developmental tasks. He died of Alzheimer's disease at the age of 90. A developmental task is a skill or behaviour that arises at a specific stage of life, and successfully mastering it leads to happiness and success in later life stages.

Development during middle adulthood

During Middle adulthood, the body starts showing some signs of ageing. Specifically, physical and certain intellectual abilities begin to decline, with health risks increasing. Let us see what they are.

A. Physical development

During midlife, individuals experience various external and internal physical changes. External changes commonly include

greying and thinning of hair, increased facial wrinkles, and weight gain, particularly around the waist or lower body. Internally, the efficiency of the cardiovascular, respiratory, and nervous systems gradually declines. Sensory abilities also change, with presbyopia—age-related farsightedness—being a noticeable issue due to changes in the eye's lens. Hearing ability, especially sensitivity to high-frequency sounds, may also weaken during this stage.

Midlife is also marked by menopause in women, signifying the end of menstruation. Symptoms may include hot flushes, mood changes, insomnia, and reduced libido, though their severity varies widely. Menopause alone does not strongly predict psychological distress. Cultural differences suggest that diet and social attitudes influence how menopause is experienced.

B. Cognitive development

The mid-life period is relatively stable in terms of primary mental abilities. In fact, on most measures, middle-aged adults perform as well as or slightly better than younger adults. Studies reveal a decline in numeric skill, a decrease in reaction time and a reduction in conscious processing efficiency during this period. Stress factors do impact cognitive areas, especially memory and processing speed. The cognitive domain that remains the most stable or actually improves is crystallized intelligence, which can be a great source of strength and meaning for adults. Whereas, Fluid intelligence, the ability to think abstractly and to solve problem with new information, tends to decrease.

C. Social and emotional development

Despite the variety in individuals' personal background, some lifespan developmentalists maintain that a particular pattern of social and emotional development is associated with middle age. During this stage, individuals evaluate their accomplishments, seek age-appropriate activities and search for their true traits and identities.

During middle adulthood, concern for the welfare of future generations begins to grow. This stage, according to Erikson (1980) centres on the conflict between generativity and stagnation. People develop a sense of social and civic responsibility as they face raising adolescent children and possibly caring for ageing parents. Generativity – the process of contributing to the next generation. Stagnation is the opposing feeling of having achieved relatively little and of having little to offer to the next generation.

iii. Late adulthood (60 + years)

Late adulthood is perhaps the most difficult of all to define precisely – mainly because there is extensive individual variation in the physical, cognitive and social processes of ageing. Generally, it is the period from the mid-sixties until death. This stage is characterised by significant variability among individuals, with development influenced by a combination of biological, psychological, and social factors.

Developmental tasks during late adulthood

The developmental tasks of late adulthood have been summarized by Robert J Havighurst as:

1. **Adjusting to decreasing physical strength and health:** In this period, individuals are expected to adjust to decrease in physical strength and to be wise health-wise.
2. **Adjusting to retirement and reduced income:** Retirement requires adjustment to a new lifestyle characterised by decreased income, lesser activity level, and increased free time.
3. **Adjusting to the death of a spouse:** Widowhood may force them to adjust to loneliness.
4. **Establishing an explicit affiliation with members of same age group:** Elders do try to maintain social networks of family and friends to preserve security and life continuity.
5. **Establishing satisfactory physical living arrangements:** Creating satisfactory arrangements for physical living during this period.
6. **Adapting to social roles flexibly:** Old people must adjust to their social roles both in the home and the community at large.

Development during late adulthood

Late adulthood is marked by significant changes in physical, cognitive, and social functioning. This stage involves adaptations to ageing, including health changes, cognitive shifts, and evolving social roles. Understanding these changes helps explain how individuals adjust and maintain well-being in later life. Let us analyse it.

A. Physical development

In late adulthood, individuals experience noticeable external physical changes such as wrinkling and loss of skin elasticity, reduced subcutaneous fat, thinning hair, and postural changes caused by spinal collagen loss. Internal changes include a decline in cardiovascular efficiency, reduced cardiac muscle strength, loss of muscle mass, and decreased functioning of the respiratory, digestive, and urinary systems. Although ageing is inevitable, the rate and extent of these changes vary widely and are influenced by lifestyle and behaviour. Sensory abilities also decline, affecting manual dexterity, vision, hearing, taste, smell, and touch.

B. Cognitive development

Cognitive development is affected by ageing, especially in the areas of attention and memory. Cognitive changes in older adulthood are often characterised by processing things more slowly, finding it harder to recall past events and failing to recall previously known information. A slowing of information processing in the brain and increased difficulty in focusing and problem-solving ability. Cognitive development in late adulthood slows, especially in the areas that require processing speed, working memory and executive cognitive function. However, actively participating in cognitive activities and ongoing learning efforts can mitigate the impact of ageing on cognitive development.

C. Social and emotional development

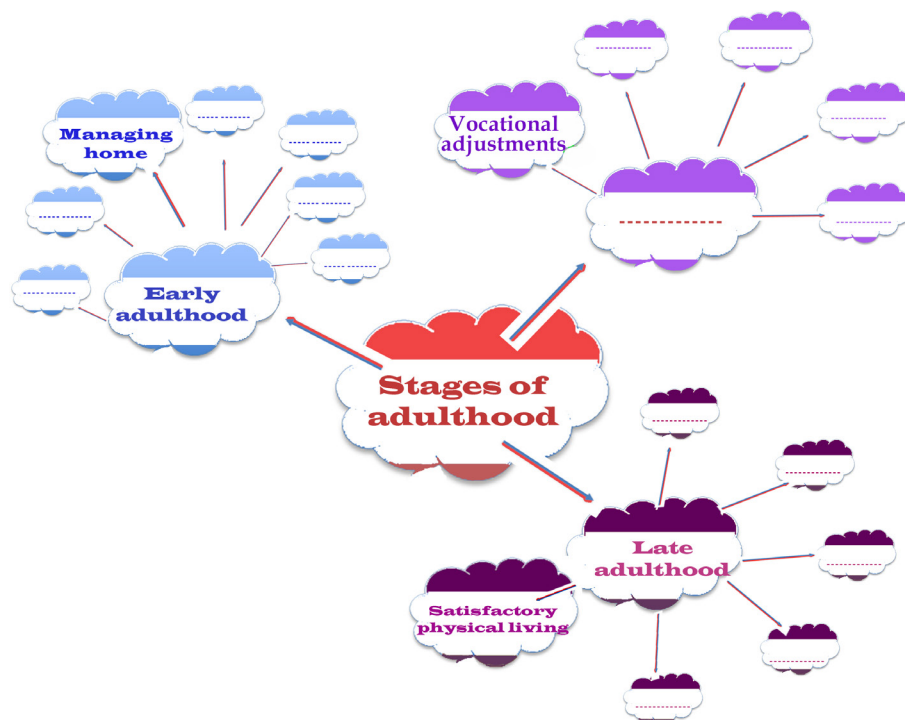
Erikson described late adulthood as the stage of integrity versus despair, in which individuals reflect on their lives, evaluate past experiences, and come to terms with their decisions. Achieving integrity involves finding meaning in life, accepting both accomplishments and unmet hopes, and developing a sense of contentment. It also includes accepting the limitations, and imperfections of oneself and others, including parents. Failure to achieve this acceptance may lead to despair, marked by bitterness, regret, and resentment toward relationships and life events.

As people age, dependence on others often increases, sometimes leading to feelings of guilt, shame, or depression. Social networks may shrink due to the loss of partners, friends, or family relocation. During this stage, physical and cognitive abilities decline, and many older adults require long-term care and support from caregivers.



Let us do

Complete the following word web based on the information given above.



Care of the elderly

Elder people have a lot to share with children of the younger generation. They can relate many aspects of their lives to today's children, such as the food habits they followed, the household tools they used, their style of dress, agriculture, occupations, and school life. Senior citizens are our wealth; therefore, we should embrace them, share love with them, take care of their health, and ensure that



their needs are met. We should make maximum use of the knowledge, skills, and experiences of the elderly. As you know, October 1 is observed every year across the world as International Day of Older Persons.

It plays a crucial role in addressing the various needs of older adults as they navigate the challenges of ageing. From physical and medical care to emotional support and social engagement, elderly care has a comprehensive range of services designed to promote independence, dignity

and overall well-being among older individuals. By providing compassionate and personalized care, aged care services enable older adults to age gracefully and maintain a high quality of life in their later years.

Needs of the elderly

The needs of the elderly are multifaceted, encompassing physical health, mental and emotional well-being and social engagement. Addressing these needs is crucial for ensuring a high quality of life during later years.

A. Physical needs

Elderly adults tend to have a lot of physical needs that need to be addressed. They are more prone to injuries with age. A few common physical needs of the elderly include:

1. **Nutrition:** Healthy meals which are easy to chew are highly essential. Staying hydrated is also equally important for maintaining energy and preventing age-related issues.
2. **Safe physical activity and rest:** Regular physical activity, such as walking, helps maintain muscle mass and bone density and lowers the risk of chronic diseases. An adequate amount of sleep must be ensured.
3. **Personal hygiene:** Many elderly individuals need help with daily hygiene activities.
4. **Safe mobility:** Ensuring safe movement around the home, such as getting out of bed and into a chair, is a key physical need.
5. **Regular check-ups:** Schedule regular appointments with doctors and specialists to address any emerging health issues.

B. Emotional and psychological needs

An elderly person's emotional well-being is just as important as their physical health. They often face traumatic life changes, including reduced mobility, chronic pain, frailty or other health problems, as well as bereavement. Such stresses can lead to isolation and psychological distress.

1. **Safety and security:** The elderly need to feel emotionally safe and secure as they get older.

2. **Socialization:** Need to continue cultivating positive social relationships with family, friends and others in the community.
3. **Need independence:** Each individual should feel that they have the power to make their own decisions and direct their lives in a meaningful way.
4. **Emotional stability:** The elderly have a basic need to remain connected to family members, friends and like-minded seniors. This can minimize issues of depression and loneliness and boost emotional stability.

C. Social needs

Research reveals a strong correlation between social interaction and health and well-being among older adults.

1. **Love:** Maintaining relationships and spending time with others is essential to emotional and mental well-being.
2. **Acceptance:** It is important to continue feeling loved and accepted by other people. Personal relationships with friends and family play an important role.
3. **Belonging:** Involvement in various activities can present opportunities to create lasting connections. If one has mobility issues, connecting via various communication tools and video calling methods are the strategies to combat.

D. Vocational and economic needs

The vocational and economic needs of the elderly focus on achieving financial security and independence while maintaining a sense of purpose and social connection.

1. **Financial security:** Skill development of older persons can provide gainful engagement opportunities, which in turn provide economic independence to them. A stable financial situation ensures their basic needs are met without worry.
2. **Better mental health:** Learning new skills encourages the elderly to stay active, generate income, improve cognitive functioning, offer a sense of purpose and provide a routine, which often contributes to better mental health.

Types of elderly care services

Various facilities are available for the care of the elderly. The

selection of care services depends on various factors, namely the elderly's personal health and needs, preferences, financial situation, support of family members, etc. Some common types of adult care services include:

- 1. In-home care:** In-home care enables older adults to receive assistance from family members or caregivers with activities of daily living such as bathing, dressing, meal preparation, and medication management while remaining in their own homes. This option offers comfort, familiarity, personalized care, and helps older adults maintain independence.
- 2. Assisted living facilities:** Assisted living facilities provide a supportive residential setting for older adults who need help with daily activities but do not require continuous medical care. Services typically include meals, housekeeping, transportation, and organized social activities that encourage independence and social interaction.
- 3. Nursing homes:** Nursing homes offer comprehensive medical care and constant supervision for older adults with serious health conditions or disabilities. Along with skilled nursing care, they provide rehabilitation services, palliative care, and assistance with daily living activities.
- 4. Memory care units:** Memory care units are specialized facilities designed for individuals with Alzheimer's disease, dementia, or other cognitive impairments. They provide a safe, structured environment with individualized care plans and specialized programs to address memory-related needs.
- 5. Adult day care centres:** Adult day care centres provide supervised daytime care, social interaction, and structured activities for older adults whose caregivers work or need respite. These centres offer meals, recreational activities, and basic health monitoring in a supportive environment.
- 6. Palliative care:** It is an approach that improves the quality of life of patients and their families who are facing problems associated with life threatening illness. It involves a range of services delivered by range of professionals who all have equally important roles to play - including physicians, nursing, support workers, paramedics, pharmacists, physiotherapist and volunteers in support of the patient and their family.



Check your progress

1. Early adulthood stage has certain developmental tasks. Evaluate.
2. Late adulthood is marked by significant changes in physical, cognitive and social functioning. Analyse.
3. List the emotional and psychological needs of elderly.
4. Complete the following table.

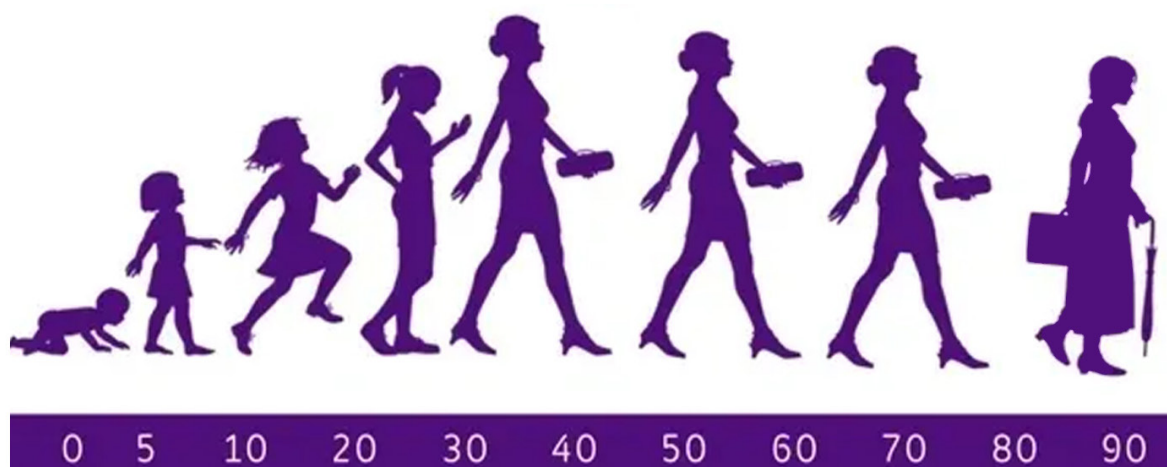
Types of care service	Feature
In-home care	-----
-----	Supportive residential setting
-----	Comprehensive medical care
Memory care unit	-----
-----	Supervised day time care

5.2 Ageing

Ageing is the lifelong process of growing older, beginning at conception and ending with death. It involves gradual physiological, biological, physical, psychological, and social changes that accumulate over time. People perceive ageing differently at various stages of life. Early changes, such as a child's first steps, are welcomed with joy, while later changes, like greying hair or physical decline, are often viewed negatively. Physical maturation is eagerly anticipated in youth but becomes less desirable as signs of ageing appear. In general, ageing can be defined as the time-related decline in physiological functions essential for survival and fertility.

However, ageing has also positive aspects. Older adults often develop a clear sense of values and priorities, adapt effectively to life changes, and gain freedom through retirement to reflect, pursue interests, and express their opinions.

The advanced stages of ageing are a normal, natural part of physical maturation. Instead of placing such a high value on youthfulness, it may be more productive to accept the changes throughout life without fear or denial.



Regardless of how ageing is defined, it is widely accepted that its effects include the following:

- A progressive decrease in efficiency and vigor of essentially all physiologic functions;
- Atrophy of most, if not all, organs and tissues;
- Increased vulnerability to trauma, infections, and various immune system malfunctions (autoimmune disorders, amyloidosis, lymphoid diseases);
- Increased susceptibility to most malignant processes; and
- Decreased V_{O2} max (the physiologic measurement of the body's capacity to extract oxygen from the air and transmit it to the circulatory system).

Types of ageing

There are four types of ageing

1. **Biological age:** The biological age of an individual can be defined as an estimate of the individual's present position with respect to his potential life span.

2. **Psychological age:** Psychological age, by definition, refers to the adaptive capacities of individuals, that is, how well they can adapt to changing environmental demands in comparison with the average.
3. **Functional age:** Functional age is closely related to psychological age. Functional age is an individual's level of capacities relative to others of his age for functioning in a given human society.
4. **Social age:** Social age refers to the roles and social habits of an individual with respect to other members of a society.

Maximum life span and life expectancy

The maximum life span is a characteristic of the species. It is the maximum number of years a member of that species has been known to survive. The maximum human life span is estimated to be 121 years (Arking 1998). However, a person cannot expect to live 121 years. Life expectancy, the amount of time a member of a species can expect to live, is not characteristic of species, but of populations. It is usually defined as the age at which half the population still survives.



Do you know?

Life Expectancy based on 2011 Census		
Particulars	India	Kerala
Male	66.87	73.5
Female	69.96	79.2



Let us do

Collect information (needs and problems) from the elderly of your society using a questionnaire (prepared in your classroom) and present a seminar.



Check your progress

1. Classify types of ageing.
2. Ageing has certain effects. Justify.

HUMAN DEVELOPMENT : CHALLENGES AND CONCERNS

Observe the picture. What does it depict? It shows some of the issues prevailing in our society that hinder the ideal conditions for development upto the full potential of the individuals. Write them down.

- Juvenile delinquency
-
-

Some are born with disabilities, while others are forced to drop their education due to unfavourable circumstances. There are instances, where children undergo various forms of abuse, adversely



affecting their development in all aspects. The situation indirectly incapacitates the potential of future generations. Gender related issues create unjust barriers for individuals, affecting the well-being of the society. The government has formulated stringent laws and various Acts to safeguard the interests of the society. Even then, some issues still exist in our society negatively affecting human development. Let us discuss some of them in detail.

6.1 Gender Discrimination

Observe the picture. Analyse the reasons. This is an evident case of gender discrimination.

Denial of rights, equality and opportunity and suppression in any form on the basis of gender is gender discrimination. Gender



discrimination simply means the situation in which people are treated differently only because they are male or female rather than on the basis of their capabilities or individual skills. In other words any denial of equality, gender and opportunity on the basis of gender is gender discrimination.

Gender bias is an inherent characteristic of a patriarchal society. Even now most of the societies in the country are based on patriarchy. Gender bias is a form that demeans women in a variety of ways. Since ancient times, a female child has been considered as

a burden that the parents would not mind doing away with. It is a known fact too, that discrimination starts from even before birth and sometimes she is killed at the foetal stage. If she manages to see the light of the day, she is killed as an infant, which makes up the highly distorted child sex ratio where for every 1000 males in India there are only 940 females. (2011 census) . According to National Family Health Survey 5 (NFHS-5, 2019-21), the sex ratio in India in 2025 is 1020 females per 1000 males. This marks an improvement from the 2011 census. The male dominant society of India makes its women habitual of discrimination. In spite of various government initiatives to eliminate gender discrimination, women are neglected and underestimated. The females faced discrimination at home too and were intended for home keeping, cooking and giving birth to kids. In the workplace, women are not given equal salary particularly, in the unorganised sector. It is hard to imagine this state of affairs in the 21st century when women have proved to be strong leaders in every field possible. The world has been revolutionised by extraordinary women in almost every field that was until recently completely dominated by men.

India is the world's largest democracy and the most populous country in the world. In recent decades, India has made significant progress to improve child nutrition, immunization rates and education enrollment rates, as well as to achieve broad economic growth. Yet, gender inequality persists against the backdrop of rapid economic growth: rates of violence against women are still high, women's participation in government is low, and discriminatory dowry and inheritance practices continue.



Do you know?

The Indian Constitution grants equality to women, ensures equality before the law (Article 14) and prohibits discrimination against any citizen on the basis of religion, race, caste, sex or place of birth (Article 15). It also allows 'personal' laws however, some of the provisions in personal laws resulting in a dual system that allows forms of discrimination against girls and women.

What is the current status of gender related issues in Kerala? Write your opinion.

Kerala exemplifies successful efforts in alleviating gender disparity with a female literacy rate of 92% and the maternal mortality rate substantially lower than the national average. The state stands as a proof to what can be achieved through progressive policy and community engagement. According to Census 2011 sex ratio in Kerala is 1084 females for 1000 males, which is remarkable.

The Following are some of the discriminations faced by females in general.

- Abortion of female gravida with the help of scanning
- Foeticide (is the intentional destruction or killing of a foetus in the uterus)
- Not giving enough and nutritious food
- Denial of education (Not allowing to go to school)
- Denial of health care while in ill health
- Early marriage
- Eve teasing, rape and sexual harassment
- Dowry
- Divorce, destitution even for silly or without any reason



Do you know?

Gravida refers to the total numbers of pregnancies a woman has had, regardless of the outcome.

Causes of gender discrimination

Let us analyse the causes of gender discrimination.

1. Considering girls as liabilities: In rural communities, there has been a belief that male children are assets. On the other hand, girls are viewed as liabilities. It is presumed that they will make demands and will not yield any returns on their investment.

2. Possession of feelings of antagonism and antipathy: There has been an obsession of antagonism and antipathy in terms of girls and women. The birth of the girls is not admired. The individuals believe that they will have to spend financial resources in promoting the rearing of girls. Moreover, when they get married, they will have to pay the dowry. The feelings of antagonism and antipathy lead to execution of verbal, physical and emotional abuse.

3. Giving preference to male children: Some of the rural households and sum disadvantaged sections of the society still believe that male children will provide an important contribution in promoting well-being of the families. Hence male children may be cared for in an adequate manner. So when they become ill, they get timely medical attention. On the other hand when girls experience any type of health problem and illness, they are likely to make use of traditional methods.

4. Occurrence of financial problems: The individuals, belonging to deprived, marginalised and economically weaker sections of the society experience financial problems. Hence girls are forced to drop their education. Parents prefer to save money for their marriage in terms of dowry. When there are instances of financial problems, there is a negative attitude towards girls.

5. Encouraging child marriage: There is a prevalent belief in society it is easy to get a suitable match for the girls, when they marry at an early age. Moreover they will have to pay less in terms of dowry when they marry early. It is believed that girls have to ultimately get married and in their marital homes and their educational qualifications are of no use. Hence they are discouraged from getting proper education. As long as girls are discouraged from acquiring basic literacy skills and married at an early age, gender discrimination remains a reality.

Consequences of gender discrimination

Some of the major impacts of gender discrimination include the following:

- Gender discrimination can manifest in different forms and it concerns both men and women. One of the effects of gender discrimination in India is domestic violence.

- Women have no bodily autonomy, so their medical health further deteriorates.
- Women are forced to abort if it is a female foetus.
- Girls receive poor quality education affecting their economic status.
- Due to poor participation of women in politics, issues like violence against women, child care and maternal health remain unaddressed.
- Women are denied equal opportunities in many decision making contexts.
- Males are overloaded with economic and family responsibilities to fulfil the basic requirements. Consequently corruption and other illegal activities may occur.
- Lot of young girls lose their lives during childbirth as they are married off at a very young age.

Solutions to resolve gender discrimination

The following are some of the solutions to resolve gender discrimination.

- 1. Education:** Gender responsive support to enable out-of-school girls and boys to learn. Enable more gender- responsive curricula and pedagogy.
- 2. Health:** Reducing female mortality under five and supporting equal care- seeking behaviour for girls and boys.
- 3. Empowerment:** Empowering women with the help of laws, education and employment will make the society ensure equality to women. Women have all the potentials like men. So empowered women will be helped to use her full capability and mitigate the economic dependency of women.
- 4. Employment to women:** Employment gives income and improves the economic position of women. Employed women must be given importance by the family members. Employment gives economic independence to women.
- 5. Economic independence:** In India, mostly, women in the young age depends on their father, in the middle age she depends on her husband and in the older age depends on her son. Women always depend on somebody for her livelihood

economic independence is hence essential for women's development.

- 6. Self-dependent and self-confident:** Women in Indian society, mainly uneducated and unemployed women, haven't had self confidence. Women need confidence to combat all the atrocities against her and to live a life of self-esteem. Hence boosting the morale and self-confidence of the women, is the key to eliminate her inferiority complex.
- 7. Decision making role:** In Indian families the decision-making power of women is denied. Most males take the important decisions in the family. This makes women voiceless and destroys self-confidence and she feels unimportant in the family as well as in the society. Women must be empowered with decision making power to put an end to gender discrimination.

Kerala is often appreciated for its high literacy rate and strong social development, which have helped reduce many forms of gender discrimination. Girls and boys today receive equal opportunities in education, and women actively participate in fields such as teaching, healthcare, administration, arts, and local governance. Government initiatives, self-help groups like Kudumbashree, and awareness programmes have empowered women socially and economically. Families are increasingly encouraging girls to pursue higher education and independent careers. Although some challenges still remain, Kerala continues to move forward with a positive attitude towards gender equality, setting an example for inclusive and progressive social change.



Let us do

Prepare a script for a skit (group wise) based on gender discrimination and present it in the class.



Check your progress

1. Analyse the causes of gender discrimination.
2. Suggest solutions to overcome gender discrimination.
3. Examine the consequences of gender discrimination.

6. 2 Child Sexual Abuse

Have you noticed news reports like this? What is your attitude towards such incidents?

Child sexual abuse has emerged as a major problem in recent times. It is being faced in our country and many other countries of the world as well. Child abuse is also one of the most serious issues which has been addressed by many organisations and institutions in the world. But what makes child sexual abuse even more deleterious in India is the social taboo of “not telling anyone, not speaking about it.” The society is very much traditional, where it has its social systems under which the issue of child sexual abuse has never been addressed or talked about.

Boy sexually assaulted by 14 men in Kerala for 2 years, eight arrested

14 persons, including an Education department officer, an RPF official, and a political leader, booked under POCSO Act



Eight people have been arrested for allegedly sexually assaulting a 16-year-old boy in Kasaragod, Kerala, whom he reportedly met through a dating app. The sexual assaults allegedly happened over two years.



Do you know?

According to World Health Organisation (WHO) “child abuse or maltreatment constitutes all forms of physical and/or emotional ill-treatment, sexual abuse, neglect or negligent treatment or commercial exploitation or other exploitation, resulting in actual or potential harm to the child’s health, survival, development or dignity in the context of a relationship of responsibility, trust or power”.

Article 39 of the Directive Principles of State Policy says that State shall direct its policy to ensure that children are not abused and are given opportunities and facilities to develop in a healthy manner in conditions of freedom and dignity.

Child abuse

Any form of violence, abuse or neglect used against a child is called child abuse. Child abuse is gross violation of basic human rights of a child and includes:

- Physical abuse
- Sexual abuse
- Emotional abuse
- Neglect

What is Child sexual abuse?

Child Sexual Abuse is a form of child abuse in which any person uses a child for sexual stimulation. It includes both touching and non-touching activity. This includes any of the following activities:

- Exposing one's private part of the body to child
- Bad touching or fondling a child in a sexual manner
- Committing penetrative or other forms of sexual assault"
- Showing pornographic materials (pictures, films, magazines) of naked people or people having sex or photographs to a child
- Having a child pose or perform in a sexual manner
- Forcing a child to watch a sexual act
- Engaging a child in prostitution.

Causes of child sexual abuse

The following are the causes of child sexual abuse.

- 1. Social factors:** In economically disadvantaged sections of society, sometimes parents are not capable of providing the needed care, protection and nutrition to the children. This might expose the children to abuse, violence or exploitation. Poverty strongly correlate with child abuse.
- 2. Familial factors:** Parents generally do not discuss sensitive issue of sexual abuse with their children as they consider their child not old enough to understand this issue. Also, many of them are unaware of how to discuss this matter. Absence of a capable guardian increases the risk and chances of perpetration of crime. Many times parents lack Information about sexual abuse which is crucial regarding children's well being.
- 3. Media:** A major contributing factor that is hidden behind the increasing rate of Juvenile delinquency all over the world is the exposure to sexual content or pornographic content on the internet. Children or juveniles accessing for pornography become more violent and a distorted view about sexuality and relationships is developed in them. 'Child on Child' sexual abuse has become an international problem due to increasing trend of watching pornography among juveniles media.

4. **Substance use:** Substance use dejects the mental stability of the individuals and they commit the offence which later they may regret. Substance use such as alcohol is strongly associated with child maltreatment (WHO). Alcohol consumption is involved in the majority of sexual abuses. Perpetrators who consume alcohol and intoxicants use their physical force more confidently to get sexual contacts.
5. **Lack of policy implementation:** Gap between policy and its implementation is the major cause that gives the perpetrators a free chance of getting the courage to commit such a brutal offence. Insensitive treatment by police in reporting the cases, delayed trials, convictions and tampering with evidence leave the offender unpunished.

Consequences of child sexual abuse

Let us see the consequences of child sexual abuse.

1. **Social stigma:** The most impactful content of stigmatization is humiliation. Victims rather than perpetrators face disrespect and shame in the society. They are condemned for the abuse they went through. This stigmatization is very severe and horrible for the abused victims. Stigmatization is carried forward in the future life of the victim child, more often in non-abuse close relationships.
2. **Physical outcomes:** Effects of child sexual abuse can be very damaging and long lasting on the physical health of the child. The general health of the victim will deteriorate. Females, who experienced sexual abuse, suffer from chronic pelvic pain. Other physical consequences are genitourinary problems, fatigue and headache. Brutal child abuse results in genital injuries. Gynaecological health and gastrointestinal health will be severely affected.
3. **Sexually Transmitted Infections (STIs):** Sexually transmitted infections are the devastating outcomes of sexual abuse. Sexually abused children are highly susceptible to STIs, such as Human Immunodeficiency Virus (HIV). When a child is abused repeatedly by the perpetrator it can cause mucosal trauma resulting in STIs. An adverse physical consequence of the sexual abuse against adolescent girls is teenage or unexpected pregnancy. Sexually abused pregnant teenagers are often forced to terminate their pregnancy without the supervision of a specialist. This causes further harm to the body.

4. **Mental outcomes:** Child sexual abuse disturbs the psychological and mental wellness of the child. Mental injuries do not cure early and it deeply impacts the behavioural and social life of the victim. Depression, low self-esteem, trouble in maintaining relationships, distrust towards people and fear are some of the common behavioural consequences.
5. **Post-Traumatic Stress Disorders (PTSDs):** Highest rate of Post-Traumatic Stress Disorders is linked with the sexual abuse or rape. Re-experiencing thoughts where victims get repeated memories of the trauma again and again. Nightmares, disturbing dreams, flashbacks and repetitive experience of traumatic thoughts are different symptoms or signs of Post-Traumatic Stress Disorders.

Prevention of child sexual abuse

Child sexual abuse is regarded as a preventable crime. The society must shed old traditions of silence, shame and embarrassment and act against this most culpable violation of child right and dignity. The parents should have the chief responsibility of protecting their children and they must be supported by the civil society. Society must be aware of information about the prevalence of child sexual abuse, its occurrence in all societies, who are the common perpetrators, legal aspects and the ways for its prevention.

1. **Awareness and education:** Children should be taught about good touch and bad touch in an age-appropriate manner.
2. **Open communication:** Children should feel safe to talk to parents, teachers, or trusted adults about any discomfort.
3. **Personal safety skills:** Children must be encouraged to say "NO", move away, and report unsafe situations.
4. **Parental supervision:** Parents should be aware of children's activities, friends, and online usage.
5. **Safe school environment:** Schools should ensure strict rules, supervision, and child protection policies.
6. **Reporting and support:** Any suspected abuse should be reported immediately to authorities, and proper support should be given to the child.

Adolescents must be provided more comprehensive knowledge of body physiology, sexual intercourse, pregnancy, healthy

relationships and sexual violence which is best provided at schools by trained teachers. School authorities and teachers should be informed about child sexual abuse and strict vigilance needs to be maintained. Improper use of the internet and mobile phones may put the children at the risk of sexual misconduct and hence to be curtailed.



Do you know?

The Law on Child Sexual Abuse

In November 2012 India adopted The Protection of Children from Sexual Offences Act (POCSO) meant to provide protection of children from the offences of sexual assault and safeguarding the interest and wellbeing of children. Definition of child sexual abuse in the POCSO Act, 2012 is comprehensive and encompasses the following: (i) penetrative sexual assault, (ii) aggravated penetrative sexual assault, (iii) sexual assault, (iv) aggravated sexual assault, (v) sexual harassment, (vi) using child for pornographic purpose, and (vii) trafficking of children for sexual purposes.

The act includes child-friendly mechanisms for reporting, recording of evidence, investigation and speedy trial of offences through designated Special Courts. It deems a sexual assault to be 'aggravated' when abuse is committed by a person in a position of trust or authority vis-a-vis the child, such as a family member, police officer, teacher or doctor. Different levels of punishment are included, which are more stringent in cases of aggravated assault. The objective of the Act is to protect children from adult abusers.

The act has been amended on 6th August 2019 with effect from 16th August 2019. Some of the key features of the act include:

1. Covers all children below the age of 18 years
2. Covers both boys and girls and is gender neutral
3. Provides a child friendly process for reporting, recording and trial keeping the best interest of the child as top priority.
4. Burden of proof on the accused which means in case of sexual assault, the accused is assumed to have committed the crime and he has to prove otherwise
5. Makes reporting mandatory.



Check your progress

1. Critically evaluate the causes of child sexual abuse
2. Child sexual abuse is regarded as a preventable crime. Comment on it.
3. Describe the consequences of Child Sexual Abuse.

6.3 Juvenile Delinquency

Have you ever heard or seen a child stealing something from a shop or witnessed a minor assaulting or threatening somebody?

Juvenile can be defined as the child who has not attained an age at which she/he, like an adult under the law, can be held liable for his/her criminal activities. Delinquency is a kind of deviation. When individuals deviate from the course of usual social life, their behaviour is called “delinquency”. When a Juvenile, below an age specified under a statute exhibits behaviour which may prove to be hazardous to society and to him/her may be called a ‘juvenile delinquent’.

Under the Juvenile Justice (Care and Protection) Act 2015, juvenile is defined under section .2 (35), “juvenile means a child below the age of eighteen years.”

Friedland says,” Delinquency is a juvenile misconduct that might be dealt with under the law”.

Juvenile delinquency is a type of abnormal or antisocial behaviour by a Juvenile who is below an age specified by law. Juvenile delinquency in India refers to crimes committed by individuals below 18 years. It accounts for about 0.9 to 1% of total crimes, with violent crimes arising from 32.5% in 2016 to 50% in 2022 showing a concerning upward trend.

Juvenile delinquency, also known as youth crime, refers to legal violations committed by minors (typically those under 18). This issue is complex and influenced by family dynamics, peer pressure, socio-economic conditions, and education levels. Juvenile delinquency can range from minor infractions such as truancy to serious crimes, including theft, assault or drug- related offenses.



Do you know?

The Latin term for juvenile delinquency is “ *delinquens juvenilis*” which translates to a youthful wrongdoer or juvenile delinquent:

“Delinquens” - Meaning to fail in duty or to commit a crime.

“Juvenilis” - Meaning youthful or related to young individuals.

Common offences

- Theft and shoplifting-Stealing money or goods
- Vandalism-Destroying property, graffiti
- Drug and alcohol use- Using or selling substances
- Violence- fighting, bullying and assaults
- Truancy-Skipping School
- Cyber crimes- Hacking, cyber bullying and fraud

Thus, juvenile delinquency is a major societal concern as it can have a long lasting effect on the young individuals involved, their families and the community. Addressing this issue requires a deep understanding of its causes and legal framework.

Causes of juvenile delinquency

Juvenile delinquency results from multiple social, economic and psychological factors.

Below are the key contributing causes:

1. Family environment

- Parental neglect or abuse - Physical/emotional abuse and lack of supervision increase delinquency risk.
- Dysfunctional family relationships- Divorce, conflict or absence of parental guidance can lead to behavioural issues.
- Lack of discipline- Inconsistent or overly harsh punishment may contribute to delinquency.

2. Peer influence

- Association with delinquent peers- Young people tend to adopt behaviours from their social circles.

- Peer pressure - The need to fit in may push juveniles toward unlawful activities.

3. Socio-economic factors

- Poverty and unemployment- Limited resources and exposure to crime may influence delinquency.
- Lack of educational opportunities-Poor schooling and disengagement from academics can lead to frustration and crime.

4. Substance use

- Drug and alcohol use-Substance use impairs judgement and increases the risk of criminal behaviour.

5. Psychological factors

- Mental health disorders- Depression, anxiety and conduct disorders can contribute to delinquency.
- Aggression and impulsivity-Some Juveniles exhibit aggressive tendencies leading to criminal actions.

6. Cultural and social influences

- Exposure to violence- Growing up in crime- prone areas normalizes unlawful activities.
- Media influence- Movies, music and games sometimes glorify crime.

7. Educational and school environment

- School failure and dropout rates- Poor academic performance and bullying may cause behavioural issues.
- School environment- Harsh disciplinary actions and lack of support can push juveniles towards crime.

8. Biological and genetic factors

- Genetics -Some research suggest that hereditary factors influence behavioural tendencies.
- Neurobiological issues- Impulse control and decision making deficit may contribute to delinquency risks.

9. Community and neighborhood influence

- High- crime areas- Residing in crime-infested regions exposes juveniles to unlawful behaviour.
- Lack of community programmes- Limited recreational or mentorship activities may increase delinquency risks.

10. Social media and technological influence

- Poverty and unemployment- Online harassment can lead to emotional distress and aggressive behaviour
- Social media glorification- Some digital platforms normalize or encourage criminal acts.

Consequences of juvenile delinquency

The following are the consequences of Juvenile delinquency:

1. **Legal consequences:** Juveniles face penalties such as fines, probation or imprisonment depending on the crime's severity.
2. **Psychological consequences:** Criminal behaviour can lead to guilt, shame and low self-esteem, affecting their ability to reintegrate into society.
3. **Social consequences:** Family reputation, societal stigma and difficulties in rehabilitation are common outcomes for young offenders.

Prevention of juvenile delinquency

Prevention of Juvenile delinquency demands a lot of effort on the part of society. It is also considered an essential part of crime prevention in our society. By involving young children in socially and legally useful activities, we can create awareness among children as to what is right and what is wrong. Prevention of juvenile delinquency through family interventions is one of the best ways to tackle juvenile delinquency. Family interactions have a major role in shaping the life of the child. So, parents should stop scolding and avoid using threats on children in order to gain control over the children. Some of the other ways to prevent juvenile delinquency are:

1. **Education:** Children have to be properly educated in schools about social behaviours.

2. **Parent - child interaction:** Programmes should be conducted about parenting skills and how the interaction should happen between parents and children.
3. **Prevent bullying:** Most of the time, children become victims of bullying near their neighbourhood by the other peer groups or on the school campus. This bullying might have an impact on the mental health of the children.
4. **Recreation:** Recreation programmes extend opportunities to the children to connect with other children and adults. They might make a positive friendship which might help them in future. Extracurricular activities have to be provided to the children to keep their minds refreshing and occupied.



Do you know?

Legal Framework for Juvenile Delinquency in India

The Juvenile Justice (Care and Protection of Children) Act 2015 (JJ Act, 2015) is the primary legislation governing offences in India. It came into force from 15th January 2016. The Juvenile Justice Act, 2015 replaced the Juvenile Justice (Care and Protection of Children) 2000, so that juveniles in conflict with the law, involved in Heinous Offences, can be tried as adults. It focuses on rehabilitation instead of punishment.

Key Features of the JJ Act, 2015

1. Establishes the Juvenile Justice Board (JJB) to handle juvenile cases.
2. Differentiates juveniles as:
 - Children in Need of Care and Protection (CINCP)- Abandoned or orphaned minors.
 - Children in Conflict with the Law (CCL)-Minors who have committed offenses.
3. Allows trial as an adult for heinous crimes (murder, rape) committed by juveniles aged 16-18.

You may collect more details about the Act from www.lbsnaa.gov.in



Check your progress

1. Anoop, a 16 year old boy has been caught by the police for pickpockets. Analyse the reasons for committing such offences. Suggest measures to prevent the same.
2. Juvenile delinquency can have long lasting consequences on society. Prove the statement.

6.4 Disabilities

Disability is a complex category of condition as it has been and still is understood and interpreted by different people in very different ways. In almost all societies, individuals with physical or intellectual challenges have been assumed to be by the very nature of their condition inferior.

Any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being is called disability. Thus disability is a functional limitation with regard to a particular activity. Whereas impairment concerns the physical aspects of health and disability is the loss of functional capacity resulting from an impaired organ.

Disability has been recognised as a human rights issue in the international domain with the United Nations Declaration on the Rights of the disabled persons focusing attention on the needs of disabled people globally. India has replaced the existing Act formulated in 1995 with a new Act named 'Rights of Persons with Disabilities Act (RPwD)' in 2016. The Act was passed in Parliament in December 2016 and came into force from 19th April 2017. This Act incorporates the rights of persons covered under the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD). The Act lays down specific provisions to uphold rights of disabled persons. The objective of the RPwD Act is to ensure that all persons with disabilities can lead their life with dignity, without discrimination and with equal opportunities.

The Act recognizes 21 conditions as disabilities, and specifies that a benchmark of 40% impairment must be medically certified for the individual to be eligible for state benefits. These 21 conditions are categorized under various heads. Details are given below:

Specified Disabilities

I. Physical Disabilities

Sl. No.	A. Locomotor /Mobility
1.	Locomotor Disability: “Locomotor disability” means disability of the bones, joints or muscles leading to substantial restriction of the movement of the limbs or any form of cerebral palsy. Cerebral Palsy: - “Cerebral Palsy” means a group of non-progressive conditions of a person characterised by abnormal motor control posture resulting from brain insult or injuries occurring in the pre-natal, peri-natal or infant period of development.
2.	Leprosy Cured Persons: Leprosy is also called Hansen’s disease named after, Dr Gerhard Armauer Hansen, the Norwegian scientist who first discovered Mycobacterium leprae in 1873. Leprosy is a disease caused by a type of bacteria called Mycobacterium leprae. These bacteria attack nerves in the hands, feet and face, causing numbness and loss of sensation to those parts of the body. ‘Leprosy Cured Person’ means a person who has been cured of leprosy but is suffering from • loss of sensation in hands or feet as well as loss of sensation and paresis in the eye and eye-lid but with no manifest deformity; • manifest deformity and paresis but having sufficient mobility in their hands and feet to enable them to engage in normal economic activity; • extreme physical deformity as well as advanced age which prevents him/ her from undertaking any gainful occupation, and the expression “leprosy Cured” shall construed accordingly.
3.	Cerebral Palsy: Cerebral palsy means a group of non-progressive neurological conditions affecting body movements and muscle coordination caused by damage to one or more specific areas of the brain usually occurring before, during or shortly after birth. The term cerebral refers to the brain. Palsy refers to problems with movement. The symptoms of cerebral palsy are caused by problems in the development of the brain that may include: • damage to the brain’s white matter • interruption of brain growth caused by gene changer • bleeding in the brain • a lack of oxygen There is no cure for Cerebral Palsy, but supportive treatments, medications and surgery can help people improve their ability to move and communicate.

4.	Dwarfism: Dwarfism (skeletal dysplasia) is a “medical or genetic condition resulting in an adult height of 4feet 10 inches (147 centimeter or less” (RPwD Act, 2016). This can affect anyone. Dwarfism can be inherited from parents. Other forms occur randomly through DNA changes. Most often but not always, dwarfism affects children of parents with average height. Dwarfism affects bone growth in the body. The most common bones that dwarfism affects are the long bones in the arms and legs but it can affect other bones including the bones of the abdomen and head.
5.	Muscular Dystrophy: (Discussed in Chapter 2)
6.	Acid Attack Victims: An acid attack victim means a person disfigured due to violent assaults by throwing of acid or similar corrosive substance.
B. Visual	
7.	Blindness: Blindness refers to a condition where a person suffers from any of the following conditions, namely: • Total absence of sight; or • Visual acuity less than 3/60 or less than 10/200 (snellen) in the better even with best possible correction; or • Limitation of the field of vision subtending an angle of less than 10 degree. Low-vision: low vision means a condition where a person has any of the following conditions namely:- Visual acuity not exceeding 6/18 or less than 20/60 upto 3/60 or upto 10/200 (Snellen) in the better eye with best possible corrections; or Limitation in the field of vision subtending an angle of less than 40 degree up to 10 degree.
C. Hearing	
8.	Deaf & hard of hearing: Hearing impairment is a partial or total inability to hear. It is a disability which is sub-divided in two categories of deaf and hard of hearing. i. “Deaf” means persons having 70 dB hearing loss in speech frequencies in both ears; ii. “Hard of hearing” means person having 60 dB to 70 dB hearing loss in speech frequencies in both ears;
D. Speech & language	
9.	Apraxia is defined as a difficulty or inability to perform learned skilled actions. Dysarthria: Dysarthria is a Motor speech disorder which can be classified according to the underlying neuropathology and is associated with disturbances of respiration, laryngeal function, air flow direction and articulation resulting in difficulties of speech quality and intelligibility.

10.	Stuttering: Stuttering is a speech disorder characterised by repetition of sounds; and syllables, or word prolongation of sounds; and interruptions in speech known as blocks.
II. Intellectual disabilities	
11.	Down syndrome (discussed in chapter 2)
12.	Specific learning disabilities: Specific learning disability is a disorder that hinders a student's ability to listen, think, speak write, spell or do mathematical calculations. One or more of these abilities may be hindered. It interferes with the normal learning process of the person. Specific learning disabilities commonly affect skills in the areas of: reading (called dyslexia) writing (called dysgraphia), listening, speaking, reasoning and math (called dyscalculia).
13.	Autism Spectrum Disorder: Autism spectrum disorder means a neuro developmental condition typically appearing in the first three years of life that significantly affects a person's ability to communicate, understand relationships and relate to others and is frequently associated with unusual or stereotypical rituals or behaviours. This condition is caused by abnormalities in the way the brain develops.
III. Mental behaviour	
14.	Mental illness: Mental illness means a substantial disorder of thinking, mood, perception orientation or memory that grossly impairs judgement, behaviour, capacity to recognise reality or ability to meet the ordinary demands of life, but does not include retardation. Mental illness is a medical condition just like heart disease or diabetes .It is a treatable condition. It can take many forms. Some are mild and only interfere in limited ways with daily life such as phobias (abnormal fears). Other mental health conditions are so severe that a person may need proper medical care.
IV. Chronic neurological conditions & blood disorder	
15.	Parkinson's disease: Parkinson's disease (PD) is a progressive disease of the nervous system marked by tremor, muscular rigidity and slow, imprecise movement chiefly affecting middle aged and elderly people associated with degeneration of the basal ganglia of the brain and the deficiency of neurotransmitter dopamine.
16.	Multiple sclerosis: Multiple sclerosis is a chronic neurological disorder. It is an autoimmune disorder, in which the immune system attacks myelin in the central nervous system. Myelin is a mixture of protein and fatty acids that makes up the protective cover (known as the myelin sheath) that coats nerve fibers (axons). Myelin is what gives the brain's white matter its whitish appearance and helps with communication between neurons.

17.	Other chronic neurological conditions: A chronic neurological disorder is a long term condition affecting the brain, spinal cord or nerves often requiring lifelong care and is characterized by structural, biochemical or electrical abnormalities that lead to symptoms like muscle weakness, seizures, memory loss or paralysis. Some of them are Alzheimer's disease, Dementia, Epilepsy, stroke etc.
18.	Haemophilia (discussed in chapter 2)
19.	Thalassemia: Thalassemia is an inherited blood disorder. It affects the body's ability to produce normal hemoglobin. Hemoglobin is a protein in red blood cells. It allows red blood cells to transport oxygen throughout the body, nourishing the body's other cells. In thalassemia the body produces fewer healthy haemoglobin proteins and bone marrow produces fewer healthy red blood cells. The condition of having fewer red blood cells is called anaemia.
20.	Sickle cell anaemia (discussed in chapter 2)
V. Multiple disabilities (more than one of the above specified disabilities)	
21.	Multiple Disabilities (more than one of the above specified disabilities) including deaf-blindness: There are many instances when a person doesn't just have one or one type of disability. In these cases, the person has more than one disability. They are set to have multiple disabilities. Multiple disabilities occur when a person has a combination of impairments serious enough that their needed accommodations go beyond what a special education program for only one of the disabilities could.



Let us do

Conduct a field trip to a centre associated with intellectual disabilities and prepare a report of activities conducted there.



Check your progress

1. Differentiate between Haemophilia and Thalassemia
2. Complete the table given below.

6.5 Sexually Transmitted Infections (STIs)

Sexually transmitted infections (STIs), are infections which are predominantly transmitted through sexual contact. A person can have an STI without having obvious symptoms of disease. Therefore, the term “sexually transmitted infection” is a broader term than “sexually transmitted disease” (STD).

Sexually Transmitted Infections remain an important focus area for global public health. More than 30 bacterial, viral and parasitic pathogens are transmissible sexually and constitute a group of infections referred to as STIs. Most common are Gonorrhoea, Chlamydial infection, Syphilis, Chancroid, Human Immunodeficiency Virus (HIV) infections, Herpes progenitalis (Herpes simplex virus infection), Trichomoniasis, Candidiasis, etc. Although some of the pathogens can be acquired through modes other than sexual transmission, epidemiologically, sexual contact is more important for their transmission from one person to another.

The infected individual is responsible for the spread of infection to other persons. The infection may occur during heterosexual or homosexual activities. Sexually Transmitted infectious patients may have multiple sex partners but contact with even a single infected sex partner may be enough to contract infection.

Greatest incidence of illness are caused by eight pathogens, which are known to be transmitted through sexual contact. Of these 8 infections, 4 are currently curable namely syphilis, gonorrhoea, chlamydia and trichomoniasis. The other four, i.e. AIDS, Herpes genitalis, Genital Warts and hepatitis B are viral infections and are incurable, but can be mitigated or modulated through treatment.

So let us discuss the above-mentioned four incurable viral infections.

i. HIV - AIDS



What is the significance of December 1st?. What does the Red ribbon in the figure represents?

HIV stands for Human Immuno Deficiency Virus. It is a virus which is found only in human beings. It affects the immune system in humans.

The virus uses the cells to create more copies of the virus. When HIV remains in the body for a long time it destroys the immune system. HIV targets the body's

white blood cells, weakening the immune system. This makes it easier to get sick with diseases like Tuberculosis, infections and some cancers. HIV can be controlled with antiretroviral therapy (ART).

Acquired Immuno Deficiency Syndrome (AIDS) occurs at the most advanced stage of HIV infection. Acquired means it is not genetically inherited. Immune deficiency denotes the weak defence mechanism of the body. Syndrome means that when the individual has AIDS, it is not just the signs and symptoms of one disease but a group of diseases that appear in him or her.

Incubation period

The time from infection to the development of detectable antibodies is generally 1 to 3 months.

Causative organism

Human Immunodeficiency virus I & II

Mode of spread

HIV is transmitted through:

- Unsafe sexual contact with an HIV infected person is the most common mode of transmission.
- HIV infected mother to her newborn during pregnancy, birth or breastfeeding.
- Receiving blood transfusions, blood products, or organ/ tissue transplants that are contaminated with HIV; and
- Sharing of needles and syringes with a person infected with HIV. This is the most common in people who are habituated to intravenous drug use.
- Getting tattoo or body piercings with unsterilized needles.

Signs and symptoms

The signs and symptoms of HIV vary depending on the stage of infection. In the first few weeks after being infected people may not experience symptoms. Others may have an influenza- like illness including fever, headache, rash and sore throat.

The infection progressively weakens the immune system. This can cause other signs and symptoms namely swollen lymph nodes, weight loss, fever, diarrhoea and cough.

Without treatment people living with HIV infection can also develop severe illnesses like tuberculosis, cryptococcal meningitis, severe bacterial infections and cancer.

HIV can make other infections such as Hepatitis B, Hepatitis C, and Mpox get worse.

ii. Herpes Genitalis or Genital Herpes

Genital herpes is a contagious sexually transmitted infection. It causes painful blisters (or sores) on the genitals. There is no cure for genital herpes. Once a person has the virus in the body it stays in the body for the rest of life. Taking medication can help to reduce symptoms and lower the risk of spreading the infection.

Incubation period: The incubation period is two to ten days

Causative organism

The herpes simplex virus(HSV) causes genital herpes. There are two types of HSV: HSV-1 and HSV-2. Both types can give genital herpes, although HSV-2 causes it much more frequently.

Mode of spread

Herpes genitalis or genital herpes is transmitted through:

- Unsafe sexual contact with an infected person
- Oral sex with someone who is infected
- Skin- to- skin genital contact
- Touching open sores, including while breastfeeding
- Childbirth (give birth while having an active infection)

Signs and symptoms

Symptoms vary and depend on whether it is a first outbreak or a recurrent outbreak. Recurring symptoms are usually milder than the first outbreak. During the first outbreak symptoms may last up to four weeks. Symptoms are:

- Flu- like symptoms
- Genital itching, burning or irritation
- Painful genital blisters or sores that break open
- Headaches

- Painful urination (dysuria)
- Swollen lymph nodes
- Unusual vaginal discharge or discharge from urethra

iii. Genital Warts

Genital warts are sexually transmitted diseases. Genital warts are soft growth on the genitals of the affected individual. These growths can be itchy and uncomfortable.

Incubation period: 2 to 3 months, with a range of 1 to 20 months.

Causative organism

Human papilloma virus (HPV) belong to the papilloma virus family have more than 170 subtypes and approximately half of them are the causative agent of genital warts. The most common high- risk HPV types are types 16 and 18. These two types are responsible for approximately 50% of cervical cancer. HPV types 6 and 11 are non carcinogenic types that are responsible for more than 90% of anal and genital warts.

Modes of spread

Genital wart is transmitted through:

- Direct skin- to- skin contact during anal, oral or vaginal sexual intercourse
- Oral sex
- Direct skin contact with the affected individual through genital touching

Signs and symptoms

Signs and symptoms of Genital wart is:

- Small swellings in the genital area that may be skin -coloured or a different colour.
- A cauliflower like shape caused by a few warts close together
- Itching or discomfort in genital area
- Bleeding during sex

iv. Hepatitis B Virus

Hepatitis B is a viral infection that causes inflammation of the liver. It can be a brief illness that may not cause symptoms and goes away without treatment. This is acute hepatitis B. But some people have a chronic (long term) form of the virus, it can lead to cirrhosis and liver failure. Adults who get hepatitis B usually recover. But among infants infected during birth or before one year of age, 90% develop chronic disease.

Incubation period : The incubation period ranges from 40 to 160 days.

Causative organism

Hepatitis B virus, a small double stranded DNA virus belonging to the Hepadnaviridae family.

Modes of spread

The hepatitis B virus is carried in the blood and other body fluids. It is usually spread by contact with blood in the following ways:

- Through an unsafe injections or needle sticks. Unsterilised needles or syringes can contain hepatitis B virus from an infected person
- Transmission of the virus by mothers to their babies during the birth process
- Transmission between children during social contacts, through cuts, scrapes, bites and scratches
- Transmission during sexual intercourse through contact with blood or other body fluids
- Also through blood transfusion

Signs and symptoms

Hepatitis B symptoms may include:

- Stomach upsets
- Dark urine pale stools
- Fever
- Joint pain
- Loss of appetite
- Upset stomach and vomiting
- Weakness and extreme tiredness

- Jaundice, which is a yellowing of the whites of the eyes and the skin. Depending on skin color, this change may be harder or easier to see.



Let us do

Collect more information about the topic from the internet and present a seminar.



Check your progress

1. Differentiate HIV, HSV & HPV. Name the diseases associated with them.
2. Suggest the preventive measures of sexually transmitted diseases.
3. List the modes of spreads of genital warts.

Prevention of sexually transmitted infections

1. **Vaccines:** Safe and highly effective vaccines are available for two sexually transmitted infections namely hepatitis B and genital warts. These vaccines have represented major advances in STI prevention.
2. **Counselling and behavioural approaches:** Counselling and behavioural interventions offer primary prevention against STIs (including HIV). These include:
 - Comprehensive reproductive health education, STI and HIV pre- and post-test counselling;
 - Safer sex/risk-reduction counselling, condom promotion; and interventions targeted at key and vulnerable populations, such as adolescents, sex workers, men who have sex with men and people who inject drugs.

6.6 Teenage Pregnancy

Teenage pregnancy remains a significant public health and social concern in India. According to the National Family Health Survey-5 (NFHS-5), conducted from 2019 to 2021, 6.8% of women aged 15-19 in India had begun childbearing. Thus teenage pregnancy remains a major public health problem in India due to its deleterious consequences on maternal and child health. Besides, teenage pregnancies contribute significantly to population growth especially in developing countries.

Let us understand more about teenage pregnancy.

Causes of teenage pregnancy

Several factors contribute to the high rates of teenage pregnancy in India, ranging from socio- economic conditions to cultural norms and inadequate access to education and healthcare. Let us analyse the specific causes.

- 1. Early marriage:** One of the primary causes for teenage pregnancy in India is the practice of early marriage. Despite legal restrictions, child marriage still exists in many parts of the country. According to the NFHS-5, 23.3% of women aged 20-24 were married before the age of 18.
- 2. Lack of comprehensive reproductive health education:** Many adolescents lack access to comprehensive sexuality education, leaving them ignorant about sexual and reproductive health. This knowledge gap increases the likelihood of unwanted pregnancies among teenagers. In many cases, young girls are unaware of contraceptive methods or are unable to access them due to cultural taboos or lack of availability.
- 3. Poverty and socio-economic factors:** Poverty is yet another significant contributing factor to teenage pregnancy in India. Poor families may consider marriage as a way to secure the future of their daughters, leading to early marriages and pregnancies. Additionally, socio-economic pressures often force young girls to leave school early, limiting their opportunities and increasing their vulnerability to early motherhood.
- 4. Gender inequality and patriarchal norms:** Deep-rooted gender inequality and patriarchal norms in Indian society also play a crucial role in teenage pregnancy. Women and girls often have limited autonomy over their bodies and reproductive choices. In most cases, decisions about marriage and childbearing are often made by male family members.
- 5. Limited access to healthcare services:** Insufficient access to healthcare services, particularly in rural areas, worsen the issue of teenage pregnancy.

Many adolescents do not have access to contraceptives, reproductive health services, or knowledge regarding safe sex practices. Even when services are available, stigma and cultural barriers may prevent young girls from acquiring the care they need.

Consequences of teenage pregnancy

Teenage pregnancy and early motherhood have profound and significant consequences for the health and well-being of mothers, their children, and society as a whole. These consequences can be categorized into health, social, and economic impacts.

- 1. Health consequences:** Teenage pregnancy is associated with several health risks for both the mother and the child. Adolescent mothers will definitely experience complications during pregnancy and childbirth, including anaemia, preeclampsia, and obstructed labour. These complications can lead to maternal mortality or long-term health issues. Besides, infants born to teenage mothers are at a higher risk of low birth weight, preterm birth, and neonatal mortality.

2. **Social consequences:** Teenage mothers often face social stigma and discrimination, which can lead to social isolation and mental health problems. They are more likely to drop out of school, hindering their educational and employment opportunities. This, in turn, continues the cycles of poverty and marginalization.
3. **Economic consequences:** The economic consequences of teenage pregnancy extend beyond the individual. It will affect families and communities. Teenage mothers are more likely to live in poverty, so their children are also at a higher risk of experiencing economic deprivation. This contributes to the intergenerational transference of poverty, limiting opportunities for social mobility and economic development.
4. **Impact on child development:** Children born to teenage mothers often face developmental difficulties due to insufficient resources and support available to their mothers. These children may experience poor health, under nutrition, and limited access to education, all of which can inhibit their cognitive and emotional development. The cycle of disadvantage can thus continue to the next generation.
5. **Impact on mental health:** Teen pregnancy can have a significant impact on a young mother's mental health, often leading to increased levels of stress, anxiety, feelings of isolation, low self-esteem and depression. The emotional challenges of navigating unexpected parenthood, societal stigma, and financial strain can make it difficult for teens to cope.

Solutions to prevent teenage pregnancy

Addressing the issue of teenage pregnancy in India requires a multi-faceted approach. It will definitely tackle the root causes whilst providing support and resources to young mothers. The following strategies could help reduce the incidence of teenage pregnancy and reduce its impact:

- Providing age-appropriate reproductive health education and health awareness.
- Encouraging open communication between parents, teachers, and adolescents.
- Promoting life skills such as decision-making, self-confidence, and goal setting.
- Ensuring access to adolescent-friendly health services and counselling.
- Preventing early marriage and supporting continuation of education.
- Creating awareness about peer pressure, consent, and responsible behaviour.



Check your progress

1. Analyze the health Consequences of teenage pregnancy.
2. What are your suggestions for the prevention of teenage pregnancy?



FUNDAMENTALS OF NUTRITION



Observe the above pictures. Which group looks healthy? A, B or C? What are the conditions of the other two groups?

Picture - A -----

Picture - B -----

Picture - C -----

Examine the picture given and analyze the reason for such a situation in India.



Please read the Child Nutrition Report 2025 published by UNICEF (www.drishtiias.com)

UNICEF (2025) reveals that 1 in 10 children (188 million globally) in the school-age and adolescent group are living with obesity. The report further indicates that in India, obesity has surpassed underweight among school-aged children and adolescents. This alarming trend is largely attributed to the dietary shift from

traditional diets rich in fruits and vegetables to ultra-processed foods and sugary beverages.

In our daily lives, we purchase a variety of foodstuffs, often without adequate awareness of their nutritional composition or their impact on health. The first and foremost factor influencing food choice is the purchasing power of individuals. Secondly, people tend to prefer foods that are tasty and aromatic, often overlooking the fact that all tasty foods are not necessarily nutritively superior. In recent years, social media has also exerted a strong influence on food preferences and eating patterns.

How can we solve these situations?

To counter this public health issue, the government can implement measures such as:

- Banning junk food marketing aimed at children
- Imposing taxes on sugary drinks
- Displaying warning labels on high-calorie food products

At the same time, the public must be educated about healthy dietary practices and the importance of maintaining optimum nutrition to promote and protect health.

In this chapter, we try to understand the relationship between diet and health, and provide knowledge to make informed choices that promote well-being through the optimum use of available resources.

7.1 Dimensions of Health

Health is a multi-dimensional concept influenced by biological, social, economic, psychological and cultural factors. Traditionally, health was viewed in terms of three interrelated dimensions — physical, mental, and social. However, in recent years, additional dimensions such as spiritual, emotional, and vocational have also been recognized.

The following are the dimensions of health :

- 1. Physical dimension:** The physical dimension refers to the proper functioning of the body, where each organ works in harmony at an optimum level. In other words, physical health denotes the state of the body — its composition, functions, development, and maintenance of vital organs. It can be achieved through regular exercise, a healthy diet,

adequate rest and sleep, and the absence of addictions. Proper physical health can also be maintained through various preventive measures and regular follow-ups with healthcare professionals.

2. **Mental dimension:** - Mental health is not merely the absence of mental illness but the ability to face life's challenges with flexibility, resilience, and a sense of purpose. It reflects a state of balance between an individual and their surroundings — between oneself, others, and the environment. A mentally healthy person is emotionally stable, socially adjusted, and capable of making rational decisions.
3. **Social dimension:** Man is a social being and is surrounded by a network of social relationships. These relationships are complementary and help satisfy various needs within society. Through social interactions and the exchange of ideas, individuals share emotions and build meaningful connections. The social dimension of health encompasses an individual's level of social skills, ability to function effectively in society, and capacity to view oneself as a part of the larger community. Overall, it reflects a person's role as a family member, a contributing member of society, and an integral part of the broader social group.
4. **Spiritual dimension:** Spirituality is an essential component of a healthy life. A spiritual outlook helps individuals identify their goals and strive to achieve them with purpose and meaning. It directs the mind toward positive thoughts and helps one find significance in life. Without a sense of meaning, life may seem directionless. True well-being goes beyond physical health and includes moral integrity, ethical values, principles, and a sense of purpose. The spiritual dimension also involves commitment to a higher power or belief system that provides inner peace and guidance.
5. **Emotional dimension:** The emotional dimension of health is closely related to psychology. A human being is not only social but also emotional by nature. Emotional elements are essential for maintaining overall health and well-being. Emotional well-being refers to the ability to recognize, understand, and manage one's own feelings as well as respond appropriately to the emotions of others. While emotional health relates to feelings, mental health is more closely associated with cognition or thinking. In the modern context, both mental and

emotional aspects should be viewed separately, as each plays a distinct and vital role in maintaining human health.

- 6. Vocational dimension:** The vocational dimension relates to the work an individual performs. Every person engages in some form of work necessary for human existence, which varies according to individual capacity and aptitude. The ability to perform work is directly influenced by one's physical and mental health. Vocational health emphasizes job satisfaction, personal fulfillment, and a sense of achievement. When individuals find meaning and satisfaction in their work, it enhances self-esteem and contributes to self-actualization. This dimension also reflects an individual's ability to contribute productively to society and avoid dependency on others.

The development of physical, mental, social, spiritual, emotional and vocational dimension depends on individual's diet. A healthy diet supports growth in all these areas. Let us now examine what a healthy diet is.

Healthy diet

The word *diet* is derived from the Latin word *di-aeta*, meaning *mode of life*. Diet refers to the total amount of food consumed by an individual for survival and well-being. It is often described as a blend of specific nutritious foods chosen for maintaining good health or managing body weight. In simple terms, it represents the pattern of food intake followed by a person. It can be challenging to determine what is truly best for the body. However, acquiring scientific knowledge about the various aspects of food and nutrition enables individuals to plan and follow a balanced and healthy diet within their available resources.

The foremost requirement for maintaining good health is adhering to a healthy diet, complemented by regular exercise, adequate rest, and sufficient sleep.

In your high school classes you might have learned about healthy diet. What does a healthy diet include?

A healthy diet is a balanced intake of foods that supply all the essential nutrients — carbohydrates, proteins, fats, Vitamins, minerals, water, and fibre — in the right proportions to sustain body functions, support growth, and provide energy. Let us examine the benefits of healthy diet:

- Build strong bones and muscles
- Protect the heart and maintaining cardiovascular health
- Prevent lifestyle-related diseases
- Promote healthy digestion and gut function
- Enhance memory, mood, and overall well-being.

Thus, the benefits of a healthy diet are immense.



Check your progress

1. Evaluate the dimensions of health
2. List the benefits of healthy diet

7.2 Functions of Food

A combination of different types of foods forms the foundation of a balanced and nutritious diet. Food performs three main functions in the human body. Let us learn the different functions of food.

A) Physiological function

B) Psychological function

C) Social function

i. Physiological function

The physiological functions are the most fundamental, as they help maintain life, promote growth, and protect the body from diseases. Physiological functions refer to the processes by which the body's organs and systems work together to sustain life, maintain health, and perform essential activities such as digestion, circulation, respiration, and temperature regulation. The physiological functions of food include energy-giving, body-building, and protective and regulatory roles.

- 1. Energy giving function:** Energy is required for performing various voluntary activities (such as sitting, standing, walking, and running) and involuntary activities (such as the beating of the heart, intestinal contractions, and expansion and contraction of the lungs).

Foods rich in carbohydrates and fats are known as *energy-yielding foods*. Carbohydrates serve as the body's preferred

and immediate source of energy, while fats provide long-term energy storage. The energy required for these functions is supplied through the oxidation of food in the body. Examples of energy-giving foods: Cereals and millets, roots and tubers, dried fruits, oils, butter, and ghee.

- 2. Body building function:** Food is also required for growth, development and repair of body tissues. Foods rich in proteins play a crucial role in building muscles, regenerating cells, and maintaining vital functions such as enzyme and hormone production. Since the body continuously undergoes wear and tear, a steady supply of protein is essential for tissue repair and maintenance. Examples of body-building foods:

High quality protein sources: Milk, meat, eggs, and fish.
Moderate quality protein sources: Pulses and nuts.

These foods not only help maintain life and promote growth but also contribute energy to the body.

- 3. Protective and regulatory function:** Foods rich in proteins, Vitamins, and minerals are known as protective and regulatory foods. They are essential for maintaining health and regulating vital body activities, such as:

- Maintenance of body temperature
- Muscle contraction
- Control of water balance
- Blood clotting
- Removal of waste products
- Heartbeat regulation
- Enhancement of immunity.

Examples of protective foods: Milk, eggs, liver, fruits, and vegetables.

Protective foods help maintain healthy skin, boost immunity, and regulate physiological processes. They also aid in rapid recovery from infections or illnesses, as the nutrients in these foods strengthen the body's defense mechanisms. Conversely, individuals consuming poor diets tend to recover more slowly from illnesses.

Regulatory functions refer to the role of specific nutrients in controlling body processes. For instance, nutrients help maintain body temperature at 37°C (98.4°F), regulate heartbeat, and facilitate

muscle activity. Water, too, has a critical regulatory role — it acts as a medium for numerous chemical reactions within the body.

Examples of regulatory foods:

- Fruits such as oranges, papaya, jackfruit, mango, guava (rich in Vitamins A and C).
- Vegetables such as green leafy vegetables, brinjal, pumpkin, carrots, (rich in Vitamins, minerals, and antioxidants).



Do you know?

Functional foods

Food is also a vital source of phytochemicals and antioxidants, which neutralize harmful free radicals that damage biological tissues. These include non-nutrient compounds that are naturally present in plant-derived foods and exhibit biological activity in the human body. They contribute to the prevention of various diseases and promote overall health. This protective function helps prevent a wide range of degenerative and chronic diseases such as cancer, cardiovascular diseases, hypertension, and diabetes. Foods containing beneficial phytochemicals that provide health-promoting effects beyond basic nutrition are known as **functional foods**.

Examples of foods rich in phytochemicals and antioxidants: Green leafy vegetables, colorful fruits, vegetables, and spices.

ii. Psychological function

Food also fulfills psychological needs, influencing mental well-being and emotional satisfaction. Beyond meeting physical and social requirements, food satisfies certain emotional needs such as security, love, and acceptance. For example, preparing delicious meals for family members is a way of expressing affection and care.

Certain amino acids, including tryptophan, phenylalanine, tyrosine, and methionine, serve as precursors for neurotransmitters like serotonin, dopamine, noradrenaline, and GABA (gamma-aminobutyric acid), which significantly affect psychological well-being. Deficiencies in amino acids, carbohydrates, and essential fatty acids have been linked to psychological disorders, including depression.

iii. Social function

Food has always played a central role in community and social, cultural, and religious life of people and it serves as an expression of love, friendship, and happiness, especially during family gatherings, festivals, and religious ceremonies. The social function of food is often overlooked but is profoundly important in determining why and what we eat.

Sharing meals fosters social bonds and a sense of acceptance. In Indian culture, the concept of “Aditi Devo Bhava” (the guest is equivalent to God) is often demonstrated by offering the best food to visitors.



Check your progress

1. Elucidate the fundamental functions of food.
2. Food performs certain functions in the body. Explain.
3. Prepare a digital chart on “functions of food”

7.3 Nutrients

What is a nutrient?

What are the main nutrients needed for our body? Discuss.

A nutrient is any chemical substance that nourishes a living organism. The main nutrients include: Carbohydrates, Proteins, Fats, Vitamins, Minerals and Water (essential for biological functions but not a nutrient per se).

Each nutrient performs specific functions, and all nutrients work together to ensure optimum nutrition.

What is nutrition?

Nutrition is the biochemical and physiological process by which an organism takes in food and uses it for the maintenance of life.

What are the different stages of nutrition? You might have learned these stages in your previous classes. Fill up the flow chart adding different stages of nutrition.

Ingestion

Absorption

Egestion

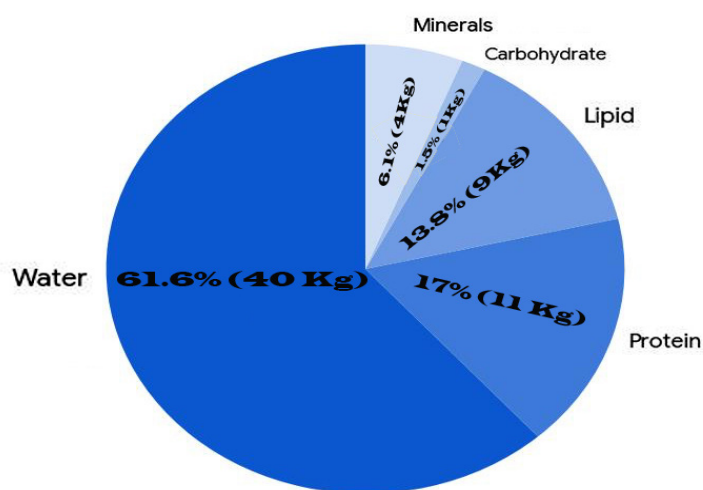
In conclusion, ingestion, digestion, absorption, assimilation and egestion are the stages of nutrition.

Optimum nutrition

Optimum nutrition ensures that essential nutrients are supplied in the correct amount and proportion. It also ensures that nutrients are efficiently utilized by the body, maintaining the highest level of physical and mental health throughout the life cycle.

7.4 Classification of Nutrients

The chemical composition of nutrients in a man gives an indication of various nutrients required by human beings. Moreover, understanding the chemical composition of the human body helps to relate the importance of various nutrients in a balanced diet. So let us analyze it first.



The chemical composition of nutrients in a normal man weighing 65 kg is given in the figure.

Water is the solvent of life and contributes to more than 60% of the weight. This is followed by protein (mostly in muscle) and lipid (mostly in adipose tissue). The carbohydrate content is rather low which is in the form of glycogen.

Based on the amount of nutrients required by an individual on a daily basis, nutrients are classified into two main groups, macro and micro nutrients.

i. Macronutrients: The term 'macro' means 'large'. These are nutrients that the body require in large amount and must be consumed regularly.

They include carbohydrates, proteins, fats, fibre and water.

Macronutrients are essential for:

- Supplying energy
- Supporting growth and repair
- Regulating metabolism and various body functions

ii. Micronutrients: ‘The term ‘micro’ means small. Micronutrients are nutrients required by the body in small quantities, but they are vital for health and proper functioning.

They include Vitamins and minerals, which play key roles in:

- Building immunity
- Supporting enzymatic activities
- Maintaining overall physiological balance.

Although most foods contain a mixture of nutrients, some foods are richer in one nutrient than others. Hence, foods are often grouped according to the predominant nutrients they contain.

Let us discuss the macro and micronutrients in detail.

i. Macronutrients

Do you know the main nutrients in our daily diet? What are they?

A. Carbohydrates

The first products of photosynthesis in plants are carbohydrates. The major portion of plants is made up of carbohydrates, whereas the animal world contains relatively limited amounts of them.

Carbohydrates are the main source of energy in the human diet.

The term carbohydrate literally means “hydrates of carbon.” They are primarily composed of carbon elements (C), hydrogen (H), and oxygen (O).

The term “sugar” is generally applied to those carbohydrates that are sweet to taste and soluble in water.

The smallest structural units of carbohydrates are called monosaccharides. These monosaccharides can combine through a special covalent bond forming larger molecules such as oligosaccharides and polysaccharides.

Classification of carbohydrates

Carbohydrates are often referred to as saccharides (from the Greek *sakcharon*, meaning “sugar”). They are broadly classified into three major groups based on the number of sugar units they contain:

- **Monosaccharides:** Simple sugars containing one sugar unit.
- **Oligosaccharides:** Formed by the combination of 2–10 monosaccharide units.
- **Polysaccharides:** Complex carbohydrates formed by many monosaccharide units linked together.

Monosaccharides and oligosaccharides are usually sweet, crystalline, and water-soluble, and hence are commonly known as sugars.

Polysaccharides, on the other hand, are insoluble, tasteless, and non-crystalline substances that serve as storage or structural carbohydrates.

1. Monosaccharides

Monosaccharides (Greek: *mono* = one) are the simplest group of carbohydrates, often referred to as simple sugars.

They cannot be further hydrolysed into smaller carbohydrate units. Monosaccharides are easily digested and readily absorbed into the bloodstream, providing an immediate source of energy. Examples: Glucose, Fructose, and Galactose.

- a. **Glucose:** Glucose is the most common monosaccharide and is also known as dextrose or blood sugar. It is found in sweet fruits such as grapes and in honey, and is an essential constituent of human blood.
 - Glucose plays a vital role in life processes, serving as the primary energy source for most body tissues.
 - The brain depends almost entirely on glucose for energy (except during extreme starvation, when ketone bodies are used).
 - In the liver, most monosaccharides are converted into glucose for energy metabolism.
 - The normal fasting blood glucose level is 70–100 mg/dL. Blood glucose levels fall during fasting and rise after meals.
 - Glucose is completely and rapidly absorbed, leading to a quick rise in blood sugar levels — it has a high glycemic index (GI).
- b. **Fructose:** Fructose, also known as fruit sugar, is found in various fruits such as grapes, figs, and mulberries, and in sweeteners like molasses and honey.

- It combines with glucose to form sucrose (table sugar).
- Fructose is the sweetest naturally occurring sugar among monosaccharides.
- It is absorbed slowly and incompletely compared to glucose.
- After digestion, fructose causes only a mild and gradual rise in blood sugar levels, hence it has a low glycemic index (GI).

c. Galactose: Galactose is a monosaccharide that combines with glucose to form lactose (milk sugar).

- It is less sweet than glucose and fructose and is not found freely in nature.
- Galactose is rapidly and completely absorbed like glucose, and therefore has a high glycemic index.
- Once absorbed, galactose is converted to glucose in the liver and utilized for energy production.

2. Oligosaccharides

Oligosaccharides (Greek: *oligo* = few) are carbohydrates that contain 2 to 10 monosaccharide units, which can be liberated upon hydrolysis (breaking down with water). Based on the number of monosaccharide units, oligosaccharides are further subdivided into disaccharides, trisaccharides, etc. Among these, disaccharides are the most common.

Disaccharides consist of two monosaccharide units (either similar or different) linked by a glycosidic bond. Before the body can use disaccharides, they must be broken down into their constituent monosaccharides during digestion. This breakdown occurs with the help of specific enzymes, allowing the sugars to be absorbed from the intestine.

The most important disaccharides are maltose, lactose, and sucrose.

- a. Maltose:** Maltose, also called malt sugar, is formed by the binding of two glucose molecules. It is rarely found in free form in nature and is mainly present in germinating grains.
- b. Lactose:** Lactose is formed by the condensation of one glucose molecule and one galactose molecule. It is naturally found only in milk, making it the primary carbohydrate in dairy. The concentration is 7–8% in mother's milk, 4–5% in cow's milk.

- c. Sucrose:** It is formed by the condensation of one glucose molecule and one fructose molecule. Commonly known as table sugar or saccharose, sucrose is extracted from sugarcane or sugar beets.



Do you know?

Glycemic Index (GI) indicates how quickly a particular carbohydrate is converted into glucose in the blood. Glycemic Load (GL), on the other hand, takes into account both the GI and the amount of carbohydrate typically consumed, providing a more practical measure of a food's impact on blood sugar levels.

3. Polysaccharides:

Polysaccharides (Greek: *poly*=many) are polymers of monosaccharide units with high molecular weight (up to a million). They are also called glycans and consist of repeating units of monosaccharides or their derivatives. Polysaccharides are usually tasteless (non-sugars) and can form colloids with water. In human nutrition, the three main polysaccharides are: starch, cellulose & glycogen.

- a. Starch:** Starch is the most important polysaccharide and serves as the primary storage carbohydrate in plants. It is widely distributed in nature and provides more calories to the human diet than any other single nutrient. Starch is the most abundant dietary carbohydrate in cereals, potatoes, legumes, and other vegetables. Plant cells synthesize starch as a reserve energy material, making it the most important digestible polysaccharide in human nutrition.
- b. Cellulose:** Cellulose is a structural polysaccharide found in plant cell walls. It is insoluble in water and most solvents are resistant to hydrolysis by dilute acids. Humans and carnivorous animals cannot digest cellulose, as they lack the necessary enzymes to break it down. When consumed, cellulose acts as dietary fibre, promoting gut health and regular bowel movements.
- c. Glycogen:** Glycogen is the main storage polysaccharide in animal cells and is also known as animal starch. It is abundant in the liver, where it may constitute up to 7% of the wet weight, and is also present in skeletal muscles. Glycogen provides energy for short-term needs, typically meeting the body's energy requirement for about 12 hours.



Let us do

Depict classification of carbohydrates pictorially.

Functions of carbohydrates

Carbohydrates participate in a wide range of functions.

- **Primary energy source:** Carbohydrates are the most abundant dietary source of energy, providing approximately 4 kcal/g for all organisms.
- **Precursors of organic compounds:** They serve as building blocks for the synthesis of fats, amino acids, and other organic compounds.
- **Cell structure and function:** As glycoproteins and glycolipids, carbohydrates are integral to cell membrane structure and participate in cellular functions such as growth, adhesion, and signaling.
- **Fat metabolism:** Carbohydrates are necessary for the complete oxidation of fats.
- **Gut health:** Some carbohydrates promote the growth of healthy intestinal bacteria (prebiotics), supporting digestive health.
- **As sweeteners and flavoring agents:** They are often used to add sweetness and flavor to foods.
- **Dietary fibre:** Complex carbohydrates are an important source of dietary fibre, aiding digestion and bowel regularity.
- **Biological functions:** Certain carbohydrates, such as heparin, function biologically to prevent intravascular blood clotting.

Dietary sources of carbohydrates

Whole grains: cereals and millets; roots and tubers: Tapioca, sweet potato, potato etc. fruits: Apples, bananas, vegetables: Corn, peas, cauliflower, broccoli, etc.



Diseases caused by deficiency of carbohydrates

Deficiency diseases caused by carbohydrates are given below.

1. **Acidosis:** During carbohydrate starvation, the body shifts from glycolysis, the breakdown of glucose, to lipolysis, the breakdown of fats, and ketogenesis to meet energy needs. This

process results in the production of ketoacids, which increase the acidity of the blood. When arterial blood pH falls outside the normal range of 7.35–7.45, it can lead to irreversible cell damage.

2. **Ketosis:** Ketosis is a metabolic state in which the body burns fat for fuel due to insufficient carbohydrate intake. In this state, low blood glucose levels force the body to use fat as an alternative energy source, producing ketone bodies. Prolonged ketosis can affect overall metabolism and may lead to health complications if not addressed.
3. **Hypoglycemia:** Severe lack of carbohydrate intake can result in hypoglycemia, a condition where blood glucose levels drop below 70 mg/dL. This causes symptoms such as giddiness, fatigue, distress, and delirium. Since glucose is the primary energy source for the brain and other organs, insufficient carbohydrate intake can have serious physiological and neurological effects.

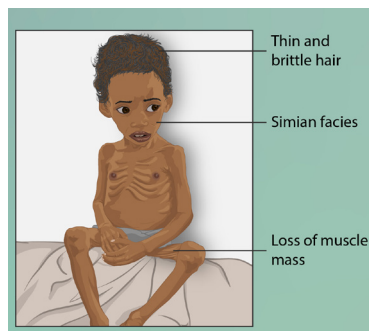


Do you know?

Hyperglycemia means having higher-than-normal sugar (glucose) levels in your blood: occurs when the body doesn't produce enough insulin or can't use it effectively: a hallmark of diabetes. Common symptoms include increased thirst, frequent urination, fatigue, and blurred vision, and if left unchecked, it can damage nerves and organs. It's managed with diet, exercise, medication (like insulin), and monitoring blood sugar levels to stay within a target range.

4. **Constipation:** Dietary fibre, a component of carbohydrate-rich foods, plays an essential role in maintaining healthy digestion. A deficiency of fibre can lead to constipation and disrupt normal bowel function. Additionally, fibre helps prevent diseases such as recto-colon cancer, highlighting its importance in a balanced diet.
5. **Marasmus:** Marasmus results from a continuous deficiency of proteins and calories, particularly in infants and very young children. This condition causes severe weight loss, dehydration, and muscle wasting. It usually occurs in children below the age of one year and can have long-term effects on growth and development if not corrected promptly.

Marasmus is commonly represented by a shrunk, wasted appearance, loss of muscle mass, and loss of subcutaneous fat. Buttocks and upper limb muscle groups are usually more affected than others. Other symptoms are unusual body temperature, anaemia, dehydration, and tachypnea (pneumonia, heart failure).



Dry skin and brittle hair are also symptoms of marasmus. Marasmus can also make children short - tempered and irritable.



Do you know?

Ketogenesis: It is a metabolic pathway that produces ketone bodies, which provide an alternative form of energy for the body.

B. Lipids

Lipids (Greek: *lipos* – fat) are of great importance to the body, serving as the chief concentrated storage form of energy. In addition, they play a major role in cellular structure and various other biochemical functions. Lipids are an organic, heterogeneous group of compounds composed of carbon, hydrogen, and oxygen. They are relatively insoluble in water but soluble in organic solvents such as alcohol and ether.

Lipids are primarily formed from two types of molecules: glycerol and fatty acids. It is important to note that lipids refer to a broad group of organic compounds, whereas dietary fat is just one type of lipid consumed in the diet.

Classification of fatty acids

Based on the nature of bond between the carbon atoms, fatty acids are classified as saturated and unsaturated.

Saturated fatty acids

Saturated fatty acids are those in which the carbon atoms are fully bonded with hydrogen atoms, meaning there are no carbon-carbon double bonds in the molecule. The term “saturated” indicates that each carbon atom has the maximum possible number of hydrogen

atoms attached. Saturated fatty acids generally have a higher melting point, which is why they remain solid at room temperature. They are commonly found in animal fats such as butter, meat, and whole milk, but some are also present in vegetable sources like coconut oil and palm oil.

Unsaturated fatty acids

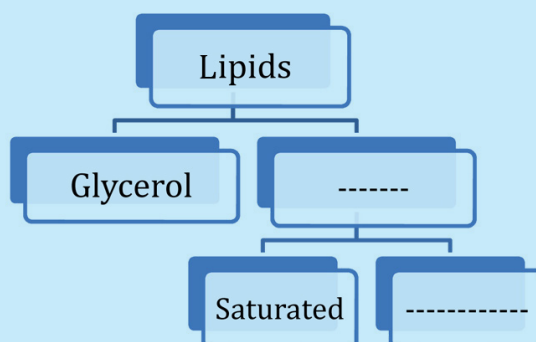
Unsaturated fatty acids have one or more double bonds between carbon atoms, so they do not contain the maximum number of hydrogen atoms. Because of these double bonds, unsaturated fatty acids have a lower melting point and are typically liquid at room temperature, as seen in vegetable oils and fish oil.

Both saturated and unsaturated fatty acids are present in natural lipids. Fatty acids with one double bond are called monounsaturated fatty acids, while those with two or more double bonds are collectively known as polyunsaturated fatty acids (PUFAs).



Let us do

Fill in the blanks



Classification of lipids

Lipids are broadly classified into simple, complex and derived lipids, which are further subdivided into different groups.

1. **Simple lipids:** They are esters of fatty acids with alcohols. These are mainly of two types:
 - a. **Fats and oils:** These are esters of fatty acids with glycerol. The difference between fat and oil is only physical. Thus oil is a liquid while fat is a solid at room temperature
 - b. **Waxes:** Esters of fatty acid with alcohols other than glycerol. Waxes are used in the preparation of candles, lubricants, cosmetics, ointments, polishes etc.

- 2. Complex (compound) lipids:** These are esters of fatty acids with alcohol containing additional groups.
 - a. Phospholipids:** They contain phosphoric acid and frequently a nitrogenous base. This is in addition to alcohol and fatty acids.
 - b. Glycolipids:** These lipids contain a fatty acid, carbohydrate and nitrogenous base.
 - c. Lipoproteins:** Macromolecular complexes of lipids with proteins.
 - d. Other complex lipids:** Sulfolipids, aminolipids and lipopolysaccharides are among the other complex lipids.
- 3. Derived Lipids:** These are the derivatives obtained on the hydrolysis of compound and simple lipids. These include carotenoids, steroids, terpenes, cholesterol.

Functions of lipids

Lipids perform several important functions.

- Lipids serve as the concentrated fuel reserve of the body, providing 9 kcal/gram, making them the most energy-dense macronutrient.
- They are essential constituents of cell membranes, helping to regulate membrane structure and permeability, particularly through phospholipids and cholesterol.
- Lipids act as a source of fat-soluble Vitamins such as A, D, E, and K, which are crucial for various bodily functions.
- Beyond energy and Vitamins, lipids play a critical role as cellular metabolic regulators, forming steroid hormones and prostaglandins that control numerous physiological processes.
- They protect internal organs, serve as insulating material, and contribute to the shape and smooth appearance of the body.
- Fats combined with proteins, known as lipoproteins, are important components of cell membranes and mitochondria, supporting cellular structure and function.
- Cholesterol acts as a precursor for fat-soluble Vitamins like Vitamin D and certain hormones.
- Additionally, lipids enhances the palatability of food and are important in cooking and food processing, contributing flavor, texture, and overall sensory appeal to meals.



Dietary sources of lipids

Oils and fats (visible source), avocados (a fruit with high lipid content, rich in monounsaturated fats), nuts and seeds, fatty fish, meats, dairy products, eggs.

Diseases caused by deficiency of lipids



Dermatitis

The deficiency diseases caused by lipids are:

1. **Dermatitis:** A deficiency of essential fatty acids can lead to phrynodema, also known as “toad skin,” which is characterized by horny eruptions on the posterior and lateral parts of the limbs, back, and buttocks, along with hair loss and poor wound healing.
2. **Growth retardation:** Inadequate intake of lipids can result in poor growth and low body weight, especially in children, affecting overall development.
3. **Vitamin deficiency diseases:** Since fats are required for the absorption of fat-soluble Vitamins A, D, E, and K, fat deficiency may cause deficiencies in these Vitamins, leading to skin problems, depression, fatigue, and nosebleeds among other health issues.
- 4) **Essential fatty acid deficiency:** When the body lacks essential fatty acids such as Omega-3 and Omega-6, it can result in skin problems, hair loss, and impaired brain function, affecting both physical and cognitive health.

C. Proteins

Protein is another important component of food we eat. Proteins are the most abundant organic molecules in living systems, occurring in every part of the cell. They form the fundamental basis of both the structure and function of life. Proteins are macromolecules that play a crucial role in biological processes, including growth and self-repair, which are essential characteristics of life. Chemically, proteins are complex nitrogenous organic compounds composed primarily of carbon, hydrogen, and nitrogen. Upon hydrolysis, proteins yield amino acids, which are organic compounds containing two functional groups: an amino group and a carboxyl group. Unlike

carbohydrates and lipids, proteins are the only macronutrients that contain nitrogen, making them unique in their nutritional and structural roles.



Do you know?

The term protein is derived from a Greek word *proteios* meaning *holding the first place*.

Classification of amino acids

Based on nutritional requirements, amino acids are grouped into two classes: essential and non-essential amino acids.

1. **Essential amino acids:** Essential amino acids are those that cannot be synthesized by the body and therefore must be supplied through the diet. They are necessary for proper growth and maintenance of the body. The nine essential amino acids for humans are: Histidine, Isoleucine, Leucine, Lysine, Methionine, Phenylalanine, Threonine, Tryptophan, and Valine.
2. **Non-essential amino acids:** Non-essential amino acids can be synthesized by the body and therefore do not necessarily need to be obtained from the diet. The eleven non-essential amino acids are: Arginine, Glutamine, Tyrosine, Cysteine, Glycine, Proline, Serine, Ornithine, Alanine, Asparagine, and Aspartate.

Classification of proteins

The nutritive value of proteins is determined by the composition of essential amino acids. From a nutritional point of view, proteins are classified into three categories:

1. **Complete proteins:** These proteins contain all 9 essential amino acids in the proportions required by the human body to support optimal growth. Examples include egg albumin, milk casein, meat, and fish.
2. **Partially incomplete proteins:** These proteins are partially deficient in one or more essential amino acids and can support moderate growth. Examples include pulse proteins, wheat, and rice proteins.
3. **Incomplete proteins:** These proteins completely lack one or more essential amino acids and, therefore, do not promote growth. Examples include gelatin and zein.

Functions of proteins

Proteins play an important function in our body. They are:

- Protein is vital in the maintenance of body tissue, including development, growth, and repair.
- As enzymes, proteins catalyze the biochemical reactions necessary for survival and proper functioning of the body.
- Structural proteins form essential elements of tissues such as muscles, skin, bones, tendons, and cartilage. Examples include collagen and elastin.
- Proteins are involved in the transport and storage of molecules and ions. Hemoglobin carries oxygen in the blood, while myoglobin stores it in muscles. Iron is transported by transferrin in the bloodstream and stored in the liver as a complex with ferritin.
- Protective proteins play a key role in the body's defense mechanisms, such as antibodies that protect against infections.
- Many hormones are proteins, including growth hormone and insulin, which regulate various physiological functions.
- Proteins participate in blood coagulation, helping in the clotting process to prevent excessive bleeding.
- Proteins can serve as an energy source, providing 4 kcal/g. They are primarily used for energy during prolonged fasting or starvation.
- Proteins help maintain water and pH balance in the body, contributing to overall homeostasis.
- Proteins produce enzymes that increase the rate of chemical reactions necessary for metabolism and other body functions.



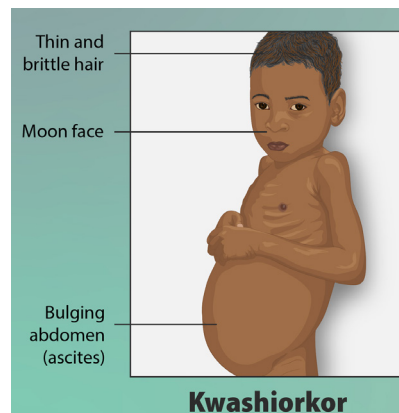
Dietary sources of protein

Meat and poultry, fish and sea food, egg, dairy products, legumes, nuts and seeds, whole grain.

Diseases caused by protein deficiency

Deficiency diseases caused by proteins are given below.

1. **Kwashiorkor:** Kwashiorkor is a disease caused by severe protein deficiency despite adequate energy intake. It usually affects older children, with the highest occurrence after 18 months. Symptoms include pitting edema (swelling of the ankles and feet), distended abdomen, enlarged liver with fatty infiltration, thinning of hair, loss of teeth, skin depigmentation, and dermatitis. Children with Kwashiorkor often develop irritability and anorexia. Severe cases can lead to death.
2. **Marasmus:** Protein deficiency also may lead to the condition called marasmus. We have already learned its symptoms in the previous session.
3. **Impaired mental health:** Long-term protein inadequacy can negatively influence psychological well-being. It may result in mental hindrance, especially in children, and can cause tension, irritability, sadness, and mood swings.
4. **Oedema:** Inadequate protein intake can lead to oedema (fluid retention), causing swelling in various parts of the body.
5. **Organ failure:** Protein is essential for the growth, repair, and proper functioning of body organs. Protein deficiency can impair the functioning of multiple organs.



D. Water

Water is the major constituent of the human body. An adult body contains about 60% water (men 55–70%, women 45–60%). Women and obese individuals have relatively less water due to a higher proportion of stored fat in an anhydrous form. Water in the body is distributed in intracellular (inside the cells) and extracellular (outside the cells) compartments, known as intracellular fluid (ICF) and extracellular fluid (ECF), respectively. The extracellular fluid is further divided into interstitial fluid and plasma. The body possesses a remarkable capacity to regulate its water content. In a healthy individual, this is achieved by balancing daily water intake with water output.

Water intake

How many litres of water do we require in a day?

Directly or indirectly we take enough water with our food.

Water intake is supplied through exogenous and endogenous sources:

1. **Exogenous water:** This includes ingested water, beverages, and the water content of solid foods, constituting 0.5–5 litres per day.
2. **Endogenous water:** Metabolic water produced within the body accounts for 300–350 ml per day.

Water output

Water losses from the body occur through four distinct routes: urine, skin, lungs, and feces:

1. **Urine:** This is the major route of water loss. In a healthy individual, urine output is about 1–2 litres per day.
2. **Skin:** About 450 ml per day is lost through perspiration via the skin. Loss of water increases in hot climates.
3. **Lungs:** During respiration, approximately 400 ml per day is lost through expired air.
4. **Feces:** Most water entering the gastrointestinal tract is reabsorbed, but around 150 ml per day is lost through feces in a healthy individual.

Water balance

Water balance means that the amount of water consumed through food and beverages is equal to water excreted. It is regulated by the hypothalamus and kidney. Key hormones is the ADH antidiuretic hormone which controls absorption and stimulate thirst.

Abnormalities associated with water balance

1. **Dehydration:** Dehydration is a condition characterized by a depletion of water in the body. It may result from insufficient intake, excessive water loss, or both. Dehydration is generally classified into two types:
 - Due to loss of water alone
 - Due to deprivation of both water and electrolytes

Causes of dehydration include diarrhoea, vomiting, excessive sweating, and fluid loss from burns, adrenocortical dysfunction, and kidney diseases such as renal insufficiency. The primary treatment for dehydration is the intake of adequate water. Clinical symptoms include extreme thirst, dry mouth, headache, dizziness, fatigue and yellow or little urine.

2. Overhydration: Overhydration, or water intoxication, results from excessive retention of water in the body. It may occur due to excessive intake of large volumes of salt-free fluids, renal failure, or overproduction of antidiuretic hormone (ADH). Overhydration is often observed after major trauma, surgery, or lung infections. Clinical symptoms include headache, lethargy, and convulsions.

Functions of water

Water is the solvent of life and is more essential than any other single compound for survival. It is involved in numerous physiological functions:

- Water provides the aqueous medium necessary for various biochemical reactions.
- Water directly participates as a reactant in several metabolic reactions.
- It serves as a vehicle for the transport of solutes.
- Water plays a key role in the regulation of body temperature.
- Water-based fluids act as lubricants in various parts of the body.
- Water is a source of dietary minerals. Although water is composed of only oxygen and hydrogen, the water we drink or use in food preparation can contain significant amounts of minerals.

E. Dietary fibres

Dietary fibre is a nutrient naturally found in the plants we eat, such as fruits, vegetables, nuts, and grains. It can be defined as “the remnants of the plant cell wall that are not hydrolysed by the alimentary enzymes of man.” Commonly known as roughage or bulk, dietary fibre consists of parts of plant foods that the human body cannot digest or absorb. Macronutrients such as carbohydrates, proteins, and fats are digested, absorbed, and assimilated in our body, but fibre passes through the stomach, small intestine,

large intestine, and colon, exiting the body along with fecal bulk. Although it is indigestible, dietary fibre is susceptible to microbial fermentation in the large intestine, with the degree of fermentation varying widely among different types of fibre.

Classification of dietary fibre

Broadly, dietary fibre is divided into two types, each with distinct characteristics—soluble fibre and insoluble fibre:

1. **Soluble fibre:** Soluble fibres dissolve in water and form a gel-like material that absorbs water. This property helps reduce Low-Density Lipoproteins (LDL), the “bad” cholesterol, and regulate blood glucose levels. Examples of soluble fibres include pectin, beta-glucans, and some types of gums, inulin, and oligosaccharides. Common sources are oats, peas, beans, apples, citrus fruits, carrots and barley,
2. **Insoluble fibre:** Insoluble fibres do not dissolve in water, passing through the digestive system largely intact. They promote the movement of digested material through the gastrointestinal tract and increase fecal bulk. Insoluble fibre is abundant in whole-wheat flour, wheat bran, nuts, beans, and vegetables such as cauliflower, peas, green beans, cluster beans and potatoes.



Do you know?

Soluble fibres:

Pectin: Fruits contain soluble fibre pectin.

Beta - glucan: Most commonly found in oats, barley and certain mushrooms

Guar gum: Derived from guar bean and used to thicken food

Inulin: Chicory root, garlic and onions contain inulin

Oligosaccharides: a type of carbohydrate made up of simple sugars.

Insoluble fibres:

Cellulose: Cellulose is an essential constituent of the major cell walls in vegetables, green plants, algae and certain microorganisms.

Hemi celluloses: Hemi celluloses are mostly found in cereal grains but approximately one third of the dietary fibre in

vegetables, fruits legumes and nuts is composed of hemicelluloses.

Lignins: It is found in trace amounts in food plants. It is seen in celery, the outer layer of wheat grains.

Resistant starches: Whole kernel grain items such as bread, seeds, pasta and legumes include resistant starch.

Chitin and chitosan: It can be obtained from the exoskeleton of arthropods such as crabs and shrimps.

Advantages of consuming fibre

The benefits of dietary fibre are:

1. Eating dietary fibre helps digestion, keeps a healthy body weight and lowers the risk of heart disease.
2. Consumption of natural dietary fibres lowers the incidence of metabolic disorders such as obesity and diabetes mellitus.
3. Dietary fibre intake reduces the risk of malignancy and improves colon health by promoting intestinal motility and preventing constipation.
4. Regular ingestion of dietary fibre, irrespective of total micronutrient or calorie intake, supports weight loss.
5. Some studies have indicated beneficial effects of dietary fibre in reducing the risk of breast cancer.
6. Fibre consumption increases the population of beneficial bacteria in the gut, enhancing immunity against infections.
7. Dietary fibre helps reduce LDL cholesterol levels, thereby decreasing the risk of coronary heart disease and type 2 diabetes.

Sources of fibre

Dietary fibre is present in fruits, vegetables, legumes, whole-grain breads, cereals and millets. Most fibre-rich foods contain a combination of both soluble and insoluble fibres in varying proportions.



ii. Micronutrients

Micronutrients are essential to us in very small quantities. Let us see which ones are essential to us.

A. Vitamins

Vitamins are organic nutrients required in small amounts for growth, survival, and reproduction, playing key roles in various biochemical reactions. Most Vitamins cannot be synthesized by the body and must be obtained from the diet. Their primary role is serving as coenzymes for enzymatic reactions.

Classification of Vitamins

Vitamins are classified based on their solubility into fat-soluble and water-soluble Vitamins. Fat-soluble Vitamins include A (retinol), D (calciferol), E (tocopherol), and K (naphthoquinone). These Vitamins dissolve in fats and oils, can be stored in the liver and adipose tissue, and are not easily excreted in urine. Excess intake, particularly of Vitamins A and D, can lead to toxicity.

Water-soluble Vitamins include Vitamin C and the B-complex Vitamins (thiamine B1, riboflavin B2, niacin B3, pantothenic acid B5, pyridoxine B6, biotin B7, folic acid B9, and cobalamin B12). They dissolve in water, are generally excreted in urine, and are not stored in large amounts (except B12), so they must be consumed regularly. Most water-soluble Vitamins function as coenzymes in cellular reactions, while Vitamin K is the only fat-soluble Vitamin known to act as a coenzyme.

1. Fat-soluble Vitamins

Fat-soluble Vitamins require dietary fats for absorption and transport, whereas water-soluble Vitamins need continuous dietary supply due to limited storage in the body.



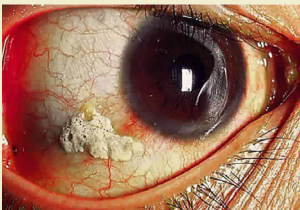
Do you know?

Vitammers: the term vitammers represents the chemically similar substances that possess qualitatively similar vitamin activity.

Let us explain Vitamins in detail.

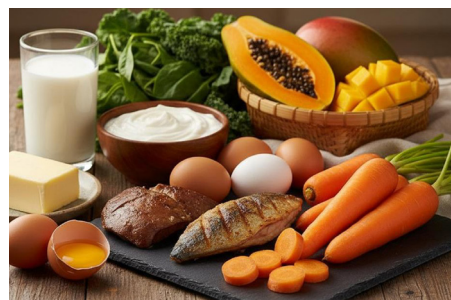
a. Vitamin A

The active form of Vitamin A is found mainly in foods of animal origin, while its precursors, the carotenoids (such as beta-carotene), are present in plant sources. Beta-carotene is converted into active Vitamin A in the liver. The different chemical forms of Vitamin A, known as vitammers, include retinol, retinal, and retinoic acid, each contributing to specific biological functions in the body.

Functions of Vitamin A	Deficiency symptoms
- Helps in the proper functioning of vision - Helps in protein synthesis and cell differentiation - Essential for reproduction and growth - Important for immunity - Beta - carotene helps protect the body from diseases like heart attack and cancer - It is necessary for the maintenance of normal epithelium and skin.	Night blindness (Nyctalopia): Visual acuity is diminished in dim light. Xerophthalmia: Conjunctival dryness and corneal dryness. Bitot's spots: These are seen as greyish- white triangular plaques firmly adheres to the conjunctiva. Keratomalacia: When the xerophthalmia persists for a long time it progresses to keratomalacia (cornea softening, necrosis and ulceration) Blindness: It is due to structural damage to the retina. Skin and mucous membrane lesions: Follicular hyperkeratosis or phrynoderma results from hyperkeratinization of the epithelium lining the follicles. The alterations in skin may cause increased occurrence of generalized infections.  Bitot's spots  Xerophthalmia

Dietary sources of Vitamin A

Animal sources include milk, butter, cream, cheese, egg yolk and liver and fish liver oils. Vegetable sources are carrot, papaya, mango, pumpkins and green leafy vegetables.



b. Vitamin D

Vitamin D is a fat-soluble Vitamin that also functions as a hormone due to its ability to be synthesized in the body and its steroid-like mechanism of action. The two primary forms of biologically inactive Vitamin D are Vitamin D3 (cholecalciferol) and Vitamin D2 (ergocalciferol). Vitamin D3 is produced in the skin upon exposure to ultraviolet (UV) radiation from sunlight. Vitamin D2 is synthesized by plants when exposed to sunlight and is obtained through dietary sources, although in smaller amounts, such as in fish, egg yolks, and some meats. Both forms are later converted into the biologically active form in the body.



Rickets

Functions of Vitamin D	Deficiency symptoms
• Maintain blood levels of calcium and phosphorus in the intestine • It stimulates calcification of bones • It is necessary for the development of teeth and bones • It decreases the pH level of small intestine which helps in increasing the absorption of calcium and phosphorus.	• The deficiency of vitamin D causes Rickets in children and Osteomalacia in adults. Hence vitamin D is known as an antirachitic vitamin. • Clinical features of Rickets: It is seen in children. The bone growth is markedly affected. Bones become soft and pliable due to insufficient mineralisation of bones. The classical features of rickets are bone deformities. Weight bearing bones are bent. The clinical manifestations include bow legs, knock-knee, rickety rosary (beading of ribs), bossing of frontal bones and pigeon chest. • Clinical features of Osteomalacia: The bones are softened due to insufficient mineralisation and increased osteoporosis. Patients are more prone to fractures. The other abnormalities are a slightly lower serum calcium and a low serum phosphate.

Dietary sources of Vitamin D

Exposure to sunlight produces Vitamin D₃ or cholecalciferol. Fish liver oil, fish and egg yolk are good sources of the Vitamin. Milk contains moderate quantities.

c. Vitamin E

Vitamin E is a fat-soluble Vitamin that acts as a natural antioxidant and an anti-sterility factor. It is not a single compound but a mixture of related compounds called tocopherols. Another group of related compounds, tocotrienols, also exhibit Vitamin E activity. Collectively, all these derivatives are referred to as Vitamin E. Tocopherols and tocotrienols function primarily as fat-soluble antioxidants, protecting cell membranes from oxidative damage, and they also participate in various other physiological functions in the body.

Functions of Vitamin E	Deficiency symptoms
• Vitamin E is the most powerful natural antioxidant • Vitamin E boosts immune response • It reduces the risk of atherosclerosis by reducing oxidation of LDL • It protects vitamin A and carotene from destruction by oxidation • It prevents sterility • It protects RBC from hemolysis • It keeps the structural and functional integrity of all cells.	• Vitamin E deficiency is seen in persons (a) who cannot absorb dietary fat and (b) in premature infants (birth weight less than 1500 grams) • Vitamin E deficiency causes neurological problems due to poor nerve conduction. These include neuromuscular problems such as spinocerebellar ataxia, retinopathy, peripheral neuropathy and myopathies. Deficiency can also cause anaemia due to oxidative red blood cells.

Dietary sources of Vitamin E

Vegetable oils are rich sources of Vitamin E namely wheat germ oil, sunflower oil, cotton seed oil etc.



d. Vitamin K

Vitamin K gets its name from the German word "*KoagulationsVitamin*". It naturally exists in two main forms: K1 (Phylloquinone), found in green leafy vegetables, and K2 (Menaquinone), produced by intestinal bacteria. A synthetic form, K3 (Menadione or Vicasol), is also available. The primary function of Vitamin K is to aid in the synthesis of prothrombin in the liver, along with other Vitamin K-dependent clotting factors, including VII, IX, X, Protein C, and Protein S, which are essential for normal blood coagulation.

Functions of Vitamin K	Deficiency symptoms
• It is necessary for blood coagulation, clotting factors such as 2,7,9,10 are activated by vitamin K through liver. It acts as a co-factor in oxidative phosphorylation • It shortens prothrombin time • It is used as an antidote to anticoagulants like warfarin.	• Hemorrhagic disease of the newborn occurs due to vitamin K deficiency. Newborns, particularly premature infants, are relatively deficient in vitamin K because of low hepatic stores, limited oral intake, and the absence of intestinal bacterial flora. • Vitamin K deficiency in children and adults may present as a tendency to bruise easily, appearance of ecchymotic patches, bleeding from mucous membranes, post-traumatic bleeding, and internal hemorrhages. • Laboratory indicators of vitamin K deficiency include prolonged prothrombin time and delayed clotting time, reflecting impaired blood coagulation.



Dietary sources of Vitamin K

Green leafy vegetables are excellent dietary sources of Vitamin K. Even if the diet lacks this Vitamin, daily requirements can still be met through synthesis by intestinal bacteria, provided that absorption in the gut is normal.

2. Water soluble Vitamins

The functions, deficiency symptoms and sources of water soluble Vitamins are given below.

a. Thiamine (Vitamin B1)

It was first isolated in 1949 and is commonly known as the antiberiberi factor. It is also referred to as an antineuritic factor. Thiamine is partially destroyed by heat.

Functions of Vitamin B1	Deficiency symptoms
• It is essential for carbohydrate metabolism, helping the body convert food into energy • It promotes a normal appetite • Thiamine is important for the proper functioning of the nervous system • It plays a vital role in forming and maintaining the myelin sheath, which protects nerve cells.	The deficiency of vitamin B1 results in a condition called beri-beri, which occurs in different forms: wet beri-beri, dry beri-beri, infantile beri-beri, and polyneuritis. • Wet beri-beri (cardiovascular beri-beri): This form is characterized by edema of the legs, face, trunk, and serous cavities. Breathlessness and palpitations are present. The calf muscles are slightly swollen, and a fast, bounding pulse is observed. The heart becomes weak, and death may occur due to heart failure. • Dry beri-beri (neurological beri-beri): This form is associated with neurological manifestations resulting in peripheral neuritis. Edema is not commonly seen. The muscles become progressively weak, walking becomes difficult, and if untreated, it may even lead to death. • Mixed beri-beri: Sometimes the symptoms of wet and dry beri-beri occur together, and the condition is referred to as mixed beri-beri.



wet beri-beri

- **Infantile beri-beri:** This is seen in infants born to mothers suffering from thiamine deficiency. It is characterized by sleeplessness, restlessness, vomiting, convulsions, and bouts of screaming due to cardiac dilatation.
- **Polyneuritis:** Common in chronic alcoholics, as alcohol inhibits intestinal absorption of thiamine. Polyneuritis may also be associated with pregnancy and old age.

Dietary sources of thiamine (Vitamin B1)

Aleurone layer of cereals (food grains) is a rich source. Therefore whole wheat flour and unpolished hand- pound rice have better nutritive value. Yeast is also a very good source. Pulses, oil seeds and nuts are good sources. It is also present in animal foods like pork, liver, heart, kidney, milk etc.



b. Riboflavin (Vitamin B2)

Riboflavin was the first B-complex Vitamin to be isolated in a pure state. It is synthesized by green plants and microorganisms. Naturally occurring forms include lactoflavin (found in milk), hepatoflavin (found in liver), and ovoflavin (found in eggs), all of which are chemically identical to riboflavin. Riboflavin is relatively stable to heat, and ordinary cooking destroys no more than 20% of its content.

Functions of Vitamin B2	Deficiency symptoms
• Riboflavin is involved in the regulatory functions of certain hormones that participate in carbohydrate metabolism • The retina contains free riboflavin, which is converted by light into a compound that stimulates the optic nerve • Riboflavin plays an important role in numerous enzyme systems involved in the metabolism of carbohydrates, fats, and proteins.	Natural deficiency of riboflavin in humans is uncommon because it is synthesized by the intestinal flora. Riboflavin deficiency usually occurs alongside other deficiency diseases such as beriberi, pellagra, and kwashiorkor. This deficiency is also referred to as Ariboflavinosis. Symptoms primarily affect the skin and mucous membranes: • Glossitis (Greek, <i>glossa</i> = tongue): The tongue becomes smooth and purplish. • Magenta-colored tongue: A deep reddish-purple discoloration of the tongue.

- | | |
|---|--|
| <ul style="list-style-type: none"> • Riboflavin mononucleotide (FMN) and flavin adenine dinucleotide (FAD) are either integral parts of enzymes or act as coenzymes. | <ul style="list-style-type: none"> • Cheilosis (Greek, <i>cheilis</i> = lip): Fissures appear at the corners of the mouth. • Angular Stomatitis: Inflammation at the corners of the mouth. • Ocular lesions: Eyes may become itchy, watery, bloodshot, and sensitive to light. |
|---|--|



Dietary sources of riboflavin (Vitamin B2)

Rich sources of riboflavin include liver, dried yeast, eggs, and whole milk. Good sources are fish, whole cereals, legumes, and green leafy vegetables.

c. Niacin/nicotinic acid (Vitamin B3)

Niacin, also known as nicotinic acid or the pellagra-preventing factor, is a water-soluble white crystalline compound. Its active form in tissues is nicotinamide.

Functions of Vitamin B3	Deficiency symptoms
• Niacin helps produce energy from food • It aids in digestion and promotes a normal appetite • It supports healthy skin • It assists the body in making sex and stress-related hormones in the adrenal glands and other tissues.	• Niacin deficiency causes a condition called Pellagra, which affects the skin, gastrointestinal tract, and central nervous system. The symptoms are commonly summarized as the “3Ds”: dermatitis, diarrhoea, and dementia. Dermatitis usually occurs on sun-exposed areas of the skin such as the neck, dorsal feet, ankles, and parts of the face. Diarrhoea often appears as loose stools, sometimes with blood or mucus, and prolonged diarrhoea can lead to weight loss. Dementia involves nervous system impairment, manifesting as anxiety, irritability, poor memory, and insomnia. If untreated, Pellagra can progress to a fourth D: death.



Dietary Sources of niacin/nicotinic acid (Vitamin B3)

Rich natural sources of niacin include liver, yeast, whole grains, cereals, and pulses. Moderate sources include milk, fish, eggs, and vegetables.

d. Pyridoxine (Vitamin B6)

Vitamin B6 comprises a group of three related compounds: pyridoxine (an alcohol), pyridoxal (an aldehyde), and pyridoxamine. In foods, pyridoxine is the predominant form, which can be readily converted into pyridoxal and pyridoxamine within the body.

Functions of Vitamin B6	Deficiency symptoms
• Aids in protein metabolism, absorption • Aids in red blood cell formation • Helps body to use fats • Essential for the growth of infants.	• Pyridoxine deficiency is associated with neurological symptoms such as depression, irritability, nervousness and mental confusion. • Convulsions and peripheral neuropathy are observed in severe deficiency. In children, B6 deficiency results in convulsions (epilepsy). • Decrease in haemoglobin level is seen in B6 deficiency. This is due to a reduction in heme production.

Dietary sources of pyridoxine (Vitamin B6)

Rich sources are yeast, rice polishing, wheat germs, cereals, legumes (pulses), oil seeds, egg, milk, meat, fish and green leafy vegetables.



e. Folic acid or folacin (Vitamin B9)

The name “folic acid” is derived from the Latin word *folium*, meaning leaf, as it is abundant in leafy vegetables. It is water-soluble but is rapidly destroyed when exposed to light.

Functions of Vitamin B9	Deficiency symptoms
• Aids in protein metabolism • Promotes red blood cell formation • Prevents birth defects of spine, brain • Lowers homocysteine levels and thus coronary heart disease risk.	• Megaloblastic anaemia: Folic acid deficiency impairs DNA synthesis. Due to a block in DNA synthesis, the maturation of erythrocytes is slowed down leading to macrocytic RBC. The rapidly dividing cells of bone marrow are seriously affected. The macrocytic anaemia (abnormally large RBC) associated with megaloblastic changes in bone marrow is a characteristic feature of folate deficiency. • Folic acid deficiency in pregnant women may cause neural defects in the foetus. Hence high doses of folic acid are recommended in pregnancy to prevent birth defects. • Folic acid deficiency may cause increased homocysteine levels in blood causing coronary artery diseases. • Its deficiency contributes to the etiology of bronchial carcinoma and cervical carcinoma.



Dietary Sources of folic acid or folacin (Vitamin B9)

Rich sources of folic acid include yeast and green leafy vegetables, while moderate sources are cereals, pulses, oilseeds, and eggs.

f. Cobalamin (Vitamin B12)

Vitamin B12 is also known as cobalamin, the extrinsic factor (EF) of Castle, and the anti-pernicious anaemia factor. It is water-soluble, heat-stable, and red in color.

Functions of Vitamin B12	Deficiency symptoms
• Essential for rapid DNA synthesis, a process vital for cell division, growth and repair, supporting overall health and development • Aids in development of normal red blood cells • It is needed for the myelination of the nerves • Essential for the metabolism of macronutrients.	• The most important disease associated with Vitamin B12 deficiency is Pernicious anaemia. It is characterized by low haemoglobin levels, decreased number of erythrocytes, and neurological manifestations. • B12 deficiency is also associated with neuronal degeneration and demyelination of the nervous system. The symptoms include paresthesia (numbness, and tingling) of fingers and toes. In advanced stages, confusion, loss of memory and even psychosis may be observed. • Deficiency of vitamin B12 causes abnormal homocysteine level causing myocardial infarction.



Dietary sources of cobalamin (Vitamin B12)

Foods of animal origin are the only sources of Vitamin B12. The rich sources are liver, kidney, milk, curd, eggs, fish, pork and chicken. Curd is a better source than milk due to the synthesis of B12 by lactobacillus.

g. Ascorbic acid (Vitamin C)

Ascorbic acid is a water-soluble and versatile Vitamin. It is easily destroyed by heat, alkali, and prolonged storage. During cooking, up to 70% of Vitamin C can be lost. It plays a vital role in human health and disease prevention. Vitamin C is rapidly absorbed from the intestine but is not stored in the body to a significant extent. Excess ascorbic acid is excreted in the urine as such or as its metabolites, including diketogulonic acid and oxalic acid.

Functions of Vitamin C	Deficiency symptoms
• Helps in collagen formation • It helps in the maintenance of normal connective tissue and wound healing • Required for bone formation • Enhances iron absorption • It is essential for the carbohydrate and cholesterol metabolism • It is a strong antioxidant • Vitamin C enhances the synthesis of antibodies • Helps in maturation of RBC.	• Scurvy: Deficiency of vitamin C causes scurvy. This disease is characterized by spongy and sore gums, loose teeth, anaemia, swollen joints, fragile blood vessels, decreased immunocompetence, delayed wound healing, sluggish hormonal function of adrenal cortex and gonads, haemorrhage, osteoporosis. Most of the symptoms are related to impairment in the synthesis of collagen and/or the antioxidant property of vitamin C. 

Dietary sources of ascorbic acid (Vitamin C)

Rich sources are amla (Indian gooseberry), guava, citrus fruits and green leafy vegetables.

B. Minerals

Minerals are inorganic elements that cannot be synthesized by the body and must be obtained from the diet. They are naturally present in soil and water. While some minerals are essential for living organisms, others can be toxic in high amounts. Plants absorb a significant portion of minerals from the environment, which are then passed along the food chain to animals. Deficiency of nutritionally important minerals can have severe or even fatal consequences.

Minerals are key elements of the body. They are required for the formation and function of important biomolecules. Although minerals do not provide energy, they are essential for maintaining normal biochemical processes.

Approximately 4–6% of body weight is composed of mineral elements. Their highest concentration is found in bones and teeth, but they are also present in soft tissues such as nerves and muscles, as well as in blood and other body fluids. Minerals help regulate various body functions, including:



- Maintenance of acid–base balance
- Control of water balance
- Muscle contraction
- Stimulation of the nervous system
- Blood coagulation

Based on body requirements, essential minerals are classified as either macro or micro (trace) minerals:

Macro minerals

They are classified as macro because the average adult daily requirement is greater than 100 mg/ day. The important major elements are: Calcium, phosphorus, potassium, chlorine, sulphur, magnesium and sodium.

Micro (Trace) minerals

As the name implies, trace elements are an essential group of minerals, which are needed, in small quantities for the day- to-day metabolic processes in man. They are regarded as trace elements because their daily requirement is below 100mg, above which it can become toxic to health. Microminerals (trace elements) include the following: Iron, fluorine, zinc, copper, Iodine, chromium, cobalt and selenium.

The functions, deficiency symptoms and sources of nutritionally significant minerals are given below.

1. Calcium (Ca)

Calcium is the most abundant mineral in the human body, with a total content of approximately 1 to 1.5 kg in an adult. About 99% of calcium is found in bones and teeth, primarily as calcium phosphate. The remaining 1% is present in blood, extracellular fluid (ECF), muscles, and other tissues.

Functions of Calcium	Deficiency symptoms
• Essential for blood coagulation • An important constituent of bone and teeth formation • Helps in muscle contraction and relaxation, nerve transmission • Vital for cell membrane permeability and enzyme activation.	• Rickets: It is a disorder of defective calcification of bones. This may be due to low levels of vitamin D in the body or due to a dietary deficiency of calcium. • Osteoporosis: It is characterised by demineralization of bone resulting in the progressive loss of bone mass. • Tetany: It is characterized by a fall in the serum calcium to below 7 mg/ dL. The symptoms include neuromuscular irritability and convulsions.

Dietary sources of calcium (Ca)

Milk, dairy products, eggs, pulses, fish, green leafy vegetables.



2. Phosphorus (P)

Phosphorus constitutes approximately 0.5–1.1% of the adult body weight. About 85% of phosphorus is present in bones, while the remaining 15% is distributed in soft tissues. The adult body contains roughly 1 kg of phosphate, which serves as an intracellular component of cells. Most of it (about 80%) occurs in combination with calcium in bones and teeth. Around 10% of body phosphorus is found in muscles and blood, where it is associated with proteins, carbohydrates, and lipids.

Functions of Phosphorus	Deficiency symptoms
• Forms and maintains bones and teeth • Essential for the formation and utilization of high-energy compounds • Required for the synthesis of phospholipids, phosphoproteins, and nucleic acids • The phosphate buffer system is important for maintaining pH in the blood (around 7.4) and within cells.	• Hypophosphatemia: The effects of phosphorus deficiency include anorexia, anaemia, muscle weakness, bone pain, rickets in children, osteomalacia in adults, general debility, increased susceptibility to infections, paresthesia, ataxia, confusion, and in severe cases, death.

Dietary sources of phosphorus (P)

Milk and milk products, eggs, chicken, meat, fish oil, seeds (pumpkin, sunflower), beans, vegetable oils, almonds, nuts etc.



3. Sodium & Chloride (Na & Cl)

Sodium and chloride are the major extracellular electrolytes, existing as fully water-soluble cations and anions, respectively. In an average 70 kg adult male, the body contains approximately 90g sodium, with up to 75% stored in the mineral apatite of bone. Since sodium and chloride intake in humans is closely linked, both are discussed together.

Functions of Sodium and Chloride	Deficiency symptoms
• The sodium is an active participant in the regulation of osmotic and electrolyte balances, whereas chloride is a passive participant in this regulatory system • Sodium is involved in nerve conduction, active cellular transport and the formation of mineral apatite of bone • Among the main functions of the chloride are as dissociated hydrochloric acid in the stomach and in the chloride shift in the electrolyte plasma membrane • Helps to maintain total body water and water balance.	• Low plasma sodium or chloride is not diet related but rather caused by a variety of clinical conditions. Loss of sodium can also ensue as a result of excessive water intake, anorexia nervosa, ulcerative colitis, severe infection, liver disease and diarrhoea. Vomiting, chronic renal disease, renal failure and chronic respiratory acidosis can result in chloride depletion.



Dietary Sources of sodium & chloride (Na & Cl)

The major sources of sodium and chloride is common salt. Naturally occurring sources of sodium are milk, meat, eggs and most vegetables.

4. Potassium (K)

Potassium is the major intracellular electrolyte, existing as a fully water-soluble cation. More than 90% of dietary potassium is absorbed from the digestive tract. In an average 70 kg adult male, the body contains approximately 120g potassium, depending on muscle mass, with men typically having proportionately more potassium than women due to greater muscle mass.

Functions of Potassium	Deficiency symptoms
• Potassium is an active determinants of osmotic pressure and electrolyte balance • Potassium is critical for nerve transmission and muscle function • The physiological importance of potassium in the body covers many systems including cardiovascular, respiratory, digestive, renal and endocrine • It is also essential for energy metabolism, glycogenesis, cellular growth and division.	• Hypokalemia: Cushing's disease (excess steroids), diuretics, chronic renal disease, diarrhoea, vomiting and laxative abuse can result in low levels of potassium called hypokalemia.

Dietary sources of potassium (K)

Potassium is present in fruits, vegetables and meat.



Do you know?

Electrolyte Balance: Electrolytes are compounds that readily dissociate in solution and exist as ions, i.e., positively and negatively charged particles. They are well distributed in body fluids to maintain osmotic equilibrium and water balance. Electrolyte and water balance are regulated together, with the kidneys playing a predominant role. This regulation is largely achieved through hormones such as aldosterone, antidiuretic hormone (ADH), and the renin-angiotensin system.

5. Iron (Fe)

The iron content of a typical 70 kg adult male is approximately 4 to 5 g. About two-thirds of this iron is functional, including hemoglobin (60%), myoglobin (5%), and various heme and non-heme enzymes (5%). The remaining iron is stored in the body as ferritin (20%) and hemosiderin (10%), which are the two major iron storage proteins.

Functions of Iron	Deficiency symptoms
- Iron is needed for haemoglobin synthesis - Hemoglobin and myoglobin are required for the transport of oxygen and carbon dioxide - Iron is associated with effective immune competence of the body - Iron is also a component of various tissue.	Iron deficiency anaemia: The functional effects of iron deficiency anaemia result from both a reduction in circulating hemoglobin and a reduction in iron containing enzymes and myoglobin. These include: - Fatigue, restlessness and impaired work performance - Disturbance in thermoregulation; impairment in certain key steps in immune response - Adverse effect on psychomotor and mental development particularly in children and - Increased maternal and perinatal mortality and morbidity.



Dietary Sources

Iron is found in foods in one of the two forms i.e. haem or non- haem. In the human diet, the primary sources of haem iron are the hemoglobin and myoglobin from consumption of meat, poultry and fish whereas non-haem iron is obtained from cereals, pulses, legumes, fruits and vegetables.

6. Iodine (I)

Iodine, usually present as iodide or iodate compounds in food and water, is rapidly absorbed in the intestine and circulates in the blood to all tissues. The thyroid gland traps most of the ingested iodine (about 80%), while other tissues such as the salivary glands, gastric mucosa, choroid plexus, and lactating mammary glands also concentrate iodine using a similar active transport mechanism.

Functions of Iodine	Deficiency symptoms
- Promotes the normal functioning of the thyroid gland - Helps in the proper functioning of brain - Promotes normal growth and development of cells.	Iodine Deficiency Disorders: Deficiency of iodine causes a wide spectrum of disorders from mild goiter (a larger thyroid gland than normal) to the most severe forms of endemic congenital hypothyroidism (cretinism) severe, irreversible mental and growth retardation. Hypothyroidism: Which is accompanied by low BMR, apathy, slow reflex relaxation time with slow movements and cold intolerance.



Dietary sources of iodine (I)

Seafood, seaweed and ionized salt.

7. Zinc (Zn)

Zinc was formally recognized as an essential nutrient in 1974 when dietary allowances for nutrients were established. Zinc is ubiquitous in the body and is the most abundant intracellular trace element. An adult human contains approximately 2 g of zinc, with about 60% in skeletal muscle, 30% in bone, and 4–6% in the skin.

Functions of Zinc	Deficiency symptoms
• Zinc has three major functional roles in the human body: catalytic, structural, and regulatory • Supports the immune system • Acts as an important structural component of DNA-binding proteins.	• Zinc deficiency can cause loss of appetite, decreased function of the immune system and slowed growth. Severe deficiency can also cause diarrhoea, loss of hair, impotence and slow down healing of wounds.

Dietary sources of zinc (Zn)

Foods high in protein are good sources of zinc. Lean red meat, whole grain cereals, pulses and legumes provide the highest concentration of zinc.



Malnutrition - undernutrition and overnutrition

- Undernutrition is the lack of one or more nutrients
- Overnutrition refers to the excessive intake of one or more nutrients
- Both undernutrition and overnutrition are undesirable forms of nutrition, collectively known as malnutrition, which literally means “bad nutrition.”

Causes of malnutrition

- Insufficient supply of essential nutrients
- Errors in metabolism
- Interactions between nutrients or between nutrients and medications



Let us do

Evolve recipes containing the following nutrients (one each) :

1. Carbohydrate
2. Protein
3. Vitamin A
4. Vitamin C
5. Calcium
6. Iron

(Nutritive value of Indian foods - Source: Internet Archive <https://share.google/ygUKLR0Lt1uyqPu46>)



Check your progress

1. If glucose :
..... : Fruit sugar
2. Evaluate the significance of dietary fibre.
3. Analyse the following, group them and name the group
Galactose, starch, maltose, lactose, cellulose, fructose, glycogen, sucrose, glucose
4. Choose the correct statements.
 - 1) Carbohydrates provide 4 kcal/g of energy.
 - 2) Carbohydrates are essential constituents of cell membranes.
 - 3) Carbohydrate promotes the growth of healthy intestinal bacteria.
 - 4) Carbohydrate participate in blood coagulation.
 - 5) Carbohydrates help to maintain water and pH balance in the body.

a. 1 & 2 b. 2 & 3 c. 1 & 3 d. 4 & 5 e. 3 & 5
5. From a nutritional point of view, proteins are classified into various categories. Justify your answer with examples.

6. Enumerate the deficiency diseases caused by lipids.
7. Ram who had diarrhoea and vomiting was given treatment for dehydration. Name another abnormality associated with water balance. Explain.
8. Fill the blanks.
 - a. Vitamin B 12 is also known as _____
 - b. Deficiency of folic acid causes _____
 - c. Deficiency of vitamin D causes _____
 - d. Glossitis is caused due to the deficiency of _____
9. Write the functions, deficiency symptoms and dietary sources (one each) of the following nutrients and present it in a table
 - a. Vitamin A b. Thiamine c. Vitamin C
10. Name the deficiency known as '3Ds'. Explain.
11. Differentiate between micro and macro minerals with examples.
12. Match the following.

A	B	C
Calcium	Essential for haemoglobin	Tetany
Iodine	To maintain osmotic pressure	Anaemia
Potassium	Essential for blood coagulation	Cretinism
Iron	Promotes the normal functioning of the thyroid gland	Hypokalemia



BALANCED DIET FOR HEALTHY LIVING



Look carefully at the picture of food items in the plates above. Which of the plates would you choose for lunch? Write your reason.

In the previous chapter you have learned about the functions of food in promoting and maintaining overall health and well-being. Adopting a healthy lifestyle has become increasingly crucial in today's fast-paced society, where convenience often takes priority. We often hear about the need to follow a well-balanced diet to live longer, stay energetic, and enjoy better health. A balanced diet plays a vital role in ensuring that the body receives all the essential nutrients required for optimal functioning. Many people think their eating habits are sufficient; the lack of a proper nutritional framework often results in imbalance. Let us now explore what truly constitutes a balanced diet and how to plan one that supports and enhances health.

8.1 Balanced Diet

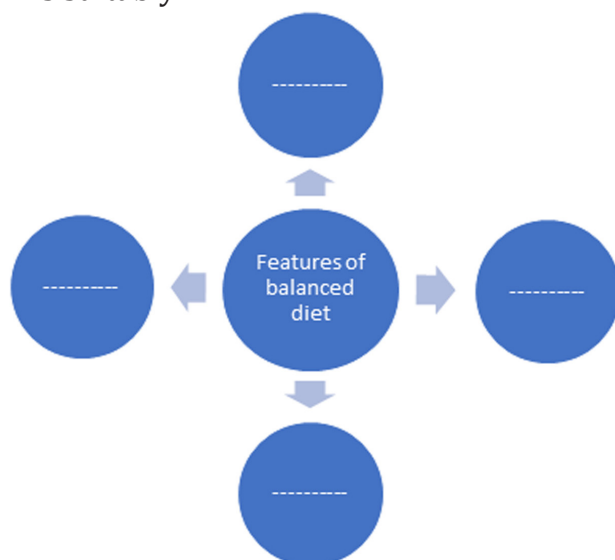
What is a balanced diet and why do we need a balanced diet? Let us discuss in detail.

A balanced diet consists of a variety of foods consumed in adequate quantities and proper proportions to meet the daily requirements of all essential nutrients—carbohydrates, proteins, fats, Vitamins,

minerals, water, and fibre. This type of diet supports and maintains good health while also providing a reserve of nutrients that helps the body to cope with brief periods of deficiency. Adopting a balanced diet enhances not only physical well-being but also emotional and mental health. The features of a balanced diet are-

- Meets nutritional requirements
- Develops maximum cognitive ability
- Prevents degenerative diseases
- Improves longevity
- Improves immunity
- Helps in coping up stress.

Fill in the blanks suitably.



Indian Council of Medical Research (ICMR) dietary guidelines for Indians

ICMR (Indian Council of Medical Research) suggest 17 guidelines to ensure a balanced diet. These guidelines give emphasis on health promotion and disease prevention across all age groups, with special attention to the nutritionally vulnerable segments like infants, children, adolescents, pregnant and lactating women and the elderly so as to ensure a balanced diet for Indians. The guidelines are as follows:

- 1. Eat a variety of foods to ensure a balanced diet:** A nutritionally adequate or balanced diet should be achieved by making wise food choices from a diverse range of food groups.

2. **Ensure provision of extra food and healthcare during pregnancy and lactation:** Pregnant women who consume a balanced diet and achieve appropriate weight gain (about 10–12 kg) during pregnancy are more likely to deliver healthy babies. While most nutrient needs can be met through a well-balanced diet, lactating women are advised to take daily supplements of iron and folic acid to meet their increased nutritional requirements.
3. **Ensure exclusive breastfeeding for the first six months and continue breastfeeding till two years and beyond:** Exclusive breastfeeding during the first six months provides complete nutritional support for the infant's growth and development while also promoting the mother's health. Breastfeeding can be continued for two years.
4. **Feeding home made:** Start feeding homemade semi-solid complementary foods to the infant soon after six months of age: When an infant reaches six months of age, breast milk alone is no longer sufficient to support optimal growth and development. Therefore, complementary feeding with semisolid foods should be introduced alongside continued breastfeeding from 6 to 12 months of age.
5. **Ensure adequate and appropriate diets for children and adolescents both in health and sickness:** A balanced diet is essential for children above two years and adolescents to ensure optimal growth and strong immunity. Their daily meals should include adequate amounts of carbohydrates, pulses, nuts, oilseeds, vegetables, seasonal fruits, eggs, and flesh foods. Sufficient quantities of milk, curd, or yogurt should also be incorporated into their diet. Regular physical activity and healthy lifestyle habits should be cultivated during these formative years. Both overeating and extreme dieting must be avoided, and the intake of foods high in fat, salt, sugar, and ultra-processed ingredients should be limited. Malnutrition contributes to increased morbidity (infections) and mortality. A child needs to eat adequately during and soon after episodes of infections to maintain good nutritional status.

- 6. Eat plenty of vegetables and legumes:** Vegetables, especially green leafy ones, are rich sources of Vitamins and minerals and help protect against micronutrient deficiencies and various diseases. Include a variety of vegetables and fruits in every meal, prepared in different ways—such as raw in salads, cooked as vegetable curries, dried, in soups, as raita with curd, or added to pulse and cereal dishes.
- 7. Use oils/fats in moderation:** Include a variety of oils, oilseeds, and nuts in the diet to meet daily requirements for fats and essential fatty acids (EFA). Since refined or extracted oils are highly processed, they should be used in moderation. To enhance nutrition and flavour, oil seeds and nuts – paste which are wholesome and nutritious can be used in place of extracted refined oils/fats. Avoid using partially hydrogenated fats (vanaspati) for cooking, as they are major sources of trans and saturated fats. Additionally, repeated reheating of cooking oils should be avoided because it produces harmful oxidative compounds.
- 8. Obtain good quality proteins and Essential Amino Acids (EAA) through appropriate combination of foods and avoid protein supplements to build muscle mass:** Maintaining adequate muscle mass is vital for overall health. Consuming high-quality protein that provides all essential amino acids (EAAs), along with engaging in regular resistance exercises, is key to building and preserving muscle mass. Vegetarians can meet their protein requirements by including sufficient quantities of pulses, legumes and milk or milk products, while non-vegetarians can do so by consuming the recommended amounts of fish, poultry, meat, or eggs.
- 9. Be physically active and exercise regularly to maintain good health:** Regular physical activity, yoga and exercise keep one physically and mentally fit and promote good health. These help in maintaining desirable body weight, muscle strength, bone health, flexibility of joints and appropriate body mass composition.
- 10. Restrict salt intake:** Excessive salt consumption is linked to high blood pressure and an increased risk of cardiovascular and vascular diseases. It is advisable to use iodized salt

and limit added salt (sodium chloride) intake to no more than 3–5 g per day. Processed and preserved foods such as snacks, sauces, ketchup, biscuits, chips, cheese, and salted fish should be avoided, as they often contain high levels of sodium. Including plenty of fruits and vegetables in the diet is beneficial, as they are rich in potassium, which promotes sodium excretion and helps regulate blood pressure.

- 11. Consume safe and clean foods:** Consumption of safe and hygienic foods is essential for maintaining good health. Contaminated and adulterated foods cause several food-borne illnesses, chronic diseases and may also contribute to malnutrition.
- 12. Adopt appropriate pre-cooking and cooking methods:** Excessive washing of grains and legumes before cooking can lead to the loss of water-soluble Vitamins. To preserve nutrients in fruits and vegetables, avoid rinsing them after peeling or slicing. Soaking cut vegetables in water or cooking them in excess water and discarding it afterwards results in significant nutrient loss. Always cover food with lids while cooking in water and prefer pressure or steam cooking over deep-frying or roasting. Consuming sprouted or fermented foods is beneficial. Avoid using baking soda when cooking pulses and vegetables, as it increases sodium content like salt. To protect nutritional value, discard leftover cooking oil instead of reheating or reusing it.
- 13. Drink an adequate amount of water:** Water makes up a major portion of the human body, and a healthy adult requires approximately eight glasses (around two litres) of water daily. During hot weather, it is advisable to include hydrating and nutritious beverages such as buttermilk, tender coconut water, or lemon water.
- 14. Minimize the consumption of high fat, sugar, salt (HFSS) and ultra-processed foods (UPFs):** Ultra-processed foods (UPFs) are often high in fat, sugar and salt (HFSS). Regular consumption of UPFs or HFSS are known to increase the risk of non-communicable diseases like diabetes, hypertension, cardiovascular diseases, etc.

- 15. Include nutrient-rich foods in the diets of the elderly for health and wellness:** Healthy food habits and regular physical activity are required to maintain good health and improve the quality of life. For healthy ageing the elderly need nutrient dense foods that are rich in Vitamins and minerals with adequate amounts of good quality proteins, complex carbohydrates and dietary fibre.
- 16. Read food labels to make informed choices:** With most foods now available in pre-packaged forms, it is essential for consumers to understand what is inside the package. Food labels provide details about ingredients, nutrient content, and shelf life. Reading these labels helps assess the nutritional quality and safety of foods, enabling informed and healthier choices.
- 17. Adopt a healthy lifestyle to prevent abdominal obesity, overweight, and overall obesity:** Preventing overweight and obesity is crucial. Weight gain commonly occurs around the age of 20 and in women after childbirth due to reduced physical activity and excess calorie intake. Obesity is also rising rapidly among children and adolescents, so vigilance is important during these periods. It is very important to follow a healthy diet and maintain appropriate BMI (Body Mass Index) for a healthy living. Minimize non-essential screen time and ensure healthy sleep patterns of 6–8 hours per day to prevent unhealthy eating behaviors and weight gain.

Following these guidelines promotes mindful eating habits that support overall health and encourage sustainable, safe food practices. A balanced diet meets all nutritional needs of the body, as no single food can provide all essential nutrients. These must be obtained through a judicious selection of diverse foods.

8.2 Basic Five Food Groups

The commonly used food group system recommended by the ICMR includes five basic food groups. As previously defined, a balanced diet can be achieved by appropriately combining foods from the five basic food groups, considering both their nutrient content and the biological category to which each food belongs.

Objectives of the Five Food Group System

- Planning wholesome balanced menus to achieve nutritional adequacy.
- Assessing nutritional status- a brief diet history of an individual can disclose inadequacies of food and nutrients from any of the five groups.

The five food groups are as follows.

Food Group	Foods	Major Nutrients Present
I. Cereals, Grains and their products	Rice, Wheat, Ragi, Bajra Maize, Jowar Barley, Rice Flakes, Wheat Flour etc.	Carbohydrates, Proteins, Vitamin B, Iron, Fibre Invisible Fat, Vitamin – B1, Vitamin – B2, Folic Acid.
II. Pulses and Legumes (whole as well as Dals),	Bengal gram, Black gram, Green gram, Red gram, Lentil, Cowpea, Peas, Rajmah, Soyabean, Soya Nuggets, etc.	Carbohydrates, Protein, Vitamin B2, Vitamin B12, Folic Acid, Calcium, Iron, Fibre
III. Milk, Egg and Meat Products	Curd, Paneer, Cheese, Products like Lassi, Buttermilk, Skimmed Milk. Liver, Fish, Egg – Meat, Chicken,	Proteins, Fat, Vitamin B, Calcium, Phosphorous.
VI. Fruits and vegetables	Fruits Viz. Mango, Guava, Orange Papaya, Banana, Sweet Lime, Apple and Vegetables Pumpkin, Tomato, Amla, Pomegranate Etc. Green Leafy Vegetables Like Amaranth, Spinach, Coriander Leaves Mustard Leaves And Fenugreek Leaves Etc. Other Vegetables: Brinjal, Lady Finger, Capsicum, Beans, Onion, Drum Stick, Cauliflower Potato Etc.	Vitamin A, Iron Calcium, Folic Acid Calcium, Iron, Fibre, Carbohydrates
V. Fats and Sugars	Fats: Butter, Ghee, Hydrogenated Oil, Ground Nut, Mustard Oil, Coconut Oil Etc.	Carbohydrates, Fat Soluble Vitamins



Let us do

Analyse the food items you eat. In what way will you achieve a balanced diet by combining foods from the Basic Five Food groups?

My plate for the day

The concept of the food plate evolved from the Basic Five Food Groups, which served as foundational guidance for balanced nutrition. The present plate ICMR 2024 recommended sourcing of macronutrients and micronutrients from a minimum of 10 food groups with vegetables, fruits, green leafy vegetables, roots and tubers form essentially half of the plate of the recommended foods for a day. At least half of the recommended cereals should be whole grains such as millets which are rich sources of micro nutrients. Millets can be consumed to the extent of 20 to 30% of the total recommended cereal in raw weight.



‘My Plate for the Day’ was developed by the ICMR’s National Institute of Nutrition specifically for Indians. It offers simple guidance for achieving a balanced diet by sourcing energy and nutrients from different food groups. The guide provides information on the variety and appropriate proportions of foods needed to meet daily nutritional requirements, typically based on a 2000 kcal Indian diet. ‘My plate for the day’ suggests different food groups in right proportions to meet the required amounts of essential amino acids, fatty acids, minerals, Vitamins and other bioactive compounds. Consumption of 350g of vegetables that includes 150g Green Leafy Vegetables (GLV) and 200g other vegetables with 150g of locally available seasonal fruits not only

provides dietary fibre (prebiotic), micro-nutrients which include Vitamins and minerals, bioactive compounds and anti-oxidants, but also ensures optimal functioning of various metabolic processes in the body and improves the immune function and resistance to fight infections. Whole grains, nuts, vegetables and fruits are good sources of prebiotics that would help maintain good/beneficial gut flora with anti-inflammatory properties that would also confer many health benefits including optimal immune function.



Let us do

Prepare your own food plate considering your interest and nutrient value and present it in the class. Also create your own food plate digitally and display it in the class.



Check your progress

1. List the guidelines by ICMR.
2. Suggest the features of a balanced diet.
3. Fill in the blanks.

Sl.No	Food groups	Nutrients supplied
1	Cereals and Grains	
2	Pulses and Legumes	
3	Milk and Milk Products	
4	Fruits and Vegetables	
5	Fats and Oils	

4. Food Plate which served as foundational guidance for balanced nutrition. Justify.

8.3 Cooking

What comes to your mind when you hear the word “cooking”?

Cooking is both an art and a science. Food should be visually appealing and flavourful to encourage consumption. While some foods—such as fruits, vegetables, and nuts—can be eaten raw, most require cooking to achieve desirable qualities. Using appropriate cooking techniques enhances palatability by improving a food’s appearance, taste, flavour, and texture, thereby increasing its

acceptability. Food preparation plays a crucial role in meeting the nutritional needs of a family. The process of applying heat to food is known as cooking.

Importance of cooking food:

Why do you think people need to cook food instead of eating everything raw?

1. **Enhances digestibility:** Cooking softens food, making it easier to chew and swallow. This allows digestive juices to mix effectively and carry out digestion efficiently.
2. **Improves sensory qualities:** Cooking enhances the appearance, texture, color, flavour, and taste of food.
3. **Adds variety:** Different cooking methods introduce variety into meals.
4. **Extends shelf life:** Cooking helps preserve food for longer periods.
5. **Ensures safety:** Proper cooking makes food safe for consumption.

Different cooking methods are suited to different kinds of foods. Understanding basic cooking methods makes it easier to prepare tasty and healthy dishes. Cooking methods are generally classified into moist heat, dry heat, or combination methods. They are summarized below:



Category	Method	Medium of cooking	Temperature	Advantages	Disadvantages
Moist heat	Boiling	Water	100°C	Simple, economical, cooks large quantity, palatable, digestible	Loss of Vitamin C & B-complex vitamins, color and flavor, bland taste
	Steaming	Steam	100°C	Retains nutrients, color, flavor, no fat used	Slow, requires equipment
	Stewing	Water/stock + oil	Slow simmer in liquid	Nutritious, flavorful, economical	Long cooking time, may lose color/texture
	Pressure Cooking	Steam under pressure	120°C	Saves time & fuel, better nutrient retention	Risk of overcooking, texture changes, pressure cooker needed
	Poaching	Water / milk/ stock	80–90°C	Gentle for eggs, fish, fruits, digestible	Less flavor, slow, over cooking may happen
	Simmering	Water / stock	85–95°C	Better nutrient retention, flavors blend well	Time-consuming, risk of mushiness
Dry heat	Roasting	Dry heat (oven air, sometimes fat)	180–220°C	Golden crust enhances flavor, texture and appearance	High fat use, nutrient loss, denatures protein

	Grilling/ Broiling	Direct radiant heat (charcoal/gas/ electric)	200–260°C	Quick method, tasty, less fat used	Risk of burning, uneven cooking, constant attention required
	Baking	Dry heat (oven air)	160–220°C	Flavorful, good texture, variety of foods can be made, uniformity in color	Can dry out food, needs controlled temperature
	Shallow Frying	Small amount of oil	160–190°C	Quick method, good flavor and texture	Adds fat, loss of fat soluble vitamins, difficult to digest and high calorie
	Deep Frying	Large amount of oil	170–190°C	Crisp texture, tasty, fast cooking	Very high fat, unhealthy if oil is reused
	Sauteing / Stir-Frying	Little oil/fat	160–200°C	Retains color and nutrients, quick	Needs attention, risk of burning
Combination	Braising	Little fat + liquid	Start with high heat, finish with simmering	Tenderizes tough meats, flavorful	Time-consuming
Other methods	Microwave cooking	Microwaves	Varies	Quick, minimal nutrient loss, less fat	Uneven heating, texture changes



Let us do

Find out an appropriate dish for each method of cooking adopted in your home.

8.4 Enrichment of Nutrients

What do you understand by the word “enrichment” in food?

The process of improving the nutrients in foods by special methods is called enrichment or enhancement of nutrients. Enhancing the nutritive value of food involves improving the nutrient content or bioavailability of nutrients in food through various techniques. This is important for promoting health, preventing nutrient deficiencies, and maximizing the nutritional benefits of meals.

Importance of enhancing nutritive value of food

- To meet the nutritional requirements of the body
- To make proper selection and preparation of foods
- To consume food in a balanced manner
- To improve the flavour and texture of the food
- To get variety in food
- To assist in planning the daily menu, keeping in view the nutrient content of the food

Do you know that there are traditional methods to enhance nutrients?

There are several traditional methods which can increase the availability of Vitamins, minerals, proteins, and other nutrients in food. They are discussed below:

A. Sprouting/Germination

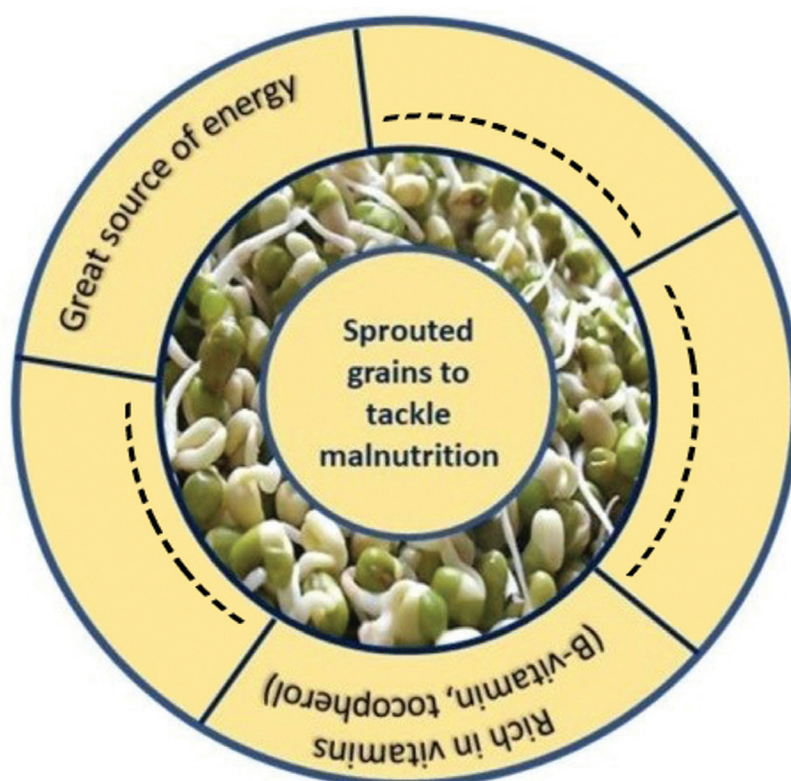
Sprouting, one of the oldest and most effective traditional food processing techniques, enhances nutrient availability in grains and pulses. In this method, raw grains or pulses are soaked in an equal

amount of water for 10–12 hours until most of the water is absorbed and the seeds swell to their maximum size. The soaked grains are then wrapped or covered in a wet muslin cloth and kept in a warm place, until sprouts appear. Sprouted grains can be consumed raw with salt and lemon juice or combined with vegetables such as onion, tomato, cucumber, cabbage, and carrot, either raw or cooked. Sprouting transforms the grains into a more easily digestible, pre-digested form.

Advantages of sprouting

- Sprouting increases the Vitamin C content of pulses and cereals by over 3 to 7 times while niacin levels can rise by 60–100%.
- Iron is released from its bound form, making it more easily absorbed by the body.
- Proteins are broken down into simpler amino acids, and fats are acted upon by enzymes like lipase.
- Sprouting is a cost-effective, traditional method to enhance the protein, Vitamin, mineral, and enzyme content of the diet.

Fill in the blanks suitably.

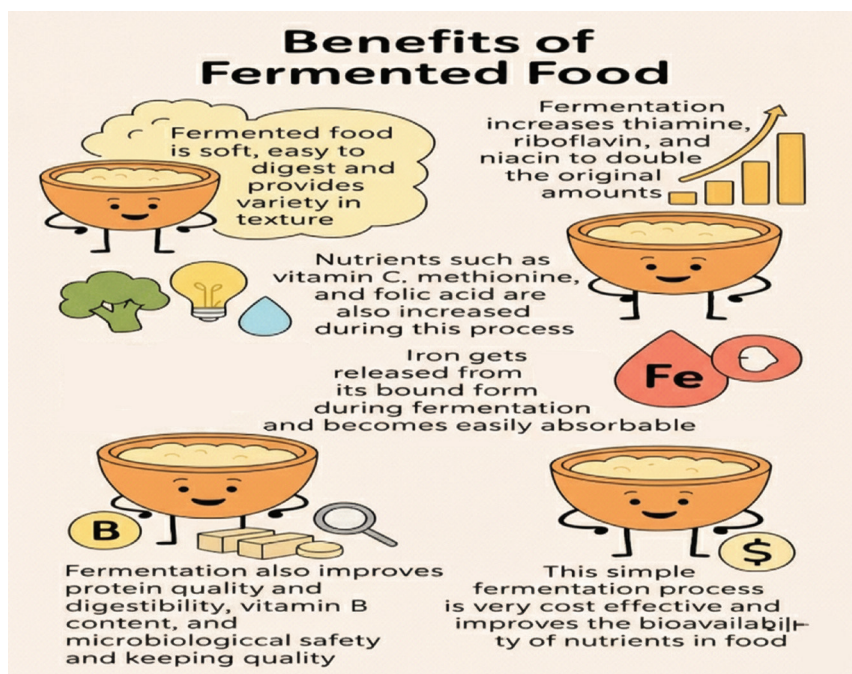


B. Fermentation

Fermentation is a widely practiced and popular food processing technique that enhances the nutritional value of foods. This process involves the naturally occurring micro-organisms in foods, which bring about specific physical and chemical changes. Can you tell an example of fermented food used in our daily life? A common example is making curd from milk, where the presence of *Lactobacillus* bacteria converts lactose into lactic acid, giving the curd its characteristic sour taste. Fermentation has long been recognized for improving the digestibility and nutritive value of grains.

Advantages of fermentation

- Fermented foods are soft, easy to digest, and add variety in texture
- The content of thiamine, riboflavin, and niacin can double during fermentation
- Levels of Vitamin C, methionine, and folic acid also increase.
- Iron is released from its bound form, making it more readily absorbed by the body
- Fermentation improves protein quality and digestibility, and increases microbiological safety and shelf life.
- This simple, cost-effective process boosts the bioavailability of nutrients in food

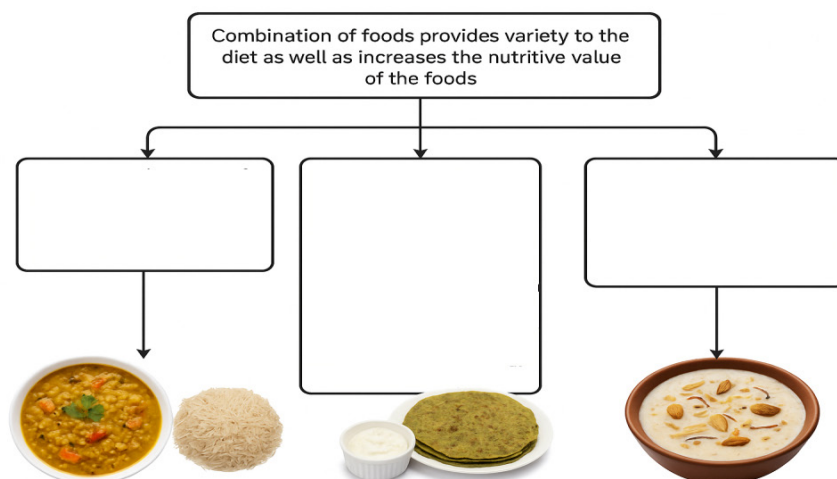


C. Combination

Combination involves pairing affordable and readily available foods from different food groups to enhance the overall nutrient quality of a meal. By combining foods from various groups, it becomes easier to obtain all essential nutrients. For example, cereals are deficient in certain amino acids that are abundant in dals, while dals lack some amino acids found in cereals. When eaten together, the protein quality approaches that of milk. Using a variety of foods in combination ensures better nutrient availability and overall diet quality.

Advantages of combination

- Combining foods adds variety to the diet while increasing its nutritional value.
- Pulses are a major protein source for vegetarians but lack the essential amino acid methionine, which is supplied by cereals. However, cereals are low in lysine, an amino acid found in pulses. Combining cereals and pulses improves the overall protein quality beyond what either can provide alone. Examples of foods that are made combining cereals and pulses include- idli, dosa, kichidi, puttu and kadala.
- Proper food combinations supply balanced amounts of protein, carbohydrates, and minerals. Leafy vegetables, for example, provide Vitamin A, calcium, and iron, and traditional Indian recipes such as spinach paratha, fenugreek paratha, or spinach dal combine cereals, pulses, and leafy vegetables effectively. Dishes like payasams and kheers made with milk and wheat, milk and rice, or milk and wheat germ also provide



a rich supply of nutrients, particularly protein, calcium, and Vitamin E.

Read the above note on the advantages of combination and based on that complete the flow chart given above.

D. Fortification



Haven't you heard of fortified atta, Iron Shakti Atta, or iodised salt? Do you know what these terms mean? We use the term 'fortification' for this. Why is food fortified? While fortifying, the nutritional value of food increases. When rice is fortified the nutrients like iron, folic acid and Vitamin B12 are added to it. Thus the whole population become beneficial. That is why our government supplies fortified rice through ration shops.

Fortification is the addition of key Vitamins and minerals such as Iron, Iodine, Zinc, and Vitamins A & D to various food articles such as rice, wheat, oil, milk, salt, etc. to improve their nutritional content. These nutrients may or may not have been originally present in the food before processing or may have been lost during processing. Deficiency of micronutrients or micronutrient malnutrition, also known as hidden hunger, is a serious health risk. Access to safe and nutritious food is a must for all age groups, especially children and women, and food fortification is one such strategy to overcome this problem. In order to address this issue of malnutrition, FSSAI has formulated Food Safety and Standards (Fortification of Food) Regulation, 2018 which outlines the standards and quality parameters for fortified foods. The '+F' logo has been notified to identify fortified foods.

Fortification is a key strategy in global nutrition, aimed at enriching foods with Vitamins and minerals to prevent nutritional deficiencies, particularly in populations with limited access to a diverse diet. Fortified foods help restore nutrients lost during processing and provide intended nutritional benefits, positively impacting public health worldwide.

Advantages of fortification

- Fortification improves nutritional intake. Fortified foods provide essential nutrients that might be lacking in people's diets.

- It prevents micronutrient deficiencies. Fortification helps prevent and alleviate micronutrient deficiencies, which can lead to various health problems, especially in vulnerable populations like pregnant women, infants, and children. For example, iodized salt prevents iodine deficiency disorders, including goitre and intellectual disabilities.
- Fortified food enhances public health. By addressing specific nutrient deficiencies, food fortification contributes to improved overall health in communities.
- It is a cost-effective method of enhancing nutrient availability and a way to deliver essential nutrients to a large population.
- It reduces in reduction in birth defects. Adequate folic acid intake before and during pregnancy helps to reduce the incidence of neural tube defects (serious birth defects in newborns).
- Fortified foods supports cognitive development. Fortification with nutrients like iron and certain Vitamins supports proper cognitive development in children.

8.5 Conservation of Nutrients

Fresh fruits and vegetables provide essential Vitamins, minerals, and other nutrients, but these begin to decline once harvested and continue to decrease until consumption. Eating them soon after harvest helps limit nutrient loss. Water-soluble Vitamins—such as thiamin, folic acid, and Vitamin C—are particularly sensitive and can be destroyed by poor storage or overcooking. Factors like heat, light, air exposure, excess water during cooking, and alkaline conditions contribute to this loss. The practice of minimizing nutrient loss during cooking is called nutrient conservation.

There are certain practices which we use daily to minimize nutrient loss during preparation to ensure the health benefits of food. They are as follows:

- Choose fresh produce that is not over-ripe, bruised, or damaged.
- Wash vegetables before cutting; minimize soaking and washing time to reduce nutrient loss.
- Cut vegetables into larger pieces to limit Vitamin exposure to water during cooking and washing.
- Use a vegetable peeler to remove only a thin layer of skin.

- Use minimal water for cooking; bring water to a boil before adding vegetables.
- Prefer steaming or pressure cooking to conserve nutrients.
- Cover the cooking vessel with a lid to speed up cooking and reduce nutrient loss.
- Prepare vegetable salads just before serving to preserve nutrients.
- Add acids like lime juice or vinegar to salads, as Vitamin C is more stable in acidic conditions.
- Store foods in a cool, dark place to prevent degradation.
- When boiling, add raw foods to already boiling water rather than cold water.
- Steaming uses minimal water while retaining nutrients.
- Use the remaining cooking water for gravies, sauces, or soups, as it contains water-soluble Vitamins and minerals.
- Cook foods only for the time necessary to make them palatable and safe.
- Avoid using baking soda to maintain green color, as it destroys Vitamin C.
- Do not use copper utensils, as copper can destroy Vitamin C.
- Soak whole pulses overnight and other dals for about an hour before cooking.
- Use leftover dal water to prepare rasam or sambar to retain nutrients.

These practices help maximize nutrient retention and ensure that the food retains its health benefits.



Check your progress

1. Discuss the advantages and disadvantages of each method of cooking and prepare a table based on it and display it in your class.
2. Differentiate different cooking methods.
3. Analyse the importance of cooking.
4. Categorise the advantages of different methods of enrichment of nutrients.

5. Enhancing nutritive value of food is very important in today's world. Justify.
6. List commonly used fortified foods.
7. How will you conserve nutrients?
8. Pick out the advantage of fermentation from the following.
 - a) A cost-effective way to deliver essential nutrients to a large population.
 - b) Supply balanced amounts of protein, carbohydrates, and minerals.
 - c) The content of thiamine, riboflavin, and niacin can double.
 - d) Proteins are broken down into simpler amino acids, and fats are acted upon by enzymes like lipase.

8.6 Junk Foods

In today's fast-paced world, convenience often takes precedence over health. It's easy to reach for a packet of chips or a sugary drink without much thought, but these choices can negatively affect our well-being. Let's take a closer look at how highly processed snacks and sweetened beverages impact overall health. Write some junk food items that you use daily.

Junk food refers to items that are low in essential nutrients, Vitamins, and minerals but high in energy, salt, sugar, or unhealthy fats. Common examples include:

- Cakes and biscuits
- Chips, burgers, and pizzas
- Chocolates and sweets
- Processed meats like bacon
- Sugary beverages including soft drinks, energy drinks, and sports drinks
- Aerated drinks



How does frequent use of these junk foods affect our health?

These foods, though convenient and tasty, can contribute to poor nutrition and long-term health issues, if consumed regularly. Let us discuss the impact of junk food in detail.

Impact of junk food

- 1. High blood pressure:** Junk foods are often high in sodium, and regular consumption can lead to elevated blood pressure. High blood pressure increases the risk of serious health problems such as heart attacks and strokes. For example, health experts recommend that teenagers should consume more than 2,400 mg of sodium per day, yet even a small serving of tomato-flavoured chips can contain over 1,600 mg of sodium, easily pushing intake to dangerous levels.
- 2. Dental issues:** Many junk foods contain sticky substances that adhere to teeth, increasing the risk of dental problems. Excessive intake of sodas and soft drinks, which are high in sugar, can lead to tooth decay and gum disease in teenagers.
- 3. Chronic illness:** Studies link junk food consumption to higher rates of diabetes, high blood pressure, and heart disease among children and teenagers. Regular intake of unhealthy foods significantly increases the risk of developing these chronic conditions.
- 4. Effects on central nervous system:** While junk food may temporarily satisfy hunger, long-term consumption has negative effects on mental health. Teenagers who eat junk food frequently are more likely to experience depression compared to those who maintain a healthier diet.
- 5. Reproductive health:** Junk foods may contain harmful chemicals such as phthalates, which can disrupt hormone balance in the body. Prolonged exposure to these substances may affect fertility and reproductive health, and could even contribute to birth defects.
- 6. Poor Concentration and Constant Fatigue:** Teenagers who consume junk food regularly often miss out on essential nutrients, leading to deficiencies in Vitamins and minerals. This can cause constant fatigue, drowsiness, and stress, which negatively affect concentration, academic performance, and overall growth.
- 7. Self-esteem and mental health issues:** Regular consumption of junk food can lead to unhealthy weight gain, which may affect a teenager's self-esteem and confidence. Poor self-esteem and body image issues can contribute to depression, adversely affecting social interactions, academic performance,

and overall development. In severe cases, these mental health challenges may even lead to suicidal thoughts.

Overall, frequent consumption of junk food can have far-reaching consequences on physical health, mental well-being, and long-term development in teenagers. Junk food is tasty, convenient, and visually appealing, which explains its global popularity. Its consumption has surged over the past two decades, particularly among young people, due to low cost, easy availability outside the home, intense advertising, time-saving convenience, food delivery apps and changing lifestyles. However, junk food offers very little nutritional value.

Adolescence is a critical period of growth, both physically and mentally. Excessive consumption of junk food during this phase can lead to obesity, anxiety, abnormal blood pressure, lack of physical activity, and poor concentration. Teenagers are particularly drawn to these foods due to hormonal changes, busy schedules, peer pressure, academic stress, and lifestyle influences.

Making healthy choices

What are the things to be referred for healthy choices of food? Let us discuss:

- 1. Read labels:** Check the nutritional information on packaged foods to understand their content of energy, protein, fat, carbohydrates, sugars, fiber, and sodium, standard mark, manufacturing and expiry date, preservatives used etc. This helps in making informed choices.
- 2. Health star rating:** Adopting the Health Star Rating system on packaged foods to compare similar items. Keep in mind that this system does not apply to fresh, unpackaged foods like fruits and vegetables.
- 3. Avoid misleading claims:** Terms such as “low fat” or “sugar-free” can be deceptive. Always verify the actual nutritional content and prioritize whole, nutrient-dense foods over junk food, which may carry hidden risks and empty calories.

It is essential to raise awareness about the harmful effects of junk food. Parents, teachers, and caregivers should encourage children to consume fresh, home-cooked meals and adopt a healthy lifestyle. Nutrition awareness programmes are especially important for young adolescents, particularly girls, to promote balanced diets and

overall well-being. By fostering knowledge about healthy eating, teenagers can make better food choices that support their growth, development, and long-term health.



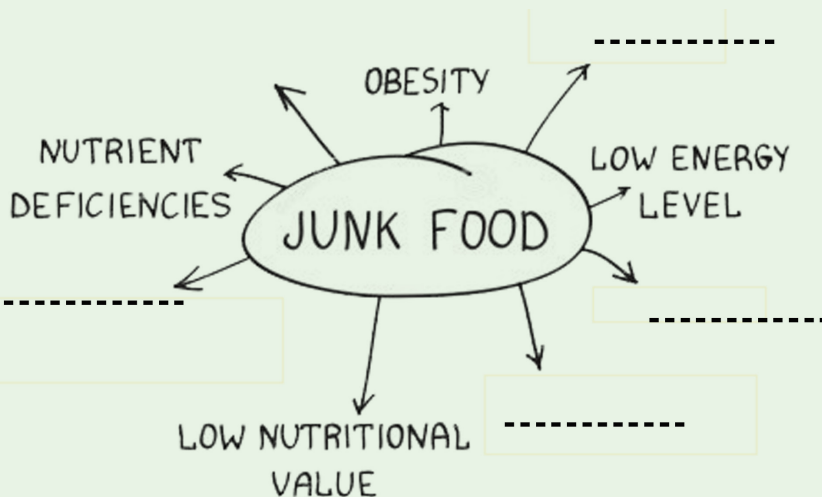
Lab activity

1. Plan and prepare a dish based on the concept of germination/fermentation/combination.



Check your progress

1. Critically evaluate the impact of junk foods.
2. Critically analyze the key factors that should be considered while making healthy food choices.
3. Elaborate the factors to be considered when making healthy food choices.
4. Complete the following.





PLANNING FAMILY DIET

Look at the following picture. What does it convey?



Your parents may have often reminded you that planning meals helps save time, energy and money. Beyond convenience, thoughtful meal planning also ensures that your family enjoys balanced, nutritious, and wholesome meals every day.

The concept of meal planning involves the systematic preparation of nutritious meals for all members of a family, considering their age, sex, level of physical activity, food preferences, and the availability of ingredients. It emphasizes the planning of balanced meals that are colourful, attractive, appetizing, and palatable, while also remaining within the family's economic means. Essentially,

meal planning ensures that each member of the household receives adequate nutrition based on the resources available.

Meal planning is both an art and a science; an art in the skilful blending of colour, texture and flavour and a science in the wise choice of food for optimum nutrition and digestion. A well planned meal is always appealing to the eye and it is rightly said that “we eat with our eye”. Therefore we should obtain adequate nutrition by including foods from all the food groups in sufficient quantity and proportion.

Since the health and well-being of a family depend largely on how effectively they are nourished within their available resources, meal planning becomes both a challenge and an opportunity for every meal manager. When done efficiently, it is a satisfying and rewarding experience that promotes good health and sound dietary habits. In essence, meal planning can be considered a practical daily food guide for every household.

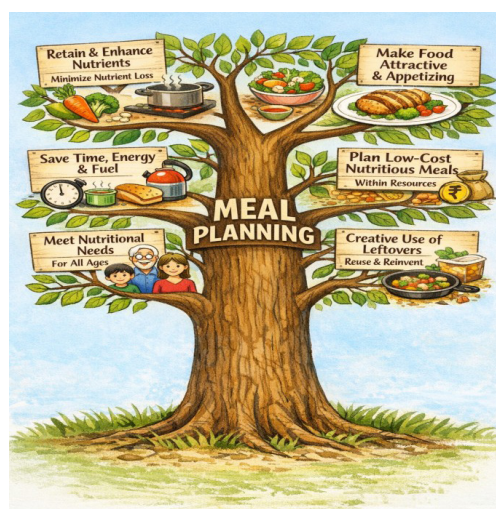
9.1 Benefits of Meal Planning

Meal planning offers numerous benefits that contribute to better nutrition, efficient use of resources, and an improved overall quality of life for the family.

- 1. Retain and enhance nutrients while minimising nutrient loss:** Strategic meal planning ensures that meals are freshly prepared and served at appropriate times, reducing the need for prolonged holding or repeated reheating. This practice not only guarantees timely service but also preserves the natural flavours, textures, and—most importantly—the nutritional integrity of foods.
- 2. Introduce variety and avoid monotony:** Thoughtful meal planning introduces variety by incorporating ingredients from different food groups and using a range of textures, colours, flavours, cooking methods, spices, and condiments. Such diversity keeps meals exciting and ensures that the diet remains balanced and nutritionally complete.
- 3. Make food attractive and appetising:** Planned meals can be made visually appealing through thoughtful presentation and the use of garnishes. Fresh herbs, citrus slices, or edible flowers enhance both appearance and flavour. Combining

foods of contrasting colours—such as vibrant vegetables with natural grains or proteins—creates an inviting visual contrast that stimulates the appetite and enhances the overall dining experience.

4. **Save time, energy, and fuel:** Planning meals in advance helps save time, energy, and fuel by allowing ingredients to be collected and prepared efficiently. For instance, potatoes needed for different dishes like dosa filling and samosas can be boiled and prepared simultaneously. This organised approach makes kitchen work smoother, reduces effort, and promotes sustainable cooking habits.
5. **Plan low-cost, nutritious meals within available resources:** Effective meal planning allows families to prepare wholesome meals that fit within their budget. By taking advantage of seasonal produce, households can access fresh, nutrient-rich, and affordable foods. It also encourages the use of economical substitutes that offer similar nutritional benefits—for example, replacing almonds with peanuts or using local greens such as spinach or amaranth instead of expensive imported vegetables. This strategy supports local agriculture, reduces food waste, and ensures nutrition without financial strain.
6. **Meet individual nutritional requirements:** Meal planning ensures that the unique nutritional needs of each family member are met. The same basic meal can be modified to suit the specific requirements of individuals, such as those with health conditions or dietary restrictions, without compromising taste or overall family harmony at mealtime.
7. **Reuse leftovers in creative and nutritious ways:** Thoughtful meal planning minimizes food waste by promoting efficient use of ingredients and precise portion control. When leftovers are available, they can be creatively repurposed into new dishes that are both appetizing and nutritious. For example, leftover rice from lunch can be transformed into a creamy rice



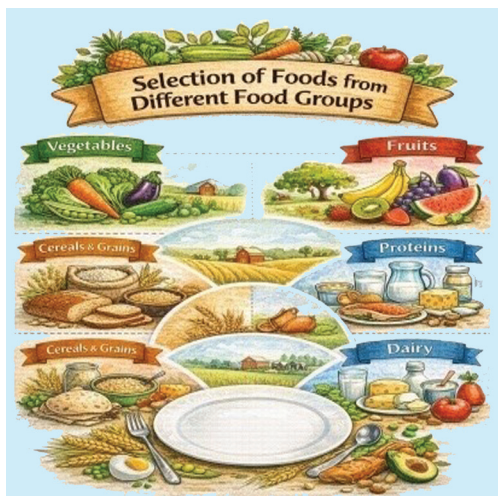
pudding by simmering it with milk, sugar, and cardamom. Such innovative reuse reduces wastage and adds variety to family meals.

9.2 Principles of Meal Planning

A well-planned meal should not only provide satiety and nutritional adequacy, but also give mental satisfaction through variety, taste, and visual appeal. To achieve this, the following principles should be kept in mind while planning meals for the family.

1. **Principles of nutrition:** This is one of the most important principles of meal planning. A family usually consists of members of different age groups—infants, adolescents, adults, and elderly people—each with unique nutritional needs. Therefore, the daily nutritional requirements of every family member must be considered while planning meals. Balanced meals should include food items from all major food groups to ensure that the body receives adequate amounts of macro and micro nutrients.
2. **Meals to suit the family:** Just as no two individuals are alike, no two families have identical food needs or preferences. Meals should be planned according to the specific requirements, habits, and health conditions of the family members. With small modifications, one meal can serve everyone—for example, dal water can be given as soup to an infant while the same dal can be served as a side dish for adults.

3. **Brings variety in meals:** Monotony in food can make even nutritious meals unappealing. Introducing variety brings joy to eating and allows creativity in the kitchen through the use of different foods, cooking methods, colours, and flavours.



- (i) **Selection of foods from different food groups:** Foods containing similar nutrients are grouped together as Food Groups. Choosing foods from only one group makes the diet unbalanced and dull. For

instance, having milk, cheese sandwiches, and milk pudding together may lack appeal. Including foods from various groups—such as a vegetable sandwich, fruit, and milk—adds variety, taste, and healthy nutritional balance.

(ii) Variety in colour combination: Colour adds visual appeal and stimulates appetite. A meal looks dull if all the foods are of the same colour, for example, a combination of dal, rice, and curd may appear bland. However, a meal including rice, green vegetables, a colourful salad with tomatoes, carrots, and radish, and garnishes like coriander or mint chutney is far more appealing and appetizing.

(iii) Variety in texture: Texture refers to the consistency or feel of food—whether it is soft, crisp, solid, or liquid. A meal should include a combination of different textures for better enjoyment, such as crispy foods (papad, chips), soft foods (custard, dal), and raw or crunchy items (salads, fruits).

(iv) Variety in taste and flavour: A meal becomes enjoyable when it offers a balance of flavours—sweet, salty, sour, and bitter. Overly spicy or bland meals can be unappetizing. Proper flavour combinations, such as bread with butter, pakoras with mint chutney, or idlis with coconut chutney, enhance the dining experience and increase satisfaction.

4. Meals should provide satiety value: Satiety refers to the feeling of fullness and satisfaction after eating. Meals should be designed to keep hunger away until the next mealtime. Foods rich in protein and fats provide higher satiety value than those high in carbohydrates. Therefore, including a moderate amount of protein and fat in each meal helps maintain fullness and energy levels.

5. Conservation of resources: Efficient meal planning helps conserve valuable household resources such as time, energy, and money. Preparing a shopping list prevents unnecessary market trips and wastage. The use of labour-saving devices

(like mixers or pressure cookers) and simple techniques such as soaking grains overnight can reduce preparation time and fuel consumption. These practices make cooking more convenient and economical.



Check your progress

1. Define meal planning.
2. What are the principles of meal planning?
3. Mention any six benefits of meal planning.
4. How can we bring variety in colour and texture in meal planning?

9.3 Recommended Dietary Allowances (RDA) and Meal Planning

A family usually includes members of different age groups, genders, levels of physical activity, and physiological conditions. Hence, ensuring each member receives a nutritious and balanced diet can be quite challenging, especially when individual needs and preferences vary significantly. So, what serves as a reliable guide to plan balanced meals that meet everyone's nutritional requirements? The answer is the Recommended Dietary Allowances (RDA) suggested by the Indian Council of Medical Research (ICMR).

This section focuses on understanding the concept of RDA and its importance in planning balanced diets.

Human beings require a wide range of nutrients to lead healthy and active lives. These nutrients can only be obtained through a well-balanced diet, where foods are wisely chosen to supply all the essential nutrients in the right proportions. The quantity of each nutrient required depends on factors such as age, sex, body weight, level of physical activity and physiological status.

The ICMR formulates and periodically revises the nutrient requirements and RDAs for different population groups. The latest revision was made in 2020. These recommendations serve as guidelines for the general population and as a reference for policymaking in public health nutrition. It is important to note that RDAs are intended for healthy individuals and do not cover abnormal conditions such as preterm birth, inherited metabolic disorders, infections, chronic diseases or cases requiring therapeutic diets. Summary of RDA for Indians-ICMR-NIN 2020 is given in Appendix. I



Do you know?

The summary of Recommended Dietary Allowances (RDA) comprises 15 nutrients namely protein, dietary fibre, calcium, magnesium, iron, zinc, iodine, thiamin, riboflavin, niacin, vitamin B 6, folate, vitamin B12, vitamin C, vitamin A and vitamin D.

Nutrient requirement vs recommended dietary allowance

The nutrient requirement refers to the minimum amount of a nutrient that must be consumed to perform specific bodily functions, prevent deficiency symptoms, and maintain adequate nutrient stores. It represents the physiological needs of healthy individuals.

The ICMR recommends nutrient requirements for various physiological groups—infants, preschoolers, children, adolescents, pregnant and lactating women and adult men and women—considering their activity levels. Individual variations may occur due to factors like temporary low intake, nutrient loss during cooking or poor nutrient bioavailability. To address this, ICMR applies general principles when determining nutrient requirements and dietary allowances.

While nutrient requirement indicates the individual physiological need, Recommended Dietary Allowance (RDA) refers to the amount of a nutrient that should be consumed daily to meet the needs of nearly all (97–98%) healthy individuals in a population group. RDA includes a margin of safety to account for individual variations, dietary habits, and nutrient bioavailability (i.e., the amount actually absorbed and utilised by the body).



Do you know?

ICMR 2024 Concepts: EAR and TUL

In addition to RDA, the 2024 ICMR guidelines introduced two additional concepts:

- Estimated Average Requirement (EAR): The average daily nutrient intake estimated to meet the needs of half (50%) of healthy individuals in a group.
- Tolerable Upper Limit (TUL): The maximum daily intake from all sources that is unlikely to cause adverse health effects.

If achieving the RDA for a nutrient is difficult, ensuring intake between Estimated Average Requirement (EAR) and RDA is acceptable. Tolerable Upper Limit (TUL) values help prevent potential toxicity from excessive nutrient consumption.

Reference man and reference woman

The reference man is aged between 19- 39 years and weighs 65 kg, with a height of 177 cm and BMI of 20.75: is free from disease and physically fit for active work. On each working day, he is engaged in eight hours of occupation which usually involves moderate activity. While when not at work he spends 8 hours in bed, 4- 6 hours in sitting and moving about, 2 hours in walking and in active recreation or household duties.

The reference woman is aged between 19- 39 years, non- pregnant, non- lact and weighs 55 kg with a height of 162 cm and BMI of 20.95: is free from disease and physically fit for active work. On each working day, she is engaged in eight hours of occupation which usually involves moderate activity. While when not at work she spends 8 hours in bed, 4- 6 hours in sitting and moving about, 2 hours in walking and in active recreation or household duties.

The National Institute of Nutrition (NIN 2024) has suggested food groups for a balanced diet to meet the daily nutrient requirements which is given in Appendix. II.

Thus a balanced diet can be planned for an individual by selecting foods according to Basic 5 food groups and following the allowances suggested by NIN, so that it will meet the RDA recommended by ICMR. While selecting foods, consider the nutritive value of foods.

Factors affecting RDA

1. **Age:** Infants require more protein per kilogram of body weight than adolescents because of their faster metabolism.
2. **Sex:** Adolescent girls need more iron than boys to compensate for menstrual losses.
3. **Body size:** A taller, heavier person requires more energy than a smaller individual due to a greater body surface area.
4. **Physiological state:** Pregnant and lactating women require additional nutrients to support foetal growth and milk production.

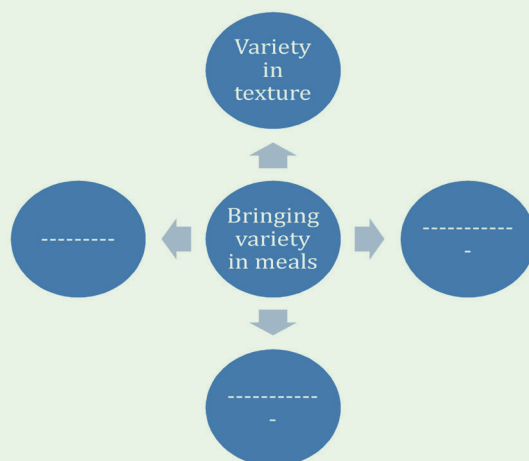
- 5. Type of work:** Energy needs increase with physical activity—sedentary workers need fewer calories than heavy labourers.

Although day-to-day variations in food intake occur due to changes in appetite, food availability, and lifestyle, average nutrient requirements should be met over time to maintain health and well-being.



Check your progress

1. Explain the term RDA.
2. Comment on the concept of reference man and reference woman.
3. Mention the factors affecting RDA.
4. Complete the following chart:



9.4 Nutrient Requirement for Different Stages

Nutrition is vital to human growth, development, and health throughout all stages of life. Our food needs change as we grow, and eating the right nutrients helps us reach our best physically, mentally, and emotionally. Similarly, when physiological conditions change, nutrient requirements also vary. Adolescence, pregnancy, and lactation are three major stages of life during which the body undergoes significant physical changes. Consequently, these stages demand higher nutrient intake compared to normal conditions. So in this session let us discuss in detail.

i. Nutrition during adolescence



You have already learnt about the physical changes that occur during adolescence. With the onset of adolescence, the growth accelerates rapidly. The growth patterns of males and females become distinctly different. Hormones regulate the intensity of the adolescent growth spurt, influencing almost every organ of the body, including the brain. After 2 to 3 years of rapid growth followed by a slower phase, individuals attain physical maturity. Generally, the adolescent growth

spurt begins around 10–11 years in females and 12–13 years in males, and lasts for about two and a half years. Before puberty, male and female body compositions differ only slightly. During

Particulars (Nutrients)	Amount of Nutrients			
	Boys (13-15y)	Girls (13-15y)	Boys (16-18y)	Girls (16-18y)
Body weight (kg)	50.5	49.6	64.4	55.7
Protein (g/d)	45.0	43.0	55.0	46.0
Dietary fibre (g/d)	43	36	50	38
Calcium (mg/d)	1000	1000	1050	1050
Magnesium (mg/d)	345	340	440	380
Iron (mg/d)	22	30	26	32
Zinc(mg/d)	14.3	12.8	17.6	14.2
Iodine (µg/d)	140	140	140	140
Thiamine (mg/d)	1.9	1.6	2.2	1.7
Riboflavin (mg/d)	2.7	2.2	3.1	2.3
Niacin (mg/d)	19	16	22	17
Vitamin B6 (mg/d)	2.6	2.2	3.0	2.3
Folate (µg/d)	285	245	340	270
Vitamin B12 (µg/d)	2.2	2.2	2.2	2.2
Vitamin C (mg/d)	70	65	85	70
Vitamin A (µg/d)	930	890	1000	860
Vitamin D (IU/d)	600	600	600	600

Table 9.1. Summary of RDA for Indians (13-18yrs) NIN-ICMR, 2020

adolescence, differences between males and females become evident in the skeletal system, lean body mass, and fat stores in females, body fat forms a larger percentage of total body weight due to the influence of the hormones oestrogen and progesterone. In males, lean body mass - mainly muscle and bone- increases significantly under the influence of the hormone testosterone. On an average, males grow about 8 inches and females about 6 inches in height during adolescence. Males gain approximately 20 kilograms and females about 16 kilograms in body weight.

We know that adolescence is a period when the body's demand for nutrients increases significantly to support rapid growth and development. Nutrient needs during adolescence are higher than at most other stages of life, except during pregnancy and lactation. According to the Indian Council of Medical Research (ICMR, 2020), the Recommended Dietary Allowances (RDA) for adolescents are categorized into two age groups – 13-15 years and 16-18 years. Since the growth patterns of boys and girls differ, separate nutrient recommendations have been provided for each group.



Let us do

- Analyze the table given above. Check it with your age and nutrient intake. Is your nutrient intake adequate?

Let us now examine the major nutrients recommended for adolescents according to ICMR, 2020.

A. Macronutrients :

- 1. Carbohydrate:** The energy requirements of adolescents vary widely depending on their rate of growth, gender, body composition, and level of physical activity. In general, boys have higher energy needs because they experience a faster rate of growth and develop a greater proportion of lean body mass compared to girls. Girls, on the other hand, begin their growth spurt earlier, reach their peak growth sooner, and generally attain shorter stature and lower body weight than boys. Consequently, their energy needs peak earlier and decline sooner. Considering these factors, the ICMR (2020) provides separate energy recommendations for adolescent boys and girls in the RDA table.

2. **Protein:** Protein is essential during adolescence to maintain body mass and to support the rapid pubertal growth spurt. A healthy diet should provide about 10-30% of total calories from protein, with an emphasis on high biological value protein sources. Ideally, about two-thirds of the protein intake should come from animal sources, and one-third from plant sources, which are rich in essential amino acids.

It is important to maintain an appropriate balance between protein and total energy intake. When energy intake is insufficient, the body may utilise protein as the energy source, thereby reducing its availability for tissue building and other vital functions. Since boys experience a greater increase in height and lean body mass during puberty, their protein requirements are higher than those of girls. Because of these differences in growth rate and body composition, the ICMR (2020) provides separate protein recommendations for adolescent boys and girls.

3. **Fat:** Fat is a concentrated source of energy, providing 9 kcal/g. It is also essential for the absorption of fat-soluble vitamins and for the production of cholesterol and sex hormones. The fat in the diet supplies the essential fatty acids (linoleic and linolenic acids). For adolescents, to provide 25% of total calories from fat, the recommended level of visible fat in the diet should be 35–50 g per day.
4. **Dietary fibre:** Considering the potential health benefits of dietary fibre, ICMR has recommended dietary fibre too, ranging from 30- 50 grams a day depending on sex and age during this period.
5. **Water:** Daily at least two liters of fluids should be consumed throughout the day, avoiding the consumption of sugary and carbonated drinks. This amount must be increased according to climatic conditions, type of diet and amounts lost in physical activities.

B Micronutrients

1. **Vitamins:** The requirement for most vitamins increases during the adolescent years. Key vitamins needed during puberty include vitamin D, K and B12.

Vitamin D is essential, in periods of accelerated growth for interacting with calcium and phosphorus promoting bone

mass. The increased rate of growth and sexual maturation increases the demand for folate and vitamin B12. Vitamin C aids in iron absorption. Thiamine (vitamin B1), riboflavin (vitamin B2) and niacin (vitamin B3) requirement also increases because of higher energy demands, as these vitamins are necessary for the release of energy from carbohydrates. Vitamin A, C and E are needed in increased amounts for cell growth and multiplication. Vitamin B6, B12 and folic acid are necessary for protein and nucleic acid synthesis. Vitamin A, C, D and E participate in cell development and bone mineralisation.

- 2. Minerals:** The need for iron increases during adolescence for both females and males, but for different reasons; for females as they start to menstruate and for males as their lean body mass develops. Moreover adolescents are particularly susceptible to iron deficiency anaemia because of their increased blood volume and muscle mass during growth and development. This raises the need of iron for building up hemoglobin.

Adolescence is a crucial time for bone development and the requirement for calcium reaches its peak during these years. The skeleton accounts for at least 99% of the body stores of calcium and gain in skeletal weight is almost rapid during the adolescent growth spurt. About 45% of the adult skeletal mass is formed during this period, although its growth continues well beyond the adolescent period and into the third decade. The largest gains are made in early adolescence, between 10-14 years in girls and 12- 16 years in boys. During peak adolescent growth, calcium retention is on an average, about 200 mg/ day in girls and 300 mg/ day in boys. The efficiency of calcium absorption is only around 30% so it is important that the diet supplies an adequate intake to help build the densest bones possible.

Zinc is another micronutrient with the highest concentration. Additional zinc is required during puberty for normal growth and sexual maturation.

Points to be considered while planning meals for adolescents

1. Have 5–6 meals per day and avoid skipping meals.
2. Ensure that the day begins with a good breakfast- make it substantial, based on cereals with pulses or eggs, and include fruits or vegetables.

3. Do not replace main meals with snacks. Snacks should only supplement, not substitute the main meals.
4. Consider individual preferences while preparing meals, not compromising the nutrient requirements.
5. Ensure that the adolescent does not miss the main meals (breakfast, lunch dinner). Meals should be well balanced, including macro and micronutrients. Food such as cereals, pulses, milk, dark green leafy vegetables, orange- yellow coloured vegetables and fruits, nuts, etc. must be emphasized. Encourage rainbow nutrition.

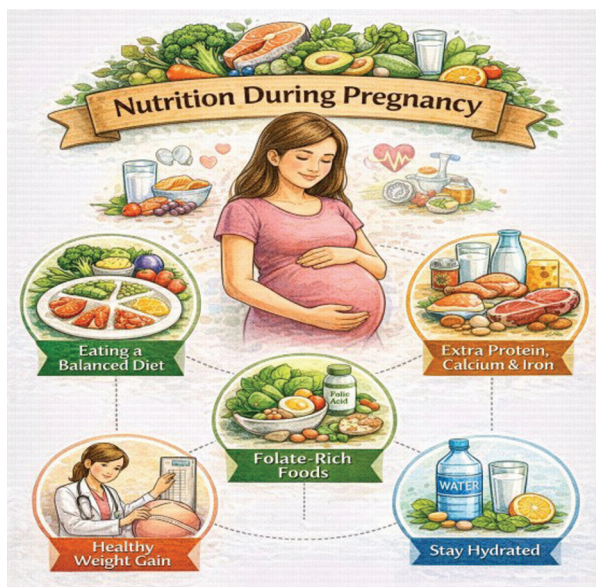
Rainbow nutrition: It is a dietary concept that emphasizes eating a variety of colourful fruits and vegetables to get a broad spectrum of nutrients, where each colour indicate different nutrients. They are

- i. Red: Lycopene, Anthocyanins, Vitamin C
 - ii. Orange/Yellow: Beta-carotene, Flavonoids, Vitamin A
 - iii. Green: Chlorophyll, Lutein, Folate, Iron, Calcium
 - iv. Blue/Purple: Anthocyanins, Resveratrol
 - v. White/Brown: Allicin, Potassium, Flavonoids
6. Encourage adolescents to eat lots of fresh fruits, vegetables and salads. These are rich sources of vitamins and minerals.
 7. Dinner is one meal when the family eats together. This meal can be made more elaborate and variety can be ensured.
 8. Packed lunches/ snacks should be nutritious and substantial. Keep adequate supply of healthy snacks at home.
 9. Ensure adequate food intake so as to meet the increased additional need for nutrients.
 10. Encourage them to cut down the fatty snacks, soft drinks and carbonated beverages.
 11. Include seasonal and locally available foods to ensue variety.
 12. Drink 1.5 - 2 liters of safe water, low fat milk, butter milk and fresh lime.
 13. Adolescents should engage in moderate -to- vigorous physical activities of 30 minutes to one hour duration daily.

14. Adolescents must get adequate sleep and reduce screen time for relaxation.

Factors influencing food choices and health habits

1. **Dieting and body image:** Body image concerns are common during adolescence. Poor body image can lead to weight control issues and dieting.
2. **Peer influence:** Peer influence and acceptance may become more important than family values. It creates periods of conflict between adolescents and parents. All of these changes have a direct effect on their nutrient needs and dietary behaviour.
3. **Media and advertisements:** Food and beverage companies promote their products to youth using various strategies namely 1. Contests, 2. Product placements (e.g. billboards near schools), 3. Sponsorships, 4. Celebrity endorsements and 5. Viral marketing (social media platforms). They also use multiple platforms. As the time that youth spend with media has increased, so has the ability for advertisers to influence their eating behaviours. The most viewed food advertisements are usually for products high in fat, sugar and/ or sodium, as well as for fast- food restaurants.
4. **Skipping meals and snacking:** Skipping meals is a common practice among adolescents. This is more common in girls than in boys. Girls generally miss meals, mostly breakfast, which is the most important meal of the day, in an effort to lose/ maintain weight. Adolescents who skip meals often snack in response to hunger. Snack foods consumed by them are often energy-dense and nutrient-poor, high in added fats, sugars, and sodium, and are commonly referred to as junk foods.
5. **Fast foods and convenience foods:** Convenience foods include foods and beverages from canteens, vendors, vending machines, fast- food restaurants and convenience stores/ supermarkets. As adolescents spend substantial amounts of time in and around schools, convenience foods available at school and in the surrounding neighborhoods are likely to influence their eating patterns. Convenience foods are mostly junk foods in nature, as they are high in fats, sugars, and sodium, but low in essential nutrients.



ii. Nutrition During Pregnancy

Pregnancy is an important time for both mother and baby. A proper diet becomes more important than ever during that time. A healthy diet during pregnancy plays a key role in ensuring a safe delivery and has lasting effects on the health of the newborn. A woman's body changes drastically during pregnancy. The uterus and its supporting muscles increase in size and strength; her blood volume increases by about 50 per cent to carry extra nutrients and oxygen; her joints become more flexible in preparation

for childbirth; her feet swell in response to high concentrations of the hormone oestrogen, which promotes water retention and prepares the uterus for delivery; and her breasts enlarge in preparation

for lactation. The hormones that mediate all these changes can influence her mood. She can handle these changes provided she consumes a nutritious diet, does regular physical activity and takes adequate rest.

According to ICMR, the optimum gestational weight gain during pregnancy is 12-14 kg. Various factors determine the gestational weight. The amount of weight gained during pregnancy greatly affects the health of the baby. In order to maintain healthy gestational weight and avoid pregnancy-related complications, adequate and balanced nutrition is essential.

From conception to birth, all parts of the infant- bones, muscles, organs, blood cells, skin and other tissues- are formed from nutrients that the mother's diet provides. To meet the peaking nutrient demands of pregnancy, a woman must make careful food choices. Her body adapts by maximizing absorption and minimising losses. See table 9.2.

Nutrients	Amount of Nutrients
Body wt(kg)	55+10
Protein (g/d)	46+9.5(2nd trimester); 46+22.0(3rd trimester)
Dietary fibre(g/d)	25(sedentary)
Calcium(mg/d)	1000
Magnesium(mg/d)	440
Iron (mg/d)	27
Zinc(mg/d)	14.5
Iodine(µg/d)	220
Thiamine(mg/d)	2.0
Riboflavin (mg/d)	2.7
Niacin (mg/d)	+2
Vitamin B6(mg/d)	2.3
Folate(µg/ d)	570
Vitamin B12(µg/ d)	+0.25
Vitamin C(mg/d)	65+15
Vitamin A(µg/d)	900
Vitamin D(IU/ d)	600

Table 9.2 Summary Of RDA for Indians (Pregnancy)
NIN-ICMR, 2020

A. Macronutrients

1. **Carbohydrate** : Energy requirement during pregnancy comprises the normal energy needs of an adult woman plus an additional requirement needed for gestational weight gain associated with protein and fat accumulation in maternal, foetal and placental tissues and increase in basal metabolic rate (BMR). Most of the accumulation occurs during the second and the third trimesters. The enhanced work of pregnancy raises the basal metabolic rate dramatically (5% increase during 1st trimester and 12% during 2nd and 3rd trimesters) and demands extra energy. A woman can easily get these added calories with judicious nutrient dense selections from the basic five food groups. Sufficient amount of carbohydrates are necessary to fuel the foetal brain. Carbohydrate ensures that the protein is spared from being used for energy. Fat is predominantly deposited in foetus and maternal tissues and contributes substantially to the overall energy cost of pregnancy. Additionally, 350kcal/ day in the second and third trimesters for a woman of body weight 55 kg and pregnancy weight gain of 10-12 kg is recommended by ICMR.
2. **Protein**: Additional protein is essential for the synthesis of maternal and foetal tissues. Demand increases throughout gestation, reaching their peak in the third trimester. Protein is predominantly deposited in foetus (42%), also in the uterus(17%), blood(14%), placenta (10%) and breast(8%). In order to meet the demands, 7.6 gms and 17.6 gms of protein are recommended additionally during the second and third trimesters respectively. The higher intake of protein recommended should preferably be obtained from high quality protein food sources and not from commercial protein supplements.



Do you know?

The protein sparing function is the role played by carbohydrates and fats in providing energy to the body so that proteins can be conserved for their vital structural and functional purposes rather than being used for energy.

3. **Fat**: Total fat intake should be moderate during pregnancy, but the essential long- chain polyunsaturated fatty acids (PUFAs), especially omega-3 (linolenic acid) and omega-6

(linoleic acid), are crucial for growth and development of the foetus. The foetal brain is largely made of lipid material and it depends highly on the long-chain omega 3 and omega 6 fatty acids for its growth and function.

4. **Fibre:** During pregnancy, adequate dietary fibre is essential to prevent constipation, which is often caused by iron supplementation. According to ICMR (2020), pregnant women should consume 25–30 g of dietary fibre per day. Fibre requirements can be met by including whole grains (brown rice, ragi, whole wheat, oats), pulses (lentils, chickpeas, beans), fruits (apples, guava, papaya), vegetables (carrots, beans, spinach, bottle gourd), and leafy greens in daily meals.
5. **Fluids:** With the rise in metabolic rate and blood volume, the need for fluids also increases during pregnancy. It is recommended that pregnant women consume 6–8 glasses (about 2–2.5 liters) of fluids daily. Milk, buttermilk, soups, and fresh fruit juices in addition to safe drinking water may be included to maintain hydration and support metabolic functions.

B. Micronutrients

All vitamins and minerals are essential for achieving optimal pregnancy outcomes. In some instances requirements may be met through diet; for others supplements are often necessary. The requirement for most of the vitamins and minerals increases with pregnancy but the quantity varies.

1. Vitamins

Pregnancy significantly increases requirements for the fat-soluble and water-soluble vitamins. If these requirements are not met, maternal stores will be depleted.

- a. **Vitamin A:** High levels of preformed vitamin A (retinol) can adversely affect foetal development if consumed in excess during pregnancy. Mothers should avoid vitamin A supplements containing retinol and limit the intake of animal sources rich in vitamin A (such as liver). A slight additional intake of about 60 µg per day from safe dietary sources is recommended to meet the increased requirements during pregnancy.

- b. Vitamin B complex:** Requirement for thiamine (B1), riboflavin (B2), and niacin (B3) increases during pregnancy by +0.6mg, +0.8 mg and + 2.0 mg respectively, due to increased energy intake. During pregnancy, the requirement for pyridoxine (B6) increases by 0.4 mg per day, and the requirement for vitamin B12 increases by 0.25 µg per day. The conversion of amino acid (tryptophan) into niacin is more efficient during pregnancy. Hence the extra allowance of niacin for the additional energy intake would cover the niacin needs during pregnancy. Folic acid recommended during this period is 570 µg per day. It is an essential component of DNA and RNA which increases rapidly during growth. Low folate levels during pregnancy are associated with abortion, low birth weight (LBW) babies and preterm birth. It may also lead to congenital malformations and cleft-lip and congenital heart problems. Supplementation of folic acid before conception and during the first twelve weeks of pregnancy is therefore recommended. Vitamin B12 is essential for the production of red blood cells and the proper functioning of the foetal nervous system.
- c. Vitamin C:** The daily requirement of vitamin C for an adult woman is 65 mg per day. During pregnancy, an additional 15 mg per day is required. Vitamin C helps maintain the mother's immune system and supports the development of healthy gums, connective tissues, and overall foetal growth.
- d. Vitamin D:** Vitamin D and the bone-building minerals, calcium, phosphorus, magnesium and fluoride are in great demand during pregnancy. Insufficient intakes may produce abnormal foetal bones and teeth. Vitamin D plays a vital role in calcium absorption and utilisation. Consequently, severe maternal vitamin D deficiency interferes with normal calcium metabolism resulting in rickets in the infant and osteomalacia in the mother. Regular exposure to sunlight and consumption of vitamin D rich sources like fortified milk are usually sufficient to meet the recommended amount of vitamin D during pregnancy.

2. Minerals

- a. Iron:** The requirement of iron increases during pregnancy. This is due to expansion of maternal tissues including red cell mass, iron content of the placenta, blood loss during parturition, building iron stores in the foetal liver, sufficient to last for at least 4–6 months after birth.

The total iron requirement during pregnancy is estimated to be approximately 1000 mg, distributed in the foetus, placenta (300 mg) and expanded red cell mass (400 mg). If this increased demand is not met with diet and supplementation, it results in anaemia. It may cause fatigue and irritability in the mother and impaired foetal growth. Hence, iron supplements are routinely given to pregnant women. Vitamin C enhances iron absorption in the gut.

- b. Calcium:** During pregnancy, the recommended intake of calcium is 1000mg per day. This is required for the growth and development of foetal bones and teeth as well as for protecting the mother's calcium stores. Inadequate intake of calcium results in the depletion of calcium from mother's bones resulting in the mineralisation of maternal bones and increases the risk of osteoporosis. Calcium absorption and retention increases significantly during pregnancy helping the mother to meet the calcium needs of pregnancy. During the last trimester, as the foetal bones begin to calcify, about 300 mg a day are transferred to the foetus. Recommendations to ensure an adequate calcium intake during pregnancy help to conserve maternal bone while supplying foetal needs.
- c. Zinc:** Deficiency of zinc adversely affects pregnancy outcomes. Severe deficiency in the mother can lead to spontaneous abortions and congenital malformations. The risk of delivering low birth weight babies doubles and the likelihood of preterm delivery increases three times. Moreover zinc is required for the synthesis of DNA and RNA and thus for protein synthesis and cell development. The requirement increases from 13.2 mg/day (pre pregnant) to 14.5 mg/per day during pregnancy.
- d. Iodine:** The Recommended Dietary Intake (RDI) for iodine during pregnancy is 220 µg per day. Iodine is essential for the normal growth and brain development of the foetus.

Dietary guidelines for pregnant woman

- Take small, frequent meals. Avoid skipping meals.
- Ensure adequate weight gain.
- Include variety in the diet in terms of colour, texture, methods of preparation etc.
- Food must be balanced with all the required macro and micronutrients.

- Include fruits and vegetables, preferably in the form of salads, in all meals.
- RDA for protein is met by consuming high-quality protein sources such as eggs, milk, fish, and pulses.
- Prefer complex carbohydrate foods over simple carbohydrates to provide sustained energy.
- Limit the intake of salt, sugar, and refined foods.
- Avoid processed foods and consume freshly prepared meals whenever possible.
- Sedentary women should engage in regular physical activity, such as walking.
- Avoid the consumption of alcohol, drugs, tobacco, and tannin-rich beverages such as tea and coffee.

Common nutrition related concerns of pregnancy

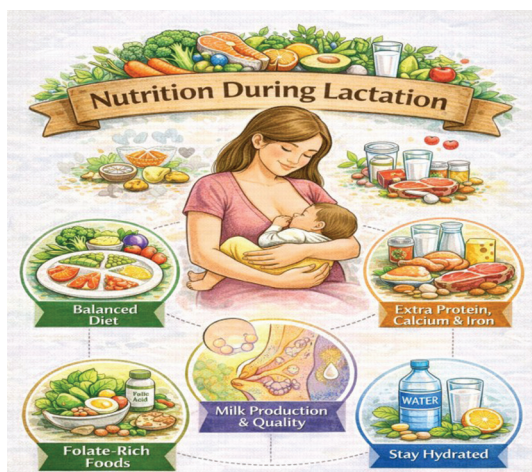
Nausea, constipation, heartburn and food intolerances are common nutrition-related concerns during pregnancy.

- 1. Nausea:** Not all women experience nausea during the early months of pregnancy, but many do. The “morning sickness” associated with early pregnancy may occur at any time of the day and can range from mild nausea to severe vomiting. These symptoms are primarily caused by hormonal changes that make women more sensitive to the appearance, texture, or smell of foods.
- 2. Constipation and Haemorrhoids:** Hormonal changes during pregnancy can alter muscle tone in the digestive tract, while the growing foetus exerts pressure on intestinal organs, leading to constipation. Some women may also develop haemorrhoids (swollen veins of the rectum), which can be painful and may bleed during bowel movements.
- 3. Heartburn:** Pregnancy hormones relax the digestive muscles, and the growing foetus puts increasing pressure on the mother's stomach. This combination causes stomach acid to flow back into the lower oesophagus, producing a burning sensation near the heart.
- 4. Food cravings and aversions:** Some women develop cravings for or aversions to certain foods and beverages during

pregnancy, which is common but they do not seem to reflect real physiological needs. Cravings and aversions that arise during pregnancy are most likely due to hormone-induced changes that affect the sensitivity to taste and smell.

5. **Nonfood cravings (Pica):** Some women develop cravings for nonfood items such as freezer frost, starch, clay, soil or ice - a condition known as 'pica'. Eating clay or soil may hinder iron absorption and reduce the intake of iron-rich foods.

iii. Nutrition during lactation



Lactation is a natural physiological process that virtually all mothers are capable of performing. Lactation naturally follows pregnancy, as the mother's body continues to nourish the infant, during which the mammary glands secrete milk. The mammary glands develop during puberty but remain fairly inactive until pregnancy. For the mother to produce sufficient milk to satisfy her infant's demands, she has to eat a well-balanced diet with special focus on critical nutrients such as calcium, iron and water soluble vitamins. This can

be achieved only with small changes to the mother's regular diet. However, if the daily intake of important nutrients is severely limited, the amount of milk produced may decrease.

Nutritional needs during lactation are based on the nutritional content of breast milk and the energy "cost" of producing milk. The healthy diet followed during pregnancy should be continued while breastfeeding. The requirements of vitamins and minerals during lactation are higher than during pregnancy. In general, if a mother's diet is inadequate, the amount of milk produced may decrease, but its quality usually remains unaffected. The exceptions are thiamine, riboflavin, vitamin B6, vitamin B12, vitamin A and Iodine. Prolonged inadequate intake of these nutrients by the mother can reduce their levels in breast milk and may affect the baby's nutrition. Although maternal supplementation can help correct such deficiencies, there are no uniform recommendations regarding the routine use of supplements during lactation. Women should be encouraged to obtain nutrients from food and not from supplements. However, iron supplements may be needed to replace depleted stores.

Breastfeeding places a greater nutritional demand on the mother than pregnancy, as she must nourish a rapidly growing infant through her breast milk. The mother should eat a wide variety of food to make sure that her own nutritional needs as well as those of her growing baby are met. If the diet of the mother has been satisfactory during pregnancy she will have enough stores for successful breastfeeding. During pregnancy, hormones promote the growth and branching of a duct system in the breasts and the development of the milk-producing cells.

The hormones prolactin and oxytocin work together to control lactation, the process of milk production and release. When the baby suckles, it stimulates the mother's body to release these hormones. Prolactin helps in making milk in the mammary glands. As long as the baby continues to feed, the level of prolactin stays high, and milk keeps being produced. Oxytocin helps in releasing the milk from the glands into the ducts so that the baby can drink it. This process is called the let-down reflex. The mother may feel this reflex as a slight tightening in the breast, followed by the flow of milk. When the mother is calm, relaxed, and well-nourished, milk flows more easily, and breastfeeding becomes more successful.

Composition of breast milk

The first milk, called colostrum, is the most suitable food for babies as it is rich in protein and other nutrients. It is a thick, yellowish, viscous liquid secreted in small amounts for the first few days after delivery. It is rich in antibodies and vitamin A. This should be given to the baby and not discarded. It is called the baby's first immunisation. After a few days of lactation the mother secretes larger amounts of less viscous and whitish milk known as 'mature milk'. Mature milk is nutritionally complete and supports the baby's healthy growth and development. On an average, a mother produces about 550 to 850 ml of milk per day, depending on factors such as the baby's demand, mother's nutrition, and overall health.

The Recommended Dietary Allowances (RDA) for lactating mothers are given in Table 9.4. You may notice that the nutrient requirements are divided into two periods—0 to 6 months and 6 to 12 months. The nutrient needs during the

Nutrient	Quantity/ 100 ml
Energy	65 kcal
Protein	1.1g
Carbohydrate	7.4g
Fat	3.4 g
Calcium	28mg
Vitamin A(Retinol)	137 I U
Thiamine	0.02 mg
Riboflavin	0.02 mg
Vitamin C	3 mg
Iron	Negligible

Table 9.3 Composition of Breast Milk

first six months are higher than those required in the following six months. The amount of milk produced during the first 6 months is much higher. After 6 months the infant is given additional foods so dependence on breastfeeding decreases gradually.

The amount of nutrients secreted in milk forms the basis for nutritional requirements during lactation. Most Indian studies show that on an average a well-nourished lactating mother secretes 850 ml of milk per day, while a poorly nourished woman generally secretes 600 ml of milk daily. After calculating the amount of nutrients secreted in milk and taking into consideration the efficacy of food nutrients into milk nutrients, the requirements for lactation are arrived at by ICMR. The RDA for lactation has been given in two categories that is, 0-6 months, (period of exclusive breastfeeding) and 6-12 months (period of partial breastfeeding along with complimentary feeding).

A. Macronutrients

Nutrients	Amount of Nutrients	
	0-6 months	6-12 months
Protein (g/d)	+17	+13
Dietary fibre (g/d)	25 (sedentary)	
Calcium (mg/d)	1200	
Magnesium (mg/d)	400	
Iron (mg/d)	23	
Zinc (mg/d)	14.1	
Iodine ($\mu\text{g}/\text{d}$)	280	
Thiamine (mg/d)	2.1	
Riboflavin (mg/d)	3.0	2.9
Niacin (mg/d)	+5	
Vitamin B6 (mg/d)	+0.26	+0.17
Folate ($\mu\text{g}/\text{d}$)	330	
Vitamin B12 ($\mu\text{g}/\text{d}$)	+1.0	
Vitamin C (mg/d)	+50	
Vitamin A ($\mu\text{g}/\text{d}$)	950	
Vitamin D (IU/d)	600	

Table 9.4 Summary of RDA For Indians (Lactation) NIN-ICMR, 2020

1. Carbohydrate: The human milk has a caloric content of approximately 65 kcal/100ml. It is assumed that the caloric efficiency of milk formation and secretion is 80 per cent and thus about 90 kcal is required for the production of 100 ml of milk or about 800 kcal for the daily production of milk. After delivery, a woman usually carries some extra weight compared to her pre-pregnancy weight. About 250–300 kcal per day becomes available from the mobilisation of body fat stored during pregnancy. This together with an extra 500 kcal/day would be sufficient to supply all the energy she needs to lactate properly. Nursing mothers

need additional carbohydrate to replace the glucose used to make the lactose in breast milk. An additional 600 kcal/day are recommended during the first 6 months of lactation. Most Indian mothers continue to lactate even after 6 months postpartum; however, the quantity of milk produced gradually decreases during this period. So an additional 520kcal/day is recommended from 6 to 12 months of lactation.

- 2. Protein:** A mother's milk contains approximately 1g protein/100 ml of milk. The efficacy of the conversion of dietary nitrogen into milk protein equivalent can be assumed to be 47 per cent on Indian diets, as in the case of adults. After adding the safe allowance, ICMR has suggested an additional of 17 g/day during 0- 6 months and +13 g/day during 6-12 months of lactation .
- 3. Fats:** ICMR has suggested an intake of 30 g visible fat per day. The fat in the diet also provides much needed energy density to meet the higher energy requirements during lactation.
- 4. Fibre:** Considering the benefits of dietary fibre, about 30 g per day of dietary fibre should be included in the diet of lactating mothers.
- 5. Water:** To prevent dehydration, a lactating mother should drink plenty of fluids. A good practice is to have a glass of milk, juice, or water with each meal and every time the baby is breastfed.

B. Micronutrients

1. Minerals

- a. Iron:** Iron requirement during lactation is the sum of the requirement of the mother and the amount of iron secreted in breast milk. The iron content of breast milk is very low. Since most women experience lactational amenorrhea there is no requirement for iron loss due to menstruation. It results in saving nearly 1 mg of iron per day which otherwise would have been lost due to menstruation. Hence, ICMR has suggested that the total iron requirement during lactation (23 mg/day) is slightly lower than that for non-pregnant adult women (29 mg/day).

- b. Calcium:** Mother's milk contains about 30 mg of calcium per 100 ml. Although low maternal calcium intake is unlikely to affect the calcium content of human milk, it may decrease maternal bone density, especially if breast feeding is prolonged. This can weaken the bones and may predispose a woman to osteoporosis in later life. ICMR has recommended 1200 mg of calcium per day for a lactating mother.
- c. Zinc:** The zinc content of breast milk varies depending on the duration of lactation. Since the level of zinc in breast milk declines rapidly during the first one month, an additional 1mg/ day is recommended.

2. Vitamins

The vitamin content of human milk depends entirely on the mother's current vitamin intake and her body's vitamin stores. Because most water soluble vitamins are not stored, the mother's diet should contain adequate amounts of these nutrients.

- a. Vitamin A:** Since milk is a rich source of vitamin A (retinal), a lactating mother needs an additional amount of this vitamin. The additional needs during lactation are calculated on the basis of vitamin A secreted in milk. The vitamin A content of human milk is 137 IU/100 ml. Considering the requirement, ICMR has recommended an additional intake of 110 µg/day.
- b. Vitamin B complex:** As the calorie and protein requirements increase during lactation, the requirements of thiamine riboflavin and niacin vitamins also increase correspondingly. ICMR recommends an additional 0.7 mg/day of thiamine and 5 mg/day of niacin for lactating mothers. For riboflavin, the recommended amounts are 3 mg/day for 0–6 months and 2.9 mg/day for 6–12 months of lactation. In the case of vitamin B6, an additional 0.26 mg/day is recommended for 0–6 months and 0.17 mg/day for 6–12 months. The recommended intake of folic acid during lactation is 330 µg/day, which includes an additional allowance of 100 µg/day. The extra requirement of 1 µg for vitamin B12 during lactation is based on the B12 content of breast milk.
- c. Vitamin C:** Vitamin C content of breast milk is 3mg/100ml. Hence an additional intake of 50mg/ day has been recommended by ICMR.

Dietary guidelines for lactating mothers

- Eat frequent meals, preferably 5–6 times a day.
- Follow healthy dietary habits and maintain an active lifestyle.
- Increase fluid intake, as fluids are essential for adequate milk production. Avoid restricting foods, except highly spiced or strongly flavoured items, as they can affect the taste of milk and may be unpleasant for the baby.
- Use medicines only under strict medical supervision, because most medications pass into breast milk and may affect the baby.
- Include animal-based foods such as milk, eggs, and meat.
- Avoid foods high in sugar, fat, and salt.
- Avoid addictive substances such as tobacco (smoking or chewing), alcohol, and psychotropic drugs.



Let us do

Collect information from your classmates about their diet during a holiday using a questionnaire and prepare a report based on that and present it as a seminar.



Lab activity

1. Plan a day's menu for the following categories, prepare a dish from the planned diet and calculate its nutritive value.
 - a. Adolescent boy or girl (Protein, Zinc)
 - b. Lactating mother (Calcium, Vitamin A)
 - c. Pregnant woman (Iron, Folic Acid)

(Nutritive value of Indian foods - Source: Internet Archive <https://share.google/ygUKLR0Lt1uyqPu46>)



Check your progress

1. State the factors influencing food choices and health habits of adolescents.
2. Enumerate the common nutrition related concerns of pregnancy.
3. Assess the importance of micro and macro nutrients during lactating mother.
5. Analyse the micro and micro nutrients needed during pregnancy and lactation.

10

THERAPEUTIC DIET



What kind of food items are seen in the given picture? Do you think it is a balanced diet?

We all know that a diet refers to the types and quantities of food consumed by an individual, and a balanced diet helps maintain good health. Since food plays a vital role in promoting recovery from illness, dietary patterns need to be adjusted according to one's health condition. This forms the basis of diet therapy.

10.1 Diet Therapy

Diet therapy is a branch of dietetics that deals with the use of food for therapeutic purposes. It focuses on promoting recovery from illness through appropriate dietary management and on preventing diseases by maintaining good nutrition. In simple terms, diet therapy involves using food and drink not only for the care of the sick but also for disease prevention and overall health maintenance. It often requires modifying one's usual eating habits to achieve optimal health.

A change in diet, or following a special diet, can play an important role in treating or preventing ill health. A therapeutic diet refers to a diet specifically designed for individuals with particular medical conditions, by including or restricting certain foods to improve or manage specific health issues. Adjustments in diet can help alleviate or even correct some medical problems.

Therapeutic diets are carefully planned to maintain or restore good nutrition in patients. During illness, the body may not receive or properly utilize nutrients due to impaired digestion, absorption, or transport of food components. This disturbance affects the nutritional balance of the individual, making dietary modification essential.

Have you ever seen an expert in the hospital who gives directions to the patients regarding their diet? Who is that person?

The dietitian plays a key role in formulating and evaluating an appropriate diet plan tailored to meet the specific needs of each patient admitted to the hospital. The type and extent of dietary modification depend on the nature and severity of the disease, the individual's nutritional status, and the metabolic changes involved. All therapeutic diets are essentially adaptations of a normal diet made to meet altered physiological needs resulting from illness.

A normal diet is planned to meet the Recommended Dietary Allowances (RDA) based on the Basic Five Food Groups, while a therapeutic diet is designed to meet or exceed these allowances. The goal of diet therapy is to maintain health and help the patient regain nutritional well-being.

Principles of diet therapy

There are certain principles of diet therapy. They are as follows:

- To maintain good nutritional status.
- Correct any existing nutritional deficiencies or disease conditions.
- Provide adequate rest to the body.
- Promote proper metabolism of nutrients.
- Bring about desirable changes in body weight whenever necessary.

Factors to be considered while planning therapeutic diets

- The specific disease condition that necessitates dietary modification.
- The expected duration of the illness.
- The dietary components that need to be altered to help manage or overcome the condition.
- The patient's tolerance and acceptance of different foods.

While planning meals for a patient, additional aspects such as economic status, food preferences, occupation, and meal timing should also be taken into account.

Principles of planning therapeutic diets

Therapeutic diets represent a fundamental shift from eating for pleasure to eating for healing. When a person is sick, the body's requirements change a lot. Normal diets may not provide what is required. Illness can affect how food is digested, absorbed, and used in the body, so special diets are often needed to meet these new needs. Hence therapeutic diets are built upon several key principles to ensure their effectiveness.

The following principles are essential while planning therapeutic diets:

- 1. Type of disease:** The diet must be planned according to the specific disease or health condition. An inappropriate diet can have harmful effects. For example, a low-calorie diet is suitable for diabetes, while a high-fibre diet is beneficial in cases of constipation.
- 2. Duration of disease:** The length of the illness—whether short-term or chronic—should be considered when planning a diet. For long-term conditions, the menu should be varied periodically to prevent monotony and maintain the patient's interest in food.
- 3. Selection of foods suitable for the disease:** The type and quantity of food should be adjusted based on the required dietary modifications for managing the illness. Food choices should aim to support recovery and overall health improvement. Whole grain cereals should be preferred instead of refined cereals for patients with diabetes.

- 4. Patient's dietary history:** Information such as the patient's age, eating habits, likes and dislikes, meal timings, economic condition, availability of foods, and cooking knowledge should be collected. The diet should be customized accordingly to ensure practicality and acceptance.
- 5. Psychological considerations:** The diet plan should also take into account the psychological well-being of the patient. Factors such as emotional state, social background, and economic status must be considered. Meals should be designed so that the patient does not feel isolated or different from others.
- 6. Variety and appeal of meals:** A patient's diet should include variety and visual appeal. Food should be well-cooked, appetizing, and served in a pleasant environment. A nutritious diet is effective only if the patient consumes it fully; therefore, taste, presentation, and palatability play an important role.

10.2 Modification of Diets

Diet modification refers to the deliberate adjustment of an individual's usual eating pattern to meet specific health requirements or manage medical conditions. Such modifications may involve changing the type or quantity of foods consumed, altering food texture, or modifying methods of preparation and serving. These adjustments are typically recommended when a person's health condition, nutritional needs, or disease status necessitate deviations from a normal or regular diet. The primary objective of diet modification is to promote health, aid recovery, and help manage symptoms in individuals with special dietary needs.

When you think of hospital food, you might picture something plain or tasteless. But hospital meals are not just about filling the stomach—they are an important part of treatment. Doctors and dietitians use Routine Hospital Diets to give patients the right nutrition for healing. These diets are planned to protect the stomach, provide energy, and help recovery. They are the first step in medical nutrition before more special diets are needed. Patients often move through these diets step by step, depending on how their health improves.

A normal diet is a regular, well-balanced, and nutritionally adequate diet that forms the basis for all therapeutic diets. It is intended to meet the nutritional requirements of individuals who do not need

any dietary restrictions or modifications. The specific requirements for a normal diet vary depending on factors such as age, sex, height, weight, level of physical activity, and physiological state.

A normal diet is composed of foods from all the basic food groups that we have already discussed. It is planned based on the Recommended Dietary Allowances (RDA) to meet the nutrient needs of healthy individuals. Remember, normal nutrition is the foundation upon which the therapeutic modifications are made. The various dietary modifications for therapeutic needs are briefly discussed here.

i. Modifications of normal diet

The normal diet can be modified in several ways to meet specific therapeutic needs or medical conditions. These modifications may include:

I. Change in consistency of foods

Diets of altered consistency are therapeutic meal plans formulated for individuals who experience difficulty in chewing, swallowing, or digesting regular foods. These diets involve modifying the texture, consistency, and sometimes the nutrient content of foods to meet specific medical needs.

Adjustments may include pureeing, mashing, chopping, or changing the seasoning, fibre, and spice content to make the food easier to consume and digest.

A. Liquid diet

A liquid diet consists of foods that are already in liquid form or become liquid at room temperature. It is generally prescribed for short-term use, particularly when the patient is unable to tolerate solid food — for example, before or after surgery, during illness, or when digestive rest is required.

Liquid diets are classified into two types:

- Clear liquid diet
- Full liquid diet

1. Clear liquid diet: A diet that is made up of only liquids and foods that are clear liquids at room temperature. Clear liquids are easy to digest and include water, broth, gelatin, plain tea

and coffee, popsicles and juices without pulp, sodas, and sports drinks. Clear liquid diets may be used before certain tests or procedures, such as a colonoscopy, or before or after certain types of surgery. They may also be used to help treat gastrointestinal problems, such as nausea, vomiting, or diarrhoea. Clear liquid diets are normally used for only a few days because they do not have enough of the calories and nutrients the body needs.

A clear liquid diet is designed to

- maintain hydration and electrolyte balance
- provide small amounts of energy, Vitamins, and minerals when regular food intake is not possible
- leave minimal residue in the gastrointestinal tract, allowing the digestive system to rest

This diet includes non-gas-forming, non-irritating, and non-stimulating fluids that are clear at room temperature.

Characteristics of clear liquid diet

- Low in calories and nutrients
- Should not be used for more than 1–3 days without supplementation
- Increases feeding frequency because of low nutrient content
- Small portions (20–25 ml) are offered hourly or every two hours
- Quantity is gradually increased as the patient's condition improves

Indications of Clear Liquid diet

- During fevers or infections
- Post-operative recovery
- When solid foods are not tolerated

Benefits of clear liquid diet

- Relieves thirst
- Stimulates mild digestive activity after illness or surgery

Common foods and drinks

- Black tea or black coffee
- Clear fruit juices (apple, grape, lemon)
- Coconut water, sherbets
- Clear soups, rice water, fat-free broths
- Dal extracts

2. Full liquid diet: a full liquid diet includes all foods that are liquid or semi-liquid at room temperature or melt at body temperature. It is used as a transition diet between a clear liquid diet and a normal diet.

Characteristics of full liquid diet

- Low in iron, Vitamin A, thiamine, and Vitamin B12
- May be inadequate in fibre, but can meet most nutritional requirements with careful planning
- Skim milk powder can be added to increase protein content
- Six or more feedings daily are recommended due to low nutrient density

Indications of full liquid diet

- Providing nourishment and hydration for individuals unable to chew or digest solid foods
- Helping recovery following gastrointestinal surgery or illness
- Preventing stress on the digestive tract while meeting energy and nutrient needs

Recommended foods

- Soups
- Cereal porridges
- Milk, milk beverages, milkshakes, eggnogs
- Fruit juices and smoothies
- Yogurt, custards, jelly, and ice cream
- Butter, cream, or oil added to foods
- Sugar, honey, or jaggery for energy

B. Soft diet

A soft diet includes foods that are easy to chew, swallow, and digest. These foods are mildly seasoned, low in fibre, and not spicy. It is commonly prescribed for individuals recovering from surgery or dental procedures or those who have difficulty chewing or swallowing.

Characteristics of soft diet

- Intermediate diet between full-liquid and normal diets
- Nutritionally adequate if sufficient amounts are consumed
- Foods should be soft, moist, and easy to digest
- Avoid coarse fibre, strong spices, and excessive fat
- Supplements or between-meal snacks may be added to improve intake

Indications of soft diet

- Providing adequate nutrition when a liquid diet is no longer necessary but solid foods are not yet tolerated
- Supporting gradual recovery and reintroduction of normal foods
- Minimizing irritation to the gastrointestinal tract

Variations of the soft diet

a. Mechanically soft diet (dental soft diet)

- Modification involves texture only—foods are chopped, mashed, or minced.
- Recommended for patients who cannot chew due to missing teeth, dental surgery, or ill-fitting dentures.

b. Pureed diet

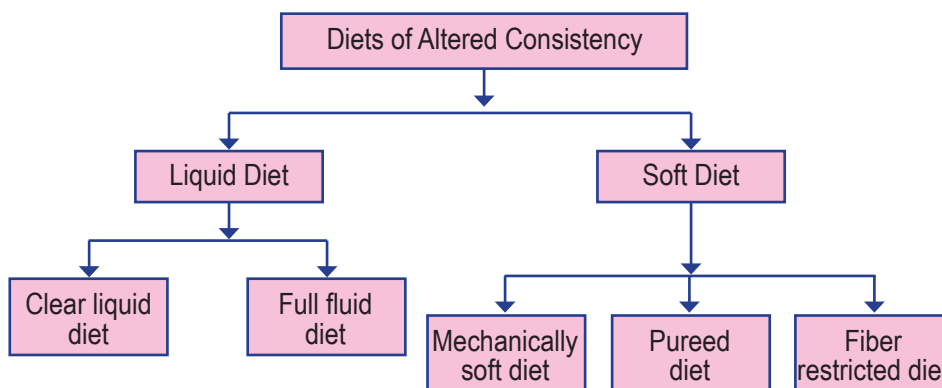
- Consists of smooth, soft foods requiring minimal or no chewing.
- Suitable for patients with difficulty swallowing (dysphagia).
- Foods are blended or pureed with liquids to achieve the right consistency.
- Calories can be increased by adding fats and sugars.

c. Fibre-restricted soft diet

Indigestible carbohydrates are excluded from this diet such as cellulose, hemicellulose, lignin, pectin, gums, mucilages and algal substances).

Fibre reduction can be achieved by using:

- Refined cereals and breads
- Immature vegetables
- Peeled and seedless fruits
- Well-cooked vegetables and fruits
- Excludes indigestible carbohydrates like cellulose, hemicellulose, lignin, pectin, gums, and mucilages. It is summarised below :



ii. Modification in nutrient/food quantity

Depending on the clinical condition, certain individuals may require dietary restrictions such as a sodium-restricted diet (for hypertension), a purine-restricted diet (for gout), or a low-residue diet (recommended before or after abdominal surgery) to minimize the frequency and volume of faecal output. This modification may involve adjusting the number of meals taken per day and/or altering portion sizes — that is, the amount of a particular food consumed during a meal.

iii. Modification in nutrient (protein, fat, carbohydrate) content

The nutrient composition of a diet may be altered to correct deficiencies, manage body weight, or control diseases such as hypertension and diabetes. For instance, patients with cardiovascular diseases require a fat-controlled, low-cholesterol diet, while those with renal failure or advanced liver disease are prescribed a low-protein diet.

iv. Changes in meal frequency

Individuals with gastro-oesophageal reflux disease (GERD) benefit from consuming smaller, more frequent meals. Instead of the conventional three large meals, five to six smaller meals are advised, ensuring that food is taken at regular intervals throughout the day.

v. Changes in method of cooking

For the elderly, food may be mechanically modified by mashing, blending, or chopping to aid in chewing and digestion. Patients prescribed a bland diet are encouraged to consume foods that are steamed, baked, or grilled rather than fried or heavily spiced.

vi. Modification in the method of feeding

Normally, nutrition is provided through oral feeding. However, when oral intake is not feasible, alternative feeding methods such as enteral nutrition (administration of a liquid formula diet via a nasogastric tube) are employed to ensure adequate nutrient intake.

Dietary counselling

Malnourished patients are known to experience delayed recovery; therefore, nutritional assessment should form an integral part of every patient's care. While not all patients require an in-depth evaluation, simple clinical observation can effectively identify those at risk of malnutrition.

Patients identified as nutritionally at risk should undergo a comprehensive nutritional assessment. Collecting a detailed nutrition history along with a clinical evaluation helps in recognizing individuals who are vulnerable to nutritional deficiencies. Once the nature, extent, and underlying causes of the nutritional problems are identified through clinical observations, an appropriate plan of nutritional care can be formulated.



Check your progress

1. Mention the principles of diet therapy.
2. Suggest the factors to be considered while planning meals for the family.
3. Analyse the principles to be followed while planning therapeutic diets.
4. Suggest the ways in which we can modify normal diets.
5. Prepare a chart depicting the modification of diets.

10.3 Dietary Modifications for Lifestyle Diseases

Modern developments such as urbanization and globalization have significantly influenced eating habits, leading many people to consume diets rich in fats, sugars, and processed foods while neglecting fruits, vegetables, and whole grains. Research indicates that these unhealthy dietary patterns are major contributors to the growing incidence of lifestyle diseases, resulting in disability and premature mortality across both developed and developing nations. Reversing these trends through deliberate dietary adjustments is essential for improving overall health and well-being.

Effective dietary modification involves adopting balanced, nutrient-dense eating habits that emphasize whole and minimally processed foods, limit unhealthy fats and added sugars, and increase the intake of plant-based ingredients. Moreover, understanding the principles of a healthy diet and making informed decisions regarding portion size, meal timing, and food variety play a vital role in the long-term prevention and management of lifestyle-related disorders.

Therefore, dietary modification is a key strategy in managing and preventing lifestyle diseases such as anaemia, diabetes, obesity, and hypertension. Let us examine these conditions in detail.

i. Anaemia

Have you ever received iron supplementation tablets as part of a school health program?

Have you ever noticed someone who appears unusually pale or feels dizzy and weak frequently? Let us find out the reasons.



Human blood contains a red pigment called haemoglobin, which is rich in iron and responsible for carrying oxygen to various parts of the body. When the diet lacks sufficient iron, the level of haemoglobin decreases, causing the blood to become thinner and less red. As a result, the oxygen supply to body tissues is reduced, leading to fatigue, weakness and pallor, a condition known as anaemia.

Cut off levels of haemoglobin for diagnosis of anaemia is given below.

Age/sex	Hb g/dL
Children (6months to 5 years)	<11.0
Children (6-14 years)	<12.0
Adolescence (15-19 years)	<12.0
Adult (Male)	<13.0
Adult(Female)	<12.0
Adult (Female pregnant)	<11.0

World Health Organisation 2024

If the level falls below the respective values, then the person is diagnosed as having anaemia.

Classification of anaemia according to WHO

Anaemia can result from a variety of causes, both nutritional and non-nutritional. Nutritional anaemia arises primarily due to inadequate intake or poor absorption of essential nutrients, while non-nutritional causes include infections (such as malaria, parasitic infestations, tuberculosis, and HIV), chronic inflammation, chronic diseases, and certain gynaecological, obstetric, or inherited red blood cell disorders.

Among nutritional causes, iron deficiency is the most common, followed by deficiencies of folate, Vitamin B₁₂, and Vitamin A. Nutritional anaemia remains the most widespread form of anaemia in many developing countries.

Mild anaemia	11.0 g.-11.9 g/dL
Moderate anaemia	8.0 - 10.9 g/dL
Severe anaemia	<7 g/dL
Anaemia in non-pregnant women	<12 g/dL (Above 15 yrs of age)
Anaemia in pregnant women	<11 g/dL

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Let us do

Prepare a table by collecting haemoglobin levels of your classmates. Are all in good health? Inform and discuss with your class teacher. Present it in your class based on the collected information.

Common causes of iron deficiency and nutritional anaemia include:

- a. Poor dietary intake of iron:** Inadequate consumption of iron-rich foods leads to reduced iron stores in the body, resulting in iron deficiency anaemia.
- b. Low bioavailability of iron:** Diets predominantly based on cereals high in phytates, along with inadequate intake of Vitamin C-rich foods that enhance iron absorption, lower the amount of absorbable iron.
- c. Deficiency of essential Vitamins:** Inadequate intake of Vitamins such as folic acid, Vitamin C, and Vitamin B₁₂ further contributes to the development of anaemia.

Iron deficiency anaemia develops gradually as the body's iron stores become depleted. Clinical symptoms may not appear until the haemoglobin level drops below 7–8 g/dL. However, adverse health effects may begin even before this stage.

Types of anaemia

Anaemia can be classified based on two criteria, morphology (appearance of red blood cells) and aetiology (underlying cause).

1. Morphological classification

- **Normocytic anaemia:** The red blood cells (erythrocytes) are of normal size and haemoglobin content is normal. It usually occurs due to blood loss (haemorrhage) or suppression of red blood cell formation caused by toxins or radiation.
- **Macrocytic anaemia:** The erythrocytes are abnormally large and rich in haemoglobin. This condition commonly arises from Vitamin B₁₂ or folic acid deficiency.
- **Microcytic anaemia:** The red blood cells are smaller than normal and often contain less haemoglobin. This type is typically caused by iron deficiency.

2. Aetiological classification

- **Nutritional anaemia:** Develops due to inadequate intake or absorption of nutrients such as iron, folate, and Vitamin B₁₂.

- **Anaemia due to excessive loss of red cells:** Results from blood loss (haemorrhage) or destruction of red blood cells (haemolysis).

Diet planning during anaemia

Diet plays a vital role in both the prevention and treatment of anaemia. Highly refined foods such as white bread, polished rice, sugar, and desserts are poor in iron and can deplete the body's nutrient stores. Therefore, it is essential to consume iron in its natural, organic form through food rather than relying solely on inorganic supplements.

To manage or treat anaemia effectively, focus should be given to the following nutrients:

1. **Iron:** Iron is crucial for the production of haemoglobin, which transports oxygen throughout the body. There are two forms of dietary iron — heme iron and non-heme iron.

Heme Iron: Found in animal-based foods and is highly bioavailable, meaning it is absorbed efficiently by the body.

Sources of heme iron includes beef, chicken liver, oysters, mussels, mollusks, turkey, veal, ham, canned sardines, fish such as halibut, haddock, salmon, tuna etc.

Non-Heme Iron: Found in plant-based foods and fortified cereals. It is less readily absorbed since it must undergo modification during digestion.

Sources of non heme iron includes cooked spinach, lentils, beans, pulses, fortified cereals, pumpkin and sunflower seeds, baked potato with skin, dried fruits such as prunes and raisins, blackstrap molasses, nuts etc.

To enhance absorption of non-heme iron:

- Include Vitamin C-rich foods (e.g., citrus fruits, guavas, tomatoes).
- Consume Vitamin A-rich foods (e.g., carrots, sweet potatoes).

To avoid hindering absorption:

- Limit foods high in phytates (found in grains and legumes); soaking or sprouting them reduces phytate levels.

- Avoid tea and coffee during or soon after meals, as their polyphenols can reduce iron absorption by up to 90%.
- Calcium also inhibits both heme and non-heme iron absorption by 50–60%.
- Excessive intake of zinc, manganese, and copper can compete with iron for absorption.

Being mindful of these factors when planning meals ensures optimal iron absorption and supports recovery from anaemia.

2. Vitamin B12: Vitamin B12 plays a crucial role in the production of healthy red blood cells and in maintaining proper functioning of the nervous system. Adequate intake of this Vitamin is essential for both the prevention and treatment of anaemia.

Vitamin B12 is primarily found in animal-based foods, particularly in organ meats such as liver and kidney. Other excellent dietary sources include milk, eggs, cheese, and other dairy products. Because plant-based foods contain little or no Vitamin B12, vegetarians and vegans are at higher risk of deficiency and may need fortified foods or supplements to meet their requirements.

3. Folate (Vitamin B9): Folate, also known as Vitamin B9, is a water-soluble Vitamin essential for the synthesis and maturation of red blood cells. Adequate intake of folate helps prevent folate deficiency anaemia and supports overall health.

Animal sources rich in folate include beef and chicken liver, eggs, salmon, and oysters, while plant-based sources include leafy green vegetables (such as spinach, lettuce, and cabbage), red peppers, avocados, broccoli, oranges, beetroot, and fortified cereals.

Folate is especially important during pregnancy, as deficiency can lead to megaloblastic anaemia and increase the risk of neural tube defects in new-borns. Therefore, regular inclusion of folate-rich foods in the diet is strongly recommended to support healthy blood formation and fetal development.

4. Vitamin A: While iron is vital for the production of red blood cells, Vitamin A plays an equally important role by enhancing the absorption, mobilization, and utilization of iron in the body. Low levels of Vitamin A can impair iron absorption even when dietary iron intake is adequate, increasing the risk of anaemia.

Animal sources of Vitamin A (in the form of retinol, which is readily absorbed) include beef liver, cod liver oil, fatty fish (such as salmon, tuna, and mackerel), dairy products (milk, cheese, butter), and eggs.

Plant-based sources (rich in beta-carotene, which the body converts into Vitamin A) include sweet potatoes, carrots, spinach, broccoli, apricots, mangoes, and papayas. Incorporating these foods into the daily diet enhances iron absorption and supports healthy red blood cell production.

By including a variety of nutrient-dense foods rich in iron, Vitamin B12, folate, and Vitamin A, individuals can strengthen their body's ability to produce healthy red blood cells and prevent different types of anaemia. Additionally, adopting healthy cooking practices that enhance nutrient absorption and maintaining a balanced lifestyle with regular physical activity and effective stress management further contribute to overall health and well-being.

Anaemia and hypertension may seem like two distinct health issues, but they are closely interrelated. In anaemia, the blood's capacity to carry oxygen is reduced due to a deficiency of haemoglobin or red blood cells. As a result, the heart must pump more forcefully to deliver adequate oxygen to the body's tissues. Over time, this increased workload puts strain on the heart and blood vessels, which can eventually lead to elevated blood pressure, or hypertension.

This connection highlights the importance of identifying and treating anaemia early to prevent complications affecting the cardiovascular system. Maintaining optimal blood health is therefore essential for supporting heart function and overall circulatory health.



Let us do

Prepare a powerpoint presentation of dietary sources of nutrients for anaemia and present it in your class.

ii. Hypertension

Have you ever noticed your heart beating rapidly after running or climbing stairs? This happens because your heart works harder to pump blood through your body. But what if your heart has to work harder all the time? That condition is known as high blood pressure, or hypertension.



Do you know?

Hypertension is often called a “silent killer” because it usually has no symptoms, yet it quietly damages blood vessels and vital organs over time. It can affect people of all age groups – children, young adults, adults, and older adults.

Understanding Blood Pressure

Hypertension (high blood pressure) is when the pressure in blood vessels is too high (140/90 mmHg or higher). It is common but can be serious if not treated. People with high blood pressure may not feel symptoms. The only way to know is to get your blood pressure checked. Lifestyle changes like eating a healthier diet, quitting tobacco and alcohol, being more active can help lower blood pressure. Some people may still need to take medicines.

A person is said to have hypertension when their blood pressure readings are 140/90 mmHg or higher. Since symptoms are rarely noticeable, regular monitoring is the only reliable way to detect high blood pressure.

Lifestyle modifications such as a healthier diet, regular exercise, avoiding tobacco and alcohol, and stress management can help reduce blood pressure. Some individuals may also require medication for effective control.



Do you know?

- Blood pressure is expressed in two numbers:

Systolic pressure: The first (systolic) number represents the pressure in blood vessels when the heart contracts or beats.

Diastolic pressure: The second (diastolic) number represents the pressure in the vessels when the heart rests between beats.

Types of hypertension

- Essential (primary) hypertension:** Hypertension of an unknown cause, which may be the result of a combination of poor lifestyle choices and genetic history. Lifestyle factors that may play a role include poor diet (high sodium, low fruit and vegetable intake), tobacco use, limited physical activity, stress, and overweight/obesity. Genes are likely to play some role in high blood pressure, heart disease, and other related

conditions. However, it is also likely that people with a family history of high blood pressure share common environments and other potential factors that increase their risk. People with a family history of hypertension often share environmental and lifestyle factors that increase their risk.

- b. Secondary hypertension:** Hypertension that arises as a result of another disease, most often associated with the endocrine system (the body's gland system, responsible for secreting hormones). Secondary hypertension may be resolved with treatment of the underlying conditions such as kidney disease, hormonal disorders, certain medications, pregnancy related complications, sleep apnea etc. In many cases, treating the underlying cause can resolve the elevated blood pressure.

Causes of hypertension

- **Excessive salt intake:** Consuming excessive sodium disrupts the body's fluid balance, causing the kidneys to retain more water, which increases blood volume and raises arterial pressure.
- **Chronic alcohol consumption:** Drinking alcohol for a long time can upset the body's automatic control system. This makes the blood vessels tighten and the heart pump harder, which causes blood pressure to go up.
- **Kidney disease:** Impaired kidney function disrupts the regulation of sodium and fluid balance, leading to increased blood volume and blood pressure.
- **Diabetes:** High blood sugar damages blood vessel walls, leading to endothelial dysfunction and reduced nitric oxide availability, which causes hypertension.
- **Certain medications:** Certain medications can cause fluid retention, increased sodium levels, and vasoconstriction, all of which contribute to elevated blood pressure.
- **Hormonal imbalances:** Conditions such as hyperthyroidism and Cushing's syndrome increase heart rate, blood volume, and vascular resistance, all of which elevate blood pressure.
- **Sleep apnea:** Repeated episodes of oxygen deprivation during sleep trigger the sympathetic nervous system, causing increased heart rate and blood vessel constriction.

- **Pregnancy:** Pregnancy alters vascular function, which causes temporary high blood pressure, which may persist postpartum.

Prevention and management of hypertension

Prevention

Lifestyle changes can help lower high blood pressure and can help anyone with hypertension. Many who make these changes will still need to take medicine. The DASH (Dietary Approaches to Stop Hypertension) diet is especially recommended for people with hypertension (high blood pressure) or pre hypertension.

The DASH diet eating plan has been proven to lower blood pressure in studies sponsored by the National Institutes of Health (NIH). In addition to being a low salt (or low sodium) plan, the DASH diet provides additional benefits to reduce blood pressure. It is based on an eating plan rich in fruits and vegetables, and low-fat or non-fat dairy, with whole grains. It is a high fibre, low to moderate fat diet, rich in potassium, calcium, and magnesium. The DASH diet is a healthy plan, designed for the whole family. Reducing hypertension prevents heart attack, stroke and kidney damage, as well as other health problems. This plan is low in saturated fat and cholesterol while being high in fibre and nutrients that help lower blood pressure.



Do you know?

Additional steps to prevent Hypertension:

Manage and reduce stress

Monitor blood pressure regularly

Control other medical conditions (like diabetes)

Avoid tobacco and limit alcohol

Reduce exposure to air pollution

Management

Effective management begins with early detection and regular monitoring. Even in the absence of symptoms, blood pressure should be checked periodically.

Hypertension can be effectively managed, and complications can be prevented if detected early. Regular monitoring of blood pressure is crucial, even in individuals without symptoms. Hypertension can be controlled through lifestyle changes and prescriptive medication. While medications to treat hypertension are available, research has shown that modest lifestyle and dietary changes can help to treat and often delay or prevent high blood pressure. In addition to healthy weight maintenance, regular exercise, quitting tobacco and alcohol, and managing stress is recommended.

Dietary management

- 1. DASH dietary pattern:** The DASH (Dietary Approaches to Stop Hypertension) dietary pattern is recommended. The DASH diet is an overall eating plan that focuses on eating twice the average daily amount of fruits, vegetables, complex carbohydrates and low-fat dairy products. It doubles the average intake of these food groups compared to typical diets.
- 2. Regulation of caloric intake:** Lowering daily calorie consumption helps reduce both systolic and diastolic blood pressure. Following the DASH diet may help one regulate daily calorie consumption, and may have a greater effect in reducing blood pressure than following a low-fat diet alone. Along with medication, weight reduction should be a primary goal. Weight maintenance may reduce the time and number of medicines necessary to control blood pressure.
- 3. Low sodium diet:** A decrease in sodium (a major component of salt) is associated with a decrease in blood pressure. The current Dietary Guidelines recommend consuming no more than 2,300 mg of sodium/day. Special recommendations for those with high blood pressure, who are middle aged, or elderly, are advised to consume no more than 1,500 mg of sodium/day. Following the DASH dietary pattern, as well as consuming less than 1,500 mg of sodium /day, has been shown to lower and maintain a normal blood pressure. Those looking to reduce salt consumption should avoid processed foods, examine food labels for sodium content, and use alternative seasonings to flavor foods.
- 4. Adequate intake of potassium, calcium, and magnesium:** These minerals help regulate water balance and blood pressure. Potassium works with sodium to regulate the body's

water balance. Studies show that having more potassium compared to sodium in the diet helps the body keep blood pressure at a healthy level. The recommended intake of potassium for adults is 4.7 g/day.

- 5. Dietary fat:** Current recommendations for dietary fat include decreasing intake of saturated fat and trans fat as well as overall intake of dietary fat. These recommendations are meant for healthy weight maintenance.

Hypertension is one of the most common chronic conditions worldwide, closely linked to poor diet, stress, and physical inactivity. It develops silently but significantly increases the risk of heart attack, stroke, and kidney damage. Since obesity and hypertension often share the same causes, managing body weight is essential in controlling high blood pressure.

Up next, let us explore obesity—another major lifestyle-related condition that often coexists with hypertension.

iii. Obesity

Obesity is a condition characterized by excess accumulation of body fat, which occurs when long-term caloric intake exceeds energy expenditure from metabolism, physical activity, and growth. There are various means through which we can screen for obesity. The Body Mass Index (BMI) is a widely used tool to assess body composition and overall health. It provides a simple numerical value that categorizes individuals into different weight status categories, such as underweight, normal weight, overweight, and obesity. BMI is a calculation of a body person's weight (kg) divided by the square of their height (m). For adults 20 and older, BMI categories are based on a person's BMI regardless of age, sex, or race.

$$\text{BMI} = \text{weight (kg)} / \text{height}^2 \text{ (m)}$$

BMI category	BMI range (kg/m ²)
Underweight	Less than 18.5
Normal weight	18.5 - 22.9
Overweight	23.0 - 24.9
Class 1 obesity	25.0 - 29.9
Class 2 obesity	30.0 - 34.9
Class 3 obesity	Severe obesity ≥ 35.0

The prevalence of obesity is increasing in developing countries due to a shift from a subsistence lifestyle to one of greater affluence. Obesity is a chronic and complex disease that affects overall health, quality of life, self-esteem, and mental well-being. Although excess weight results from positive energy balance, achieving weight loss is challenging because

obesity results from a combination of genetic predisposition and environmental factors. While heredity cannot be changed, lifestyle and environmental factors can be modified through diet, physical activity, and behavioral interventions.



Let us do

Take height and weight of your classmates and record it in your activity log. Calculate their BMI. Compare it and categorise based on BMI.

Causes of obesity

Obesity is a complex concern with many causes. It is caused when extra calories are stored in the body as fat. If you consume high amounts of energy, particularly found in high fat and high sugar foods, and do not use all of the energy through physical activity, much of the extra energy will be stored in the body as fat. Several factors can play a role in gaining and retaining excess weight. These include diet, lack of physical exercise, environmental factors, and genetics. Some of these factors are discussed briefly in the following section.



Do you know?

Indians are particularly at risk because, for the same BMI, they tend to have higher body fat percentage and visceral fat, increasing the likelihood of chronic degenerative diseases later in life.

Waist Circumference and Health Risk of individuals may also be considered.

The distribution of body fat is an important indicator of health risks. According to the ICMR the recommended waist circumference is:

- Females: < 80 cm
- Males: < 90 cm

High waist circumference is linked to an increased risk of cardiovascular disease and Type 2 diabetes.

- 1. Dietary factors:** Excess intake of high-calorie foods, especially those rich in sugars and fats, combined with insufficient physical activity, leads to fat storage. Consuming more calories than your body needs, eating ultra-processed food, high-sugar foods and juices, carbonated drinks and foods with high amounts of saturated fat may cause overweight.

2. **Lack of physical activity:** Sedentary behaviour, including excessive screen time (TV, computers, mobile devices), reduces energy expenditure.
3. **Genetics:** Certain obesity-susceptibility genes influence appetite, metabolism, and fat storage. Genetics may predispose individuals to weight gain, but do not solely determine obesity. Lifestyle choices play a major role.
4. **Medications:** Drugs such as antidepressants, steroids, anti-seizure medications, diabetes drugs, and beta-blockers can cause weight gain by altering metabolism or increasing appetite.
5. **Disability:** Mobility limitations, intellectual or learning disabilities, and certain physical limitations can restrict access to healthy foods, reduce activity, and increase obesity risk.
6. **Sleep deprivation:** Insufficient sleep disrupts hormonal balance, increasing appetite and weight gain.
7. **Stress:** Elevated cortisol levels during stress increase hunger and fat storage, often leading to consumption of high-calorie comfort foods.
8. **Underlying health conditions:** Diseases such as hypothyroidism, Cushing syndrome, Prader-Willi syndrome, polycystic ovary syndrome, or arthritis can contribute to obesity. Mental health issues like anxiety or depression may also promote overeating.



Do you know?

Cushing Syndrome : Is a rare hormonal condition that happens when body has too much cortisol.

Prader Willi Syndrome : Is a rare genetic disorder caused by a loss of function of specific genes on chromosome 15.

Dietary management of obesity

Effective weight management begins with lifestyle changes, particularly dietary adjustments. No single diet works for everyone; plans should be tailored based on health status, cultural preferences, and cost. Certain important suggestions for managing obesity are given below:

1. **Changing what you eat:** A low-carbohydrate diet, involves reducing the number of carbohydrates you eat each day while increasing the amount of protein. These diets often restrict carbs to just 20 to 50 grams per day. A low-carb diet encourages you to eat a lot of protein, which has been shown to burn more calories during digestion than carbs or fat and helps keep you full longer. Skipping meals is never a sustainable way to go about obesity management.

The guidelines that recommend for a healthy eating plan includes:

- Vegetables of all types
- Fruits, especially whole fruits rather than fruit juices
- Whole grains, such as brown rice, oats, and millets, whole-wheat bread
- Dairy, including fat-free or low-fat milk, yogurt, and cheese, or similar products such as soy beverages with added calcium, Vitamin A, and Vitamin D.
- Protein from foods such as lean meats, poultry, and eggs; seafood; beans, peas, and lentils; and nuts, seeds, and soy products



Do you know?

The ICMR guidelines also emphasise that adults should limit:

- Added sugars to less than 10% of calories/day
- Saturated fat to less than 10% of calories/day
- Sodium, or salt, to less than 2,300 mg/day
- Cooking oil to less than 10% of calories/day

2. **Building activity into your day:** Activity burns off calories and there are many ways to boost your activity. Moderate physical activity is better than minimal physical activity. At least 150 min (2.5 hours) per week of moderate physical activity or at least 75 min (1.25 hours) per week of vigorous intensity aerobic exercise has the most health benefits, promotes modest weight reduction, and may help prevent weight gain or regain.
3. **Mental health support:** Counseling, support groups and cognitive behavioral therapy (CBT) can help support positive changes. They can also help you manage stress and address emotional and psychological factors that may be working against you.



Let us do

Complete the following table based on the notes above and present in your class.

Strategy key points	Recommendations	Benefits /purpose
1. Modifying food intake	Low-carbohydrate diets: reduce carbs (20–50 g/ day), increase protein for better satiety and energy expenditure.	-----
2. Increasing physical activity	-----	Aids weight reduction and prevents weight regain. Enhances cardiovascular and metabolic health. Boosts overall fitness and well-being.
3. Mental health support	Use counseling, support groups, or cognitive behavioral therapy (CBT). Focus on managing stress, emotional eating, and psychological causes of obesity.	-----

IV. Diabetes Mellitus

Diabetes, often referred to by doctors as diabetes mellitus describes a group of metabolic diseases in which the person has high blood glucose (blood sugar), either because insulin production is inadequate or because the body's cells do not respond properly to insulin or both.

As you know glucose is a form of sugar in the blood and it is the principal source of fuel for our body. When food is digested the glucose makes its way into blood stream. Our cells use the glucose for energy and growth. However glucose cannot enter our cells without insulin being present, insulin makes it possible for our cells to take in the glucose. Insulin is a hormone that is produced by the pancreas. After eating, the pancreas automatically releases an adequate quantity of insulin to move the glucose present in our blood into the cells and as soon as glucose enters the cells, blood glucose level drops.

A person with diabetes has condition in which the quantity of glucose in the blood is too elevated (hyperglycemia). This is because the body does not produce enough insulin or produces no insulin or has cells that do not respond properly to the insulin, that is produced by the pancreas. This results in too much glucose building up in the blood. This excess blood glucose eventually passes out of the body

through urine. Patients with high blood sugar will typically experience polyuria (frequent urination), they will become increasingly thirsty (polydipsia) and hungry (polyphagia).

Types and causes of diabetes

Diabetes mellitus can be classified into three main types. Type-1 diabetes mellitus (T1DM), Type-2 diabetes mellitus (T2DM), and Gestational diabetes mellitus (GDM).

- 1. Type 1 Diabetes mellitus (T1DM):** It is an autoimmune condition characterized by a loss of insulin-producing in the pancreas, leading to insulin deficiency. The immune system of the body mistakenly attacks and destroys the beta cells in the pancreas that make insulin, resulting in type 1 diabetes. The condition is normally diagnosed in children and young people, so it is called juvenile diabetes. Its causes include genetic factors and possibly autoimmune responses.
- 2. Type 2 diabetes mellitus (T2DM):** It is also called adult-onset or non-insulin-dependent diabetes. It happens mainly because the body cannot use insulin properly or does not make enough of it. So T2DM is distinguished by a condition known as insulin resistance, where in the cells in the body fail to respond efficiently to the presence of insulin. To compensate for this resistance, the pancreas initially produces an excess of insulin, but as time progresses, the production of insulin may decline. Its causes are obesity, lack of physical activity, and family history with genetics often being the strongest factor.
- 3. Gestational diabetes (GDM):** This type of diabetes occurs during pregnancy when the body does not make enough insulin and low sensitivity of insulin. When increased insulin resistance is brought on by hormonal changes during pregnancy and the pancreas is unable to produce enough insulin to meet these demands, then GDM develops. It usually goes away after childbirth but increases the risk of type 2 diabetes later. The main causes include genetics, lifestyle, and hormonal changes.

Dietary management of diabetes

Diet plays an important role in the management of Diabetes Mellitus. Eating the right food at the correct time is crucial for maintaining acceptable blood glucose values. Knowing what food to eat, when to eat and how much to eat, helps one to monitor blood glucose levels and maintain it within the normal range. Proper diet is crucial for blood glucose control, prevention of complications, and maintenance of overall health. The primary objectives of dietary intervention are essentially the same for Type 1 and Type 2 diabetes as follows:

- Maintain blood glucose, blood pressure, and lipid levels within normal range.
- Achieve and maintain a healthy body weight.

- Prevent or delay complications.
- Respect cultural food preferences and individual willingness to change.
- Maintain enjoyment of eating by limiting restrictions to scientifically necessary adjustments.

Key nutritional recommendations

- Carbohydrates:** Aim for 50-55% of total calories with a focus on complex carbs and fibre rich foods. Carbohydrates form the major portion of our Indian diet. Food items like *rice, idli, dosa, chapathi, appam, puttu, paratta* have a high proportion of carbohydrates (65-80%). These foods are easily digested and cause an elevation in blood sugar. They have a high GI. They should be eaten in limited amounts to prevent high blood sugar. Underground vegetables like potatoes, yam, colocasia, tapioca are also starchy foods and must be restricted.
- Proteins:** Include 10-15% of calories from good quality proteins utilizing combination of foods from different food groups. This includes pulses, beans, meat, poultry, fish, egg, milk and milk products.
- Fats and oils:** Use in moderation and choose a variety of oil seeds, nuts and legumes. Target 20-30% of total calories from healthy fats emphasizing oils, nuts and seeds. Minimise consumption of high -fat, high-sugar, and high-salt foods including ultra-processed foods.
- Fibre:** The fibre present in foods traps the sugars and only gradually releases it into the blood stream, thereby preventing a sudden rise of sugars in the blood stream. Thus it is important to include at least one serving (100g) of fibre rich food with each meal.
- Added - sugars:** Limit solid foods to 5% of energy from added sugar and 10% from total sugar. For beverages limit is 10% from added sugar and 30% from total sugar. For taste, while one may replace sugar with sugar free, but all sugar substitutes have side effects that could be harmful. It is best to avoid sugar. Don't eat direct glucose/sucrose (sugar). There is no difference between glucose, sucrose (sugar), honey and or jaggery in terms of their impact on blood glucose. Impact of fructose (sugar in fruits) on blood glucose is relatively better.
- Vegetables, fruits, nuts and milk:** These should form a remainder of the diet, providing essential micro nutrients. Include natural/raw fruits and vegetables which have a lower glycemic index. (e.g. salad vegetables have a lower glycemic index than cooked vegetable; fruits have a lower glycemic index than fruit juice). The simplest way to lower glycemic index of food is to chew it properly, so that food that reaches stomach and intestines is adequately mixed with saliva.

Diet of any individual is not to be changed completely for treatment of diabetes. Changes should be suggested within the usual diet options for the patient, that also address the working hours of the patient. In addition to the above dietary modification, a healthy lifestyle with adequate sleep and exercise, meditation, and work-life balance, will help to manage blood sugar within normal range. The person should be physically active and should do exercise regularly to maintain good health. At least 150 min/week of aerobic exercise is recommended for diabetes. Best exercise would be brisk walking, yoga (under supervision), racket sports, cycling and swimming, etc. Following a regular meal timing, with a consistent quantity and relatively fixed composition, practising portion control for all food items and reading food labels help to make informed healthy choices.

Lifestyle interventions

To prevent lifestyle diseases, focus should be on a balanced diet, regular physical activity, stress management, and avoiding tobacco and alcohol consumption. Regular health check-ups and screenings are also important for early detection and intervention. Nutrition plays an elementary role in the prevention and management of lifestyle diseases. Preventive dietary strategies include:

- **Reducing saturated fats, trans fats, and sodium:** Reduced intake of saturated fats, trans fat and sodium lowers the risk of hypertension and cardiovascular diseases.
- **Increasing intake of fruits, vegetables, whole grains, and legumes:** These provide essential nutrients and antioxidants.
- **Mediterranean diets:** This diet, rich in fruits, vegetables, whole grains, and healthy fats, has been linked to reduced risk of cardiovascular disease and other chronic conditions. It has also proven to lower risk of metabolic syndrome.
- **Limiting added sugars, processed foods and unhealthy fats:** These can contribute to weight gain and increase the risk of chronic diseases. Portion sizes should be controlled. Eating smaller portions can help maintain a healthy body weight. Reduced consumption of these also helps to prevent obesity and insulin resistance.
- **Embrace a balanced diet:** Prioritize fruits, vegetables, whole grains and lean proteins in our daily diet. Eat more natural foods and seasonal foods.
- **Intake of water:** Body should always be hydrated. Drinking plenty of water throughout the day is very important. Substituting sugary drinks with nutritious alternatives such as milk, lassi, fresh fruit juices, or wholesome soups may greatly enhance well-being. Furthermore, regularly opting for balanced, home-made meals is preferable to consuming processed food items.

- **Physical activity and exercise:** Regular physical activity significantly reduces the risk of most lifestyle diseases. Engaging in activities like walking, swimming, cycling, or dancing is recommended. It should be a regular habit. Incorporation of physical activity into the daily routine, such as taking the stairs instead of the elevator or walking during lunch break is advised. Exercises improve insulin sensitivity, lowers blood pressure, reduces abdominal fat, and enhances mental well-being.



Lab activity

1. Plan a day's menu for the following categories, prepare a dish from the planned diet and calculate its nutritive value.
 - a. Anaemia (Iron, Vitamin B12)
 - b. Hypertension (Sodium, Fat)
 - c. Obesity (Calorie, Protein)
 - d. Diabetes Mellitus (Carbohydrate, Fibre)

(Nutritive value of Indian foods - Source: Internet Archive <https://share.google/ygUKLR0Lt1uyqPu46>)



Check your progress

1. Match the following :

A	B
1. Physical Activity	a. Eat at consistent times with balanced portions.
2. Sleep and Stress Management	b. Drink plenty of water: replace sugary drinks with healthy options.
3. Meal Timing and Portion Control	c. Include at least 150 minutes/week of aerobic exercise and stay active daily.
4. Hydration	d. Ensure adequate rest and manage stress through relaxation or meditation.

2. Differentiate types of anaemia.
3. Analyse the dietary modifications to be followed during anaemia.
4. Prepare a poster on the causes of hypertension.
5. Suggest the lifestyle modifications to be done to prevent hypertension.
6. List the causes of obesity.
7. Evaluate the dietary modifications to be followed for the prevention of obesity and diabetes.
8. Compare the types of diabetes.

Appendix - 1

SUMMARY OF RDA FOR INDIANS - ICMR- NIN, 2020

Age Group	Category of work	Body Wt (kg)	Protein (g/d)	Dietary Fiber* (g/d)	Calcium (mg/d)	Magnesium (mg/d)	Iron (mg/d)	Zinc (mg/d)	Iodine (µg/day)	Thiamine (mg/d)	Riboflavin (mg/d)	Niacin (mg/d)	Vit B6 (mg/d)	Folate (µg/d)	Vit B12 (µg/d)	Vit C (mg/d)	Vit A (µg/d)	Vit D (IU/d)
Men	Sedentary	65	54.0	30	1000	440	19	17	140	1.4	2.0	14	1.9	300	2.2	80	1000	600
	Moderate			40						1.8	2.5	18	2.4					
	Heavy			50						2.3	3.2	23	3.1					
Women	Sedentary	55	46.0	25	1000	370	29	13.2	140	1.4	1.9	11	1.9	220	2.2	65	840	600
	Moderate			30						1.7	2.4	14	1.9					
	Heavy			40						2.2	3.1	18	2.4					
	Pregnant woman		+9.5 (2 nd trimester) +22.0 (3 rd trimester)	-						2.0	2.7	+2	2.3					
	Lactation		+17.0 +13.0	-						2.1	3.0	+5	+0.26 +0.17					
Infants	0-6m	5.8	8.0	-	300	30	-	-	100	0.2	0.4	2	0.1	25	1.2	20	350	400
	7-12m									0.4	0.6	5	0.6					
	0-6 m*									0.2	0.4	2	0.1					
Children	6-12m	8.5	10.5	-	300	75	3	2.5	130	0.4	0.6	5	0.6	85	1.2	30	350	400
	1-3y	12.9	12.5	15	500	90	8	3.3	90	0.7	1.1	7	0.9	120	1.2	30	390	600
	4-6y	18.3	16.0	20	550	125	11	4.5	90	0.9	1.3	9	1.2	135	2.2	35	510	
	7-9 y	25.3	23.0	26	650	175	15	5.9	90	1.1	1.6	11	1.5	170	2.2	45	630	
	10-12y	34.9	32.0	33	850	240	16	8.5	100	1.5	2.1	15	2.0	220	2.2	55	770	600
	Girls	36.4	33.0	30	850	250	28	8.5	100	1.4	1.9	14	1.9	225	2.2	50	790	600
	Boys	50.5	45.0	43	1000	345	22	14.3	140	1.9	2.7	19	2.6	285	2.2	70	930	600
	Girls	49.6	43.0	36	1000	340	30	12.8	140	1.6	2.2	16	2.2	245	2.2	65	890	600
	Boys	64.4	55.0	50	1050	440	26	17.6	140	2.2	3.1	22	3.0	340	2.2	85	1000	600
	Girls	55.7	46.0	38	1050	380	32	14.2	140	1.7	2.3	17	2.3	270	2.2	70	860	600

* Adequate Intake (AI)

Note: For adequate intake of Biotin and Pantothenic acid, refer to the text on summary of recommendations.

Appendix - 2

Suggested food groups for a balanced diet to meet the daily nutrient requirements

Age group	Category of work	Body wt	Cereals /Millets (g)**	^Pulses & Beans (g)	GLV (g)	Vege tables (g)	Roots & Tubers (g)	Fruits (g)	Nuts (g)	Milk/ Curd (ml)	Fats & oils (g)	Energy (Kcal) obtained from these food groups	Crude protein (g) Obtained from these food groups
Men	Sedentary	55	230	75	100	200	100	100	30	300	30	~1900	64
	Moderate		320	105	100	200	100	100	40	300	35	~2400	82
Women	Sedentary	50	180	60	100	200	100	100	25	300	25	~1660	55
	Moderate		250	85	100	200	100	100	30	300	30	~2125	68
Pregnant women		55+10	220	75	150	200	100	150	40	400	30	~2020	72
Lactating women	0-6 m		260	85	150	200	100	150	40	400	35	~2245	77
	7-12 m		250	85	150	200	100	150	40	400	35	~2200	78
Exclusive breastfeeding													
Infants	0-6 m	5.8											
	7-12 m	8.5	25	12	20	25	20	40-60	7	*milk	10		
Children	1-3 yrs	12.9	100	50	50	100	50	60-75	10	350	20	~1110	38
	4-6 yrs	18.3	160	60	50	100	50	75	15	350	20	~1370	46
	7-9 yrs	25.3	200	65	100	150	100	100	20	400	25	~1710	59
	10-12 yrs	34.9	280	90	100	200	100	100	30	400	35	~2230	76
Boys	10-12 yrs	36.4	250	85	100	200	100	100	30	400	30	~2060	70
Girls	10-12 yrs	36.4	250	85	100	200	100	100	30	400	30	~2060	70
Boys	13-15 yrs	50.5	390	130	100	200	100	100	40	400	45	~2860	95
Girls	13-15 yrs	49.8	300	100	100	200	100	100	35	400	40	~2410	81
Boys	16-18 yrs	64.4	450	150	100	200	100	150	50	400	55	~3300	107
Girls	16-18 yrs	55.7	315	105	100	200	100	150	40	400	40	~2490	85
Elderly	>60 yrs	Man	170	75	100	200	100	150	30	400	25	~1740	62
		Woman	140	70	100	200	100	150	30	400	15	~1530	56

** 20% to 30% of Cereals (weight in raw) should be from millets for adults. 20% of cereals (raw weight) should be from millets for children upto 10 years of age.

^ For non-vegetarians, 30g of pulses may be substituted with meat.

* Continue breast milk, which is roughly 580ml per day.

- Sugar should be less than 5% of the total energy per day.
- No added sugar for children <2 years old.
- These suggested food groups are for children who are growing normally and for adults with normal BMI (18.5 to 23).
- The suggested diets provide around 30% energy from total fats and ~15% from protein.
- Age groups for children and boys/girls: e.g., 1 to 3 yrs means 1+ to 3 yrs 11 months; 4 to 5 yrs means 4+ to 5 year 11 months and so on.