ALAGAPPA UNIVERSITY

[Accredited with 'A+' Grade by NAAC (CGPA:3.64) in the Third Cycle and Graded as Category–I University by MHRD-UGC]

KARAIKUDI – 630 003

DIRECTORATE OF DISTANCE EDUCATION

M.A. [Child Care & Education]
312 12

CHILD HEALTH AND NUTRITION

I - Semester

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CHILD HEALTH AND NUTRITION

Authors:

Richa Sharma, *Assistant Professor, Jagannath University, Haryana*

Units: (1, 2.0-2.2, 2.5, 3.0, 3.2, 3.3, 4.0, 4.2, 4.3, 4.4, 5, 6.3, 6.2, 7, 8)

Dr Rajlakhsmi Raina, *Assistant Professor, Amity University, Noida*

Units: (9-14)

Amit K Kashyap, *Assistant Professor, Gujarat National Law University, Gujarat*

Dr. Anjani Singh Tomar, *Assistant Professor, Gujarat National Law University, Gujarat*

Unit: (2.3)

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Child Health and Nutrition

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INTRODUCTION

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Food is one of the basic needs of life. It is required for growth, to maintain good health, to meet special needs during pregnancy and lactation and recovery from illness. Food is composed of nutrients required for our body. Upon consumption of food, organisms assimilate the nutrients present in them and use it for growth and replacement of tissues. The process of assimilation of nutrients is called 'Nutrition'.

Therefore, to lead a healthy life, we all need adequate food and nourishment. Food, which is essential for survival and growth of human beings, can also lead us to many health risks if not chosen properly.

This nutrition is especially important in the formative years of life. The nutritional needs change as per the age group, region, sex and other related factors. In fact, the nutrition of pregnant and lactating mother is also extremely important for the child about to be born. In case, there are nutritional deficiencies, certain diseases also develop in the children. The overall nutritional status is also examined through varied ways to ascertain the problem areas and to develop and implement targeted programmes and ensure that the deficiencies are corrected. The efforts for this involves work from the individual household, the national government as well as international agencies.

This book, *Child Health and Nutrition*, covers all these aspects. This book is written with the distance learning student in mind. It is presented in a user-friendly format using a clear, lucid language. Each unit contains an Introduction and a list of Objectives to prepare the student for what to expect in the text. At the end of each unit are a Summary and a list of Key Words, to aid in recollection of concepts learnt. All units contain Self-Assessment Questions and Exercises, and strategically placed Check Your Progress questions so the student can keep track of what has been discussed.

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BLOCK - I

NUTRITION AND HEALTH

UNIT 1 NUTRITION AND HEALTH

Structure

1.0 INTRODUCTION

Balanced nutrition includes drinking plenty of water and having a wholesome diet by regularly eating foods from each of the six foods groups: grains, vegetables, fruits, milk products, meat, beans and oils. These foods contain nutrients such as: proteins, carbohydrates, fats, minerals, vitamins and water. It is important that to remain healthy and achieve proper growth and development, an individual follows a regular diet comprising of all these nutrients along with the intake of a good amount of water.

There are many children who do not get enough food or the right kind of food to eat. Because of this, their growth becomes stunted, they become ill, many of them die, or they do grow up as clever, or as healthy as per their age. The causes and consequences of poor nutrition are necessary to understand, so that there are ways to prevent and manage it.

According to the research, low food intake and infections are the immediate causes of malnutrition. The underlying causes include insufficient household food security, inadequate childcare and poor basic health services in the community. It also includes poor living conditions, lack of education, heavy physical work, and frequent childbearing. There are basic causes which include economic structure, political and ideological superstructure. It has also been seen that, the mortality rate among the preschool children is too high in developing countries in general. It is quite clear that malnutrition in

combination with infection, often is, the cause of high morbidity and mortality. In this unit, you will learn about the concept of nutrition, the interrelation between nutrition and health and the indicators of health.

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1.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the concept of nutrition
- Explain the meaning of nutrition
- Examine the interrelation between nutrition and health
- Describe the different indicators of health

1.2 AN OVERVIEW OF NUTRITION AND CONCEPT OF NUTRITION

In this section, we will have a look at the concept and meaning of nutrition.

1.2.1 Concept of Nutrition

A discussion on the concept of nutrition must begin with the clearing of some of the basic terms used.

Food: It is defined as any solid or liquid that is taken by any individual and will enable the body to carry out any of its life function. Most of the foods are made up of several simple substances, which we call nutrients. There are six nutrients each of which has specific function in the body. Those that supply energy are the carbohydrates and fats. Those responsible for growth and repair of tissues cells are proteins. Those, which regulate chemical process in the body, are the vitamins and minerals. Water is present in most foods and is an indispensable component of our bodies. It is the means of transportation for most nutrients and is needed for all cellular activities.

Nutrition: It is the sum of the entire procedure through which living things receive and utilize the necessary materials for survival, growth and maintenance of worn out tissues.

Malnutrition: This is the condition that results from an imbalance between dietary intake and requirements. It includes under nutrition, which results from less food intake and hard physical work and over nutrition results from excess food intake and less physical activities.

Diet: It is defined as food containing all the nutrients in a sufficient amount and in proper ratio.

Roughage: Roughage is defined as food fibers that enables the body to get rid of waste products, which would otherwise become poisonous to the body. It prevents many problems such as gastrointestinal disorders (gastritis,

appendicitis, gallbladder stone and constipation) as well as metabolic disorders (diabetes mellitus, hypertension, ischemic heart disease and colon cancer).

Now that you have learnt about the basic concepts, let's have a look at some of the guidelines which are often advised for maintaining a good diet.

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Dietary Guidelines

- Eat wide variety of foods
- Maintain a healthy diet and weight
- Choose the diet low in fat, saturated fat, and cholesterol
- Choose a diet with plenty of vegetable, fruits and grain products
- Use of sugar in moderation
- Use of salt and sodium in moderation
- If you drink alcoholic beverage, do so in moderation.

It must also be ensured that the food and drinking water is clean and free from disease causing germs (bacteria, viruses and parasites) to remain healthy. Purified water must be included in the diet. It is prepared by removing dirt from the water ad treating the water to remove or kill germs. In some areas government delivers purified water through secured plumbing. However, in most of the countries, water must be purified before taking into use. It is necessary to wash the food and fruits before including it in the diet. For that food should be washed, peeled and then cooked, boiled, or sanitized before eating.

In the aforementioned guidelines, there are mentions of having variety of food. Let's see how food is divided into different groups based on shared characteristics.

Food Groups

- Milk, cheese, yoghurt
- Meat, poultry, fish and alternates
- Fruits and vegetables
- Bread and cereals
- Fats, sweets and alcohols

Why human beings need food?

Human beings need food to provide energy for the essential physiological functions such as:

- Respiration process
- Circulation of blood and tissues
- Digestion of food and substances

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- Metabolism of fluids
- Maintaining body temperature
- Growth and repair body Tissues
- Cognitive Development

An adequate amount of nutrients is the prime requisite to maintain all the functions of the body and for proper functioning of the body and daily activities at maximum efficiency along with ensuring a healthy lifestyle. Health and nutrition are closely related to each other and to ensure proper development of the individual right from the childhood it is necessary for every individual to take balanced diet. But what are the reasons a person is not able to have a balanced and what are the causes that are behind malnutrition? Let's discuss these here.

Major Causes of Malnutrition

- Lack of knowledge in selecting foodstuff with high nutritive value
- Poverty and infectious diseases
- Drought
- Uneven distribution of the available foods
- Social arrest and civil conflicts
- Transport problems (inaccessibility)
- Increased populations
- Inadequate weaning
- Farming technique-insufficient
- Poor management of resources
- Topographical differences in different regions (variation in productivity)
- Loss of food through destruction by insects
- Exploited land due to planting the same type of food crop for many years, erosion because of overgrazing and moreover the farmers could not use the fertilizers due to many reasons.

Daily calorie requirements of individuals

- Infants 1 - 3 years need 1,000 cal/day
- Children 5 years need 1,500 cal/day
- Children 5 – 8 years need 1,800 cal/day
- Children 10 – 12 years need 2,000 cal/day

For adolescents and adults calorie requirements depend on the degree of physical activities.

From 13 – 20 years of age

Office worker	Heavy work 3,500 cal/day	
2, 800 cal/day	Adults 2,300-cal/day	2,700 cal/day
Very heavy work up to	4,000 cal/day	

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For pregnant woman, the daily figure must be increased by 150 calories for the first trimester and 350 for the second and third trimester. For the nursing mother the daily figure must be increased by 800 calorie.

Staple foods

Staple foods are foods, which form the largest part of a nation's diet. They are of plant origin and are classified into three main groups:

- The grain and cereals
- The roots and tubers
- The starchy fruits

Carbohydrates

Carbohydrates provide a great part of the energy in all human diets. In the diet of poor people, especially in the tropics, up to 85% of the energy may come from this source. On the other hand, in the diet of the rich people in many countries the proportion may be as low as 40%. However, the cheapest and easily digestible fuel of humans is carbohydrate.

Carbohydrates are components of body substances needed for the regulation of body processes. Heparin, which prevents blood from clotting, contains carbohydrate. Nervous tissue, connective tissue, various hormones, and enzymes also contain carbohydrate. Ribose, another carbohydrate is part of Deoxyribonucleic acid (DNA) and ribonucleic acid (RNA).

Carbohydrates are necessary for the proper use of fats. If carbohydrate is taken in low quantity, larger than normal amounts of fats are called on to supply energy. The body is unable to handle the excessive breakdown of fat. As a result, the fat does not burn completely, and abnormal amounts of certain breakdown products accumulate in the blood, causing a condition known as ketosis.

Proteins

Proteins have long been recognized as fundamental structural elements of every cell of the body. Specific proteins and protein derivatives have been recognized as functional elements in certain specialized cells glandular secretion, enzymes and hormones. Proteins in natural foods differ widely in the number and the proportion of the 22 or more amino acids.

A good quality or a complete protein is the one that supplies all the essential amino acids in sufficient quantities and in proper ratio for normal

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growth and maintenance. In general, all proteins from animal source, such as meat, poultry, fish, eggs, milk and milk products provide good quality proteins.

Source of proteins

- Milk and milk products such as cheese, ice cream all derive their protein from milk
- Meat, poultry, and fish are all forms of animal tissues
- Eggs are in a class by themselves a protein food of high nutritive value
- Vegetables are poor source of protein
- Legumes provide more than 4 or 6 percent. They are listed as meat alternates in the four-food group chart because they provide one of the better-quality plant proteins.
- Bread and cereals make an important contribution to the protein of the diet, the protein of uncooked grain ranges 7 to 14 percent.

Lipids

Lipids are a group of organic compounds that are insoluble in water but soluble in organic solvents. Lipids are fats and oils. Lipids:

- Form of stored energy in animals
- Have high energy value 9 kcal/gm of fat
- Act as carriers for fat soluble vitamins
- Palatable as it gives good taste and satiety
- Serve as insulator preventing heat loss from the body
- Lubricates gastrointestinal tract
- Protect delicate organs such as kidney, eyes, heart and the like.

1.2.2 Meaning of Nutrition

The word nutrition first appeared in 1551 and comes from the Latin word 'nutrire', which means 'to nourish' Now a day, we define nutrition as the sum of all the processes involved in how organisms obtain nutrients, metabolize them, and use them to support all of life's processes.

Nutritional science is the investigation of how an organism is nourished and incorporates the study of how nourishment affects personal health, population health, and planetary health. Nutritional science covers a wide spectrum of disciplines. As a result, nutritional scientists can specialize aspects of nutrition such as biology, physiology, immunology, biochemistry, education, psychology, sustainability, and sociology.

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In 1946, the World Health Organization (WHO) defined health as 'a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity.'

Nutrition is the science involving interaction of nutrients with other substances in food in relation to maintenance of growth and development of an individual. Nutrition involves taking up of proteins, lipids, fruits and vegetables after a certain period.

The foods we eat contain nutrients. Nutrients are substances required by the body to perform its basic functions. Nutrients must be obtained from diet, since the human body does not synthesize them. Nutrients are used to produce energy, detect and respond to environmental surroundings, move, excrete wastes, respire. Substances required by the body that must be obtained from the diet to, grow, and reproduce.

There are six classes of nutrients required for the body to function and maintain overall health. These are carbohydrates, lipids, proteins, water, vitamins, and minerals. Foods also contain non nutrients that may be harmful (such as cholesterol, dyes, and preservatives) some are beneficial (such as antioxidants).

Check Your Progress

1. Name the type of nutrients which regulate chemical process in the body.
2. What are the daily calorie requirements of infants?
3. What are the categories of malnutrition?

1.3 INTERRELATION BETWEEN NUTRITION AND HEALTH

The problem of under nutrition is common among impoverished people, pregnant women, infancy and adult people in developing countries, where food production and supply are inadequate. Poverty has been found as the leading risk factor of under-nutrition in both the developed and developing countries. According to the statistics, more than a billion people live on the equivalent of less than $1.25 per day.

However, many other factors are responsible for under nutrition, including: war, overpopulation and disease in the developing countries. Hence, three factors that contribute to under-nutrition are poverty, war and disease.

Poverty exists when people lack the means to satisfy their basic needs. It is a loading risk factor for under-nutrition in both developed and developing

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countries. More than a million people live on the equivalent of less than $1.25 per day and those living in chronic poverty unquestionably struggle to obtain food to meet their nutritional needs, basic services that would reduce under nutrition and poverty including health care and education programme.

On the other hand, poor access to and utilization of quality reproductive health services contributes significantly to the high maternal mortality level. Each year 35% of deaths in children under 5 years of age or 3.5 million children are related to maternal or child under-nutrition.

Statistics suggest that productivity rate would significantly increase on a global scale if iron deficiency anemia were eliminated. Because of the increase productivity the number of people living in poverty would be reduced. Women with iron deficiency anemia are at greater risk for serious complications during childbirth including hemorrhage or uncontrolled bleeding which can be deadly. According to health experts, maternal mortality rates could be decreased by 20% with appropriate iron supplementation during pregnancy.

Further, poverty is often identified as a major barrier to human development. It is also a major cause of maternal mortality as it prevents many women from getting proper and adequate medical attention due to their inability to afford good antenatal care. Thus, poverty is a threat to human existence particularly women's health.

Under-nutrition is harmful during the period of rapid growth and development, especially at the time of elevated nutrient needs, for example during the period of pregnancy, infancy and childhood.

It has been seen that, under-nutrition mostly occurs in older adults as a result of physiological changes which are rapid, in the adulthood stage of development. These physiological happen because of the ageing process, which results in weakening of the immune system with the age of the individual and therefore older adults have a greater risk of developing the physiological consequences of chronic under nutrition than the younger adults.

Further, according to statistics, every year, nearly 35% deaths occur in children who are under 5 years of age or 3.5 million children who are related to maternal or children under nutrition. And, it has also been seen that, worldwide, one in every four children is stunted and about one every five children are underweight because of under-nutrition. Hence, it is evident that, adults and children are the two groups at risk for under-nutrition.

The groups of individuals most likely to experience harmful consequences from chronic under-nutrition are infancy, pregnancy and childhood. It has been commonly seen that, under-nutrition mostly occurs in older adults as compared to the younger adults because the process of ageing weakens the immune system.

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Chronic under-nutrition mostly occurs during the period of rapid growth, development and elevated nutritional needs and the physiological process are slow in older adults as compared to the younger adults. Therefore, the group of individuals who are least likely to experience harmful consequences of under-nutrition are younger adults.

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1.3.1 Indicators of Health

There are various indicators which can be used to get information about the health status of children including immunization, birth weight, diseases, etc. The following are the definition of some of the health and nutritional indicators used in the 'ANNUAL HEALTH SURVEY REPORT A REPORT ON CORE AND VITAL HEALTH INDICATORS PART I':

- Immunization is a process by which resistance to a particular disease is developed through vaccination. Fully immunized child refers to infants who receive within 11-23 months BCG (Bacillus Calmette–Guérin) vaccination against tuberculosis, three doses of DPT (Diphtheria, Poliomyelitis and Tetanus,), minimum three doses of polio vaccine and one dose of measles vaccine.
- Birth weight refers to an infant's weight measured immediately at the childbirth. Low birth weight is defined as children whose birth weight is less than 2.5 Kg.
- Measurement of key micro-nutrients like
  - (*i*) Vitamin A is administered through oral doses every six months to children aged between 9 months and 5 years to avoid its deficiency.
  - (*ii*) Iron and folic acid (IFA) is a supplementary nutrient administered as syrups or tablets to children beyond the age of six months.
- Child feeding practices: these indicator studies two aspects, namely, breastfeeding within an hour of birth and exclusive breast feeding for six months.
- Childhood diseases: An indicator that analyzes the prevalence of fever, diarrhoea and acute respiratory infection.

These indicators are also used for assessing child health by National Family Health Survey in addition to checking for the anthropometric data on height and weight as nutritional indicators. For meeting the Child Health Goals of the National Health Policy 2017, the following indicators are considered infant mortality rate, neo-natal mortality rate and under five mortality rate.

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Similarly, the UNICEF uses the following health and nutrition indicators:

Child Survival

- Under-five child mortality
- Neonatal mortality

Child Health

- Pneumonia
- Diarrhea
- Malaria
- Immunization

Child Nutrition

- Malnutrition
- Low birthweight
- Infant and young child feeding (incl. breastfeeding data)

We have already seen how nutrition is one of the biggest factors affecting child health, let's discuss the crucial deficiency which has a major impact on nutrition. It is evident that, lack of nutrient-dense foods and variety in the diet are the leading cause of micronutrient deficiencies worldwide. Four micronutrients that are identified as top public health concerns are mentioned below: Vitamin A is found to be the leading cause of childhood blindness or xerophthalmia. According to the statistics, approximately 250 million children around the world do not consume adequate quantity of vitamin A. Nearly, 500,000 children develop blindness each year because of Vitamin A deficiency.

The four leading micronutrients deficiencies worldwide are Vitamin A, Iron, Iodine and Zinc. Major health concerns for each of the micronutrient deficiencies are mentioned below:

Deficiency of vitamin A causes childhood blindness or xerophthalmia. According to statistics, it is evident that, approximately 250 million children around the world do not consume sufficient quantity of vitamin A and as many as 500,000 children develop blindness every year due to vitamin A deficiency. Further, weakening of immune system occurs as a result of vitamin A deficiency due to which a person is unable to combat infectious diseases.

Iron deficiency is found to be one of the most prevalent micronutrient deficiency. Deficiency of iron results in abnormal cognitive functioning and reduce physical activity levels. Iodine is one of the major micronutrient responsible for metabolism and thyroid functioning. The most common result

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of Iodine deficiency is seen as Goiter. Iodine deficiency during pregnancy period can result in intellectual disability in the developing fetus. Iron deficiency is one of the most prevalent micronutrient deficiency throughout the world. Iron is required for the hemoglobin development. Without Iron, sufficient oxygen delivery to the brain and muscles are not possible.

Some of the natural food resources of Iodine include dairy foods and sea food products.

Zinc controls and regulates the immunity which increases person's resistance towards infection. It is found that, nearly half a million deaths of children throughout the world who are under 5 years of age is due to zinc deficiency. Zinc regulates immunity in an individual, which increases person's resistance towards infection. Women who have low zinc status prior to becoming pregnant will further deplete their zinc stores during pregnancy, unless they obtain zinc supplementation. Babies who are born to zinc deficient mothers are highly likely to be deficient in the micronutrient as well. Further, if the micronutrients are taken in adequate amount in the diet then effects of malnutrition and under-nutrition can be overcome to a larger extent.

Food insecurity is the state in which individuals do not have enough money to buy more food. People, who are unemployed, work in low-paying jobs or have excessive medical and housing expenses generally face this situation of food insecurity.

The causes of under-nutrition and hunger are complex and, therefore difficult to eliminate. A few of the major global food aid agencies striving to eliminate under nutrition are as follows:

1. **United Nations Children's Fund (UNICEF):** Strives to save and improve children's lives by providing health care and immunizations, clean water, nutrition education and emergency relief.
2. **UN Food and Agriculture Organization:** Develops worldwide strategies to meet the following objectives:
   (a) Eliminate hunger and malnutrition
   (b) Improve production and sustainability of agriculture.
   (c) Decrease rural poverty and
   (d) Ensure efficiency of agriculture and food systems.

UNICEF and UN Food and Agriculture Organization are the two international agencies that sponsor programmes to reduce under nutrition worldwide.

Three nutrition assistance programmes available globally that experience food insecurity are mentioned below:

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S.No.	Nutrition Assistance Programme	Agency	General Eligibility Requirements	Description
1.	Supplemental Nutrition Assistance Programme (SNAP)	PNS	Low income individuals and families	It enables the qualified low-income participants to use monthly cash allotment and special debit card to purchase food from authorized stores.
2.	Special supplemental nutrition assistance programme for Women, Infants and Children. (WIC)	FNS	Low-income pregnant, breastfeeding or postpartum, women; infants and children upto 5 years of age who are at nutritional risk.	Participants receive cheques or vouchers to purchase approved food items additional in nutrition education, health referrals and breastfeeding support are provided
3.	W I C Farmers Market Nutrition Programme	FNS	Same eligibility as WIC except infants	Participants receive coupons to purchase fresh unprepared fruits and vegetables that are locally grown and sold at the farmers market and approved roadside stands.

Hence, the nutrition assistance programmes help the individuals to overcome food insecurity, thereby providing the participants assistance. However, every nutrition assistance programme has specific general eligibility requirements.

Check Your Progress

4. Name the stages of growth and development when under-nutrition is harmful.
5. Mention some of the natural food resources of iodine.

1.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Nutrients which regulate chemical process in the body, are the vitamins and minerals.

2. Infants 1 - 3 years need 1,000 cal/day.
3. Malnutrition includes under nutrition, which results from less food intake and hard physical work and over nutrition results from excess food intake and less physical activities.
4. Under-nutrition is harmful during the period of rapid growth and development, especially at the time of elevated nutrient needs, for example during the period of pregnancy, infancy and childhood.
5. Some of the natural food resources of Iodine include dairy foods and sea food products.

1.5 SUMMARY

- Balanced nutrition includes drinking plenty of water and having a wholesome diet by regularly eating foods from each of the six foods groups: grains, vegetables, fruits, milk products, meat, beans and oils. These foods contain nutrients such as: proteins, carbohydrates, fats, minerals, vitamins and water.
- Food is defined as any solid or liquid that is taken by any individual and will enable the body to carry out any of its life function. Most of the foods are made up of several simple substances, which we call nutrients.
- Major dietary guidelines include: Eat wide variety of foods, maintain a healthy diet and weight, choose the diet low in fat, saturated fat, and cholesterol, choose a diet with plenty of vegetable, fruits and grain products, use of sugar in moderation, use of salt and sodium in moderation and if you drink alcoholic beverage, do so in moderation.
- Carbohydrates provide a great part of the energy in all human diets. In the diet of poor people, especially in the tropics, up to 85% of the energy may come from this source.
- Proteins have long been recognized as fundamental structural elements of every cell of the body. Specific proteins and protein derivatives have been recognized as functional elements in certain specialized cells glandular secretion, enzymes and hormones.
- Lipids are a group of organic compounds that are insoluble in water but soluble in organic solvents. Lipids are fats and oils.
- The word nutrition first appeared in 1551 and comes from the Latin word ‘nutrire’, which means ‘to nourish’ Now a day, we define nutrition as the sum of all the processes involved in how organisms obtain nutrients, metabolize them, and use them to support all of life’s processes.

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- Nutritional science is the investigation of how an organism is nourished and incorporates the study of how nourishment affects personal health, population health, and planetary health. Nutritional science covers a wide spectrum of disciplines.
- The problem of under nutrition is common among impoverished people, pregnant women, infancy and adult people in developing countries, where food production and supply are inadequate.
- Three factors that contribute to under-nutrition are poverty, war and disease.
- There are various indicators which can be used to get information about the health status of children including immunization, birth weight, diseases, etc.
- The four leading micronutrients deficiencies worldwide are Vitamin A, Iron, Iodine and Zinc.

1.6 KEY WORDS

- **Food:** It is defined as any solid or liquid that is taken by any individual and will enable the body to carry out any of its life function.
- **Nutrition**: It is the sum of the entire procedure through which living things receive and utilize the necessary materials for survival, growth and maintenance of worn out tissues.
- **Malnutrition**: This is the condition that results from an imbalance between dietary intake and requirements.
- **Diet**: It is defined as food containing all the nutrients in a sufficient amount and in proper ratio.

1.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Write a short note on general dietary guidelines.
2. What are the major food groups?
3. Enumerate the essential physiological functions for which food provides energy to humans.
4. State the major causes of malnutrition.
5. What is nutritional science?
6. What are some of the major indicators of health and nutrition?

Long Answer Questions

1. Explain the concept of carbohydrates, proteins and lipids in food.
2. Describe the interrelationship between nutrition and health.
3. Discuss the four leading micronutrients deficiencies which are major indicators of health.

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1.8 FURTHER READINGS

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UNIT 2 HEALTH SITUATION IN INDIA

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Structure

2.0 INTRODUCTION

The healthcare system of India is vast and extensive but there remain wide differences in the quality of nutrition and diet taken by the rural and urban areas as well as in the public and private health care. Despite this, India is a popular destination for medical tourists, given the low costs and high quality of its private hospitals. Studying in India offers a number of challenges that students from developed countries are not used to, so it is important to know the healthcare system in India that operates in the event you need it. Healthcare in India is a vast system and much like the rest of the country full of challenges and paradoxes.

In this unit, you will learn about the National Health Policy and the concepts of health care services, financing and delivery in India.

2.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the national health policy in India
- Explain the health care services
- Describe the concept of health care financing
- Examine the health care delivery system in our country

2.2 NATIONAL HEALTH POLICY

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India's Health Ministry was established with the independence from Britain in 1947. Efforts have been made by the government as a priority in its series of five-year plans, each of which determines state spending priorities for the next five years. This National Health Policy was endorsed by the Parliament of India in 1983. This policy aimed at universal health care coverage by 2000, and the programme was updated in 2002. This health care system in India is primarily administered by the states. India's constitution tasks each state with providing health care for its people.

So as to resolve the issue of lack of medical coverage in rural areas, the national government launched the National Rural Health Mission in 2005. The focus of this mission is on the rural areas and their resources including those of poor states which have weak health services in the hope of improving health care facilities in the poorest regions of the country.

The healthcare system in our country is universal. That being said, there is a great discrepancy in the quality and coverage of medical treatment here. Healthcare in India in the rural and urban areas differ vastly. Rural areas often suffer from physician shortages, better medicines and health care facilities in the hospitals. Especially in the states like Bihar, people have limited access to the resources with adequate health care facilities. State government provide healthcare services and health education, while that of central government offers administrative and technical facilities.

Lack of adequate coverage by health care system in India led Indians to turn over to the private health care providers, although this option is quite inaccessible to the poor. To help pay for healthcare costs, insurance is available, often provided by employers, but most Indians lack health insurance, and out of pocket costs make up a large portion of the spending on medical treatment in India.

On the other hand, private hospitals in India offer world class quality health care at a fraction of the price of hospitals in developed countries. This aspect of health care in India makes it a popular destination for medical tourists. India also is a top destination for medical tourists seeking alternative treatments, such as ayurvedic medicine.

India is a popular destination for both the students and researchers of alternative medicine. International students should expect to rely on private hospitals for better medical facilities and their treatment in India. Local pharmacists can be a valuable resource for most minor health ailments.

Health Policy and Planning in Post-Independent India

During the British Raj, every dimension of Indian life, including medical and public health service was subordinate to commercial, political and

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administrative interests of the imperial (state) government in the United Kingdom and its representatives in India. However, the Britishers also permitted native Indian elite to avail of modern healthcare.

Keeping in view the constitutional directions aiming at elimination of poverty and ill health, the Government of India, soon after independence, planned several approaches for healthcare delivery. The basis of the health development policy in India was laid in the recommendations of the Health Survey and Development Committees, namely, Bhore Committee as early as 1946, Mudaliar Committee (1961), Chadah Committee (1963), Mukherjee Committee (1965), Jungalwala Committee (1967), Jain Committee (1968), Kartar Singh Committee (1973), and Srivastava Committee (1975). Besides the Committees, inputs have been provided by some studies on health policy, which were conducted by the autonomous institutions like the ICSSR and the ICMR. The important recommendations by these committees can be thematically grouped under the following: (a) for improving the existing institutional structure of healthcare delivery system; (b) to improve the supporting services for a proper and quick delivery of medicare facilities; and (c) to improve the quality of the delivery system thereby improve the health standard of the masses (Nagla 1993). Healthcare planning has undergone changes in its structure, personnel and in its access of the populace on the basis of recommendations made by different committees.

Nagla (1993) has highlighted the enormous efforts made by the various committees to chart out the growth of health manpower in India. The work of these committees has, however, been subject to serious data limitations. Information on different categories of health personnel, their priorities and distribution (especially in respect to professionals outside the public sector) has been rather scanty. The various committees and even institutions like the ICSSR/ICMR study group have been focusing on providing expert opinions rather than garnering accurate statistical data. No committee has been able to take into account the contribution of non-governmental health institutions and that of professionals in rendering healthcare services. Perhaps more importantly, the committees have been unable to assess the healthcare needs of the people through field surveys and ascertain the extent of utilization of healthcare institutions and practitioners (Yesudin 1981).

Health for all by 2000 AD

The low access to the basic healthcare facilities is a common phenomenon in most of the developing countries. In order to provide minimum basic health facilities, it was resolved by the Health Assembly of the WHO to launch a movement known as 'Health for all by 2000 AD'. In 1978, the Alma-Ata Conference re-affirmed 'Health for All' as the major social goal of all governments. In 1981, a global strategy for this programme was adopted by WHO, which was later endorsed by the UN General Assembly. India is a

signatory to those declarations and has made efforts to extend health facilities to the vulnerable sections of its society. 'Health for All' has been defined as attainment of "a level of health that will enable every individual to lead a socially and economically productive life" (Government of India, 1982).

The concept of 'Health for All by 2000 AD' implied a substantial change in basic health policies and in the approaches to healthcare. In order to provide minimum health facilities, the government of India along with the state governments increased the allocation to the health sector. On the whole, it appeared that there was tremendous investment in widening the health infrastructure, which included within its purview a variety of programmes and viewed health and humans as a vital component of overall socio-economic development.

A group set up jointly by the ICSSR and ICMR with Dr. Ramalingaswami as the Chairman came up with an alternative strategy to achieve health for all citizens. It suggested certain steps for restructuring the healthcare service infrastructure based on the principle of promoting the preventive and curative aspects of health. This group felt that, "the growth of healthcare services in the country has been haphazard and unrelated to the needs of poor and rural people who stand most in need of healthcare". The group remarked that several assumptions on which present system is based were wrong. For instance, there was no distinction between planning for health and that for health services so that little or no attention has been paid to the social, economic, political and cultural dimensions of health. The recommendations of the study group were more practical and provided details of health services up to the village level. It emphasized that most common illnesses can be self-cured and need only symptomatic treatment with simple remedies, be it herbal, indigenous, or allopathic medicine. The diseases, which are communicable, can be controlled by preventive measures, and can be readily diagnosed and treated with the help of cheap and highly effective drugs. The group, therefore, proposed that primary health services should be extended to the community through a trained and involved community health volunteer, preferably male or female, for a population of 1000. The study group recommended the elimination of the PHC category as it felt that it is an institution of semi-professional and paramedical personnel who deliver poor medical care and extend no preventive promotive healthcare (ICSSR and ICMR 1981).

National Health Policy (NHP) 1983

The National Health Policy (NHP), 1983, had hoped to provide 'Health for All by 2000 AD' particularly the poor and under-privileged through comprehensive primary healthcare services. The important aspects for the reforms were directed through the process of Planning and Health Policy (1983).The government of India has already considered and provided for health legislation, research, and its monitoring, and review of healthcare

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quantitative goals. Therefore, it can be concluded that the genesis of the health sector reforms and its various dimensions are already in-built in Indian policy instrument and its developmental framework. However, several pertinent issues in health sector reforms have a bearing on our Constitutional provisions—like equity, accessibility for the poor, efficiency in using resources and inadequacy of resources, gender bias, quality of healthcare, impact of liberalization etc.

Therefore, the National Health Policy, 2002, was formulated with a more realistic expectation and focussed more on financial resources. It was also envisaged that over a period of time financial resources will also be increased.

National Health Policy: 2002

The main objective of the NHP, 2002, was to achieve an acceptable standard of good health among the people, especially, the poor people. To make health services available to the people, the decentralization of public health system was targeted. This was possible by establishing new infrastructure in deficient areas and upgrading the infrastructure in the existing institutions. Importance was to be given to the equitable access to the health services across all sections of society and particularly the poor people and people living in remote areas. It was also emphasized that aggregate public health spending would be increased by the central government to strengthen the capacity of the public health administration at the state level to render effective service delivery. Since the country had accepted the policy of liberalization, entry of private health sector was encouraged primarily keeping in mind the people who could afford to have the capacity to pay for the health services. In NHP, importance was given to the preventive and first-line curative initiatives at the primary level through increased sectoral share of allocation. The rational use of drugs within the allopathic system was also preferred. Recently, increasing use of generic drugs over the branded drugs is encouraged particularly in the government health facilities. Access to tried and tested systems of traditional medicine are also being ensured.

In 2013-14, total health spending was 4.02 per cent of GDP and global enidence suggests atleast a spending of 5-6 per cent for meeting basic health care needs. Even earlier, it was seen that there was not much increase in the health expenditure over a period of different health plan budgets (National Health Policy: 2002). The figures of public health spending has alwas been in the range of 0.9-1.2 per cent of GDP and it was concluded that the expenditure on public health services was very meager and below the desirable standard. However, under the Constitutional structure, public health is the responsibility of the states. Under the federal structure it is the states which provide the health services to their population and central government helps them through certain National programmes and National Health initiatives. The contribution

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of central resources to overall public health funding has been limited to about 15 per cent (National Health Policy 2002). The fiscal resources of the state government are limited, as it has been reflected in the declining percentage of the state resources allocated to the health sector out of the total health budget. It was understood that to improve the decentralization of public health services, an increase in the health budget of the state government as well as budget of the central government on health is must. Amidst all this the NHP: 2002 was formulated.

It is also a reality that there is a paucity of public heath investment. It can only be increased when state governments and central government day a key role in reducing the fiscal deficit and augmenting public health investments. It was proposed that the central government will spend 6 per cent of GDP, with 2 per cent of GDP being contributed as public health investment by the year 2010. However, it is the failure of the government that it has not done what it envisaged in the NHP, 2002. To keep a higher budget for public health investment is also contingent upon the increasing capacity of the public health expenditure so the funds can be utilized gainfully. In the development of the country, central planning is the key feature and equitable regional distribution is the major objective. However, the deliberate focus on the development proves the attainment of the health indices has remained uneven across the states, rural-urban divide, e.g. infant mortality is much higher in rural areas as compared to urban areas. To reduce these inequalities and imbalances at inter-regional level, rural-urban level, between different economic classes, caste groups, the primary health sector was targeted. This approach envisaged to provide access to a vast number of people to facilitate preventive and early stage curative initiatives which are much more cost effective. This public health principle has set out an objective in NHP, 2002, by increasing the allocation to 55 per cent of the total public health investment for the primary health sector.

Primary health sector was given importance over tertiary and secondary health sectors. Secondary health sector was allotted with 35 per cent and tertiary sector with 10 per cent. The NHP, 2002, also projected that the increased aggregate outlays for primary health sector would boost the existing facilities and also open the door for new PHCs and sub-centres according to the norms of such facilities. India is a pluraristic society, therefore, there are different socio-economic and ethnic settings which require the differential programmes to cater to the health needs of the differential population. Therefore, National Health Programmes have to be designed with enough flexibility to allow the state governments to design their own programme package according to the needs of their people. These are to be carried out by the state governments through decentralized public health machinery.

In the past decade, the government has focused more on the vertical implementation structure for the major disease control programmes. With

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the help of these programmes, substantial achievements have been made in reducing the burden of diseases. However, it was realized that such an organizational structure requires independent manpower for each disease programme thus making it very expensive and difficult to sustain over a long period of time. It can only be possible in the case of certain diseases whose elimination or eradication is seen in a foreseeable future. The policy for the eradication and elimination of disease requires a major role of the central government with the active participation of the state governments. For public health facilities, the funding is insufficient. The personnel are also insufficient. The availability of consumable items is negligible, beds are insufficient, and equipment in many public health facilities is outdated or unusable. Buildings are in a dilapidated condition with some facilities being in rented accommodations.

Availability of essential drugs is minimal and the capacity of facilities is grossly inadequate. Over-crowding is another feature in the public health facilities which results in the steep deterioration of quality of health services delivered to the people. This results in the decreasing use of public health facilities i.e. around 20 per cent. Only less than 20 per cent seek outdoor patient service and less than 45 per cent avail indoor facilities in public health facilities. This is the situation in spite of peoples' inability to pay for the private services. According to a nation-wide survey of household expenditure on healthcare, nearly 55 per cent was spent on private doctors and only 39 per cent on public healthcare organization (National Council of Applied Economic Research, 1992). Health researchers noted that as much as 8 per cent of the poorest family's income gets spent on injections.

It was estimated that private personal health expenditure amounts to more be three times that of governmental spending, inclusive of health and expenditure on water and sanitation. The private healthcare contribution is coming through independent practitioners.

Non-governmental service providers were treating a large number of patients at the primary level for the major diseases. However, the treatment given by them was diverse and not scientifically optimal which led to an increase in the incidence of drug resistance.

In principle, this policy welcomed the participation of the private sector in all areas of health activities—primary, secondary or tertiary and it encouraged the private insurance companies to increase the coverage of secondary and tertiary sector under health insurance packages. In the National Health Framework, the alternative systems of medicine, like Ayurveda, Unani, Siddha and Homeopathy were also put under one umbrella to have their substantial role in the healthcare. There is a distinct advantage of the these alternative systems of healthcare as they have diversity, are cost effective, and low- level of technology input, based on the treatment from natural plant

based products. These advantages attract the under-served, remote, and tribal people as they find themselves closer to nature. There is substantial untapped potential of alternative systems of medicine as India is one of the important global centres of plant diversity in medicinal and aromatic plants.

National Rural Health Mission (NRHM): 2005

National Rural Health Mission was launched in April 2005 in eighteen states to provide healthcare to the rural people particularly to the vulnerable section, children, and women.

The aim was to provide comprehensive and integrated healthcare to the rural masses. In this mission, there is a provision to provide every village with trained female community health activist, known as Accredited Social Health Activist (ASHA). ASHA would be selected from the village community itself and she would be accountable to the Panchayat. She would work as mediator between the community and the public health system. These ASHA workers would not get any renumeration; they would be provided only performance incentives for promoting universal immunization, referral, and escort services for reproductive and child health and other programmes. On an average, they get ₹1,100 in a month and are provided with a drug kit having drugs for certain common ailments.

Trends in the Health Services (Prior to 2005)

The provision of health under the Indian Constitution falls in state subject. Today, every state is free to formulate their health programme and strategy. In fact, India was the first country in the world, who introduce Family Planning Programme in 1952. Since Independence, we have invested a lot in the health infrastructure and created 1,45,000 sub-centres, 23,000 PHCs and 3,222 CHCs. However, this infrastructure is still insufficient for the vast population, as still approximately 80 per cent of the population is receiving healthcare from the private sector. Poor access to public health facilities heads to higher incidence of morbidity and mortality.

In India, private households' contribution to healthcare is 75 per cent. Most of these costs are out-of-pocket costs. State governments contribute 15.2 per cent, the central government 5.2 per cent , and third party insurance and employers put in 3.3 per cent. Local governments and foreign donors contribute 1.3 per cent. Out of this amount, 58.7 per cent is spent on primary healthcare (curative, preventive, and promotive); 38.8 per cent on secondary and tertiary inpatient care and the rest on non-service costs (World Bank 1997).

Private Expenditure on Health (PHE) as a per cent of per capita income has almost doubled since 1961. The PHE as per cent of per capita income has increased from 2.71 during 1961-70 to 5.53 during 2001-03 Private

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expenditure on health has increased at much higher rate than the per capita income over the period of time.

The rich countries mobilized organizations such as the WHO, UNICEF and the World Bank to promote their agenda of Selective Primary Healthcare (SPHC). This led to opening up of virtual barrage of what the international agencies called International Initiatives (Grant 1985). The 'vertical' or 'categorical' programmes were not properly conceived. Techno-centric programmes are imposed by the western countries over the poor developing countries without understanding of their specificity. When these programmes were launched, lot of predictions were made for the success of the programmes despite spending of massive investment running in billions of US dollars. However, they did not achieve then goals. (Banerji 1999).

Government of India made a confession in its National Health Policy Document of 2002, that health services system suffered for agreeing to the donor driven vertical programmes which includes immunization for tuberculosis and AIDS.

International Monetary Fund (IMF), while giving the loans, also imposed certain conditions in the form of imposition of international initiative in the early phase of 1990s. The Structural Adjustment Programme (SAP) enabled the entry into most important elements of the governance of the country in the form of influencing budgetary allocations in the country.

The government was also forced to make certain unimaginative regime of 'cost recovery' from small allocations made for the government funded health services (Banerji 1994, World Bank: 1992, 1997). Private sector has been provided many subsidies and rebates in the import of medical instruments and for drugs. India has the largest and least regulated private healthcare industry in the world (Rao: *The Times of India,* 2006).

Globalization led to the trend of 'commodification' of the medical services. Growth of numerous unregulated profiteering private hospitals, nursing homes, diagnostic centres and other ancillaries has occurred. Unregulated institutions for education of physicians and other health personnel such as dentists, nurses, homeopaths and *vaids* rapidly expanded in the private sector with unabashed political support as they became a lucrative field for making profits at the expense of the suffering of the people.

All these trends point to what Ivan Illich calls 'medicalization' of life (Illich 1977). Producing dependence—almost addiction—to medicine and a generation of iatrogenesis of various kinds, were mentioned by him as maladies of the market driven 'modern' medicine. Systematization of medicine, when healers become a cog of the wider 'system' and its even more awesome manifestation in the form of a still bigger conglomerate— have been the more advanced manifestation of this malignant trend in the 'developed countries' (Illich: 1977). The imposition of the Trade Related Intellectual

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Property System (TRIPS) by the World Trade Organization (WTO) has led to the sharp rise in the prices of drugs.

The NRHM seeks to provide effective and integrated healthcare to the poor, needy, vulnerable, and marginalized sections of the society throughout the country (Government of India 2005). The basic mission of the healthcare is to provide universal access of healthcare facilities to all sections of society. ₹6713 crore has been marked for NRHM in the budget. However, in the 2005-06 budget the central government did not provide separate budget separately for NRHM. In fact, NRHM was asked to use its funds from the budget of Reproductive and Child Healthcare (RCH-2), Integrated Disease Surveillance project and the AYUSH programme.

The critique of the NRHM mentions that with the exception of the small states like Nagland and Haryana, there has been '0 per cent' growth in the setting up of PHCs. The performance of CHCs is also poor. Only eleven CHCs were set up during April 2004 and January 2005 as against the target of 103. The mission document—2005 also draws a gloomy picture as people on an average spend their 58 per cent income for hospital expenses. They borrow heavily or sell their assets to cover the expenses. Another 25 per cent of hospitalized Indians fall below poverty line because of the hospital expenses (*The Pioneer,* 2005).

India is highly populous country, therefore, its health needs are also enormous. The financial resources and managerial capacity of the country to meet the optimistic projection of the health goals fall short. The NHP, 2002, has had to prioritize certain priorities and operational options. At no point of time the NHP, 2002, claimed to be a road map for meeting all the health needs of the population of the country. Like any other unit or element of society is in dynamic state, health too is dynamic. The threats and priorities of health keep on changing over time. The Health policy always kept scope for the dynamism in its various elements. The health policy is holistic and it always "undertakes the necessary risks for recommending differing emphasis on different policy components. NHP- 2002 focussed on the need for enhanced funding and on organizational restructuring of the national public health initiatives in order to facilitate more equitable access to the health facilities."

The disease burden of historical diseases like tuberculosis, malaria, blindness etc. is taken care in the policy framework. At the same time newly emerging diseases like HIV/AIDS, lifestyle diseases were also noticed in the NHP, 2002. By identifying various core and other supplementary areas, various priorities were accorded in the policy framework. Under the umbrella of the macro-policy document, government and private sector planners have designed separate schemes according to the health needs of women, children, elderly, tribals, and other socio-economically disadvantaged people. Many times, there are certain calamities and disasters for which robust management plan has to be placed to effectively cope with the situations.

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The most important aspect of the policy document which influences at every level was the equity dimension. Whatever evaluation one makes after NHP, 2002, it is obligatory to evaluate the health policy on its equity front. The success or failure of the policy is mainly judged in its equity component. In the framework of equity dimension, a marked emphasis has been given to the expansion and improvement for the primary health facilities including the new concept of provisioning of essential drugs through central funding. The policy document also made commitment to the central government to an increased over-writing of the resources for meeting the minimum health needs of the people. Thus, in all NHP, 2002, attempted to provide guidance for prioritizing expenditure, thereby facilitating rational resource allocation. The improvement in the health status of the people depends upon the quality of health services. Increase in financial and material input is not only sufficient for improvement in the health status but it also depends on more empathetic and committed attitude in the service providers in the private and public sectors. Ultimately it is the quality of the health services which matters for the enhanced health status.

Major Developments in Recent Years (Till 2017-18)

Two major developments in terms of policy has taken place in the recent years. Let's have a look at them.

National Health Mission

National Rural Health Mission (NRHM) is now overarching National Health Mission (NHM), along with National Urban Health Mission (NUHM) as the other sub-Mission. It is implemented in all States /UTs in the country. NHM is a flagship Programme of the Ministry of Health & Family Welfare that continues to support the State Governments in strengthening their health systems.

- For the last three year period from 2014-15 to 2016-17 and the current year (2017-18 up to Sept.), about 27,454 health HR on contractual basis have been added. These include 448 GDMOs, 1,141 ANMs, 9,101 Staff Nurses, 962 Specialists, 7,859 AYUSH Doctors and 12,957 Paramedics. Apart from providing support for health human resource, NRHM has also focused on multi-skilling of doctors at strategically located facilities identified by the states.
- For the last three-year period from 2014-15 to 2016-17 and the current year (2017-18 up to Sept.), 72,806 ASHAs were selected under NHM.
- NRHM seeks to strengthen public health delivery system at all levels. For the last three-year period from 2014-15 to 2016-17 and the current year (2017-18 up to Sept.), 5,217 new constructions and 8,990 renovation/up gradation projects for various health facilities were sanctioned.

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- In order to provide services at the doorsteps of population living in the most remote and hard to reach areas, States have been supported with Mobile Medical Units (MMUs). For the last three-year period from 2014-15 to 2016-17 and the current year (2017-18 up to Sept.), 268 MMUs were added and operationalized.
- At the time of launch of NRHM 2005, such ambulance networks were non-existent. As on Sept 2017, 32 States/UTs have the facility where people can Dial 108 or 102 for calling an ambulance. Dial 108 is predominantly an emergency response system, primarily designed to attend to patients of critical care, trauma and accident victims etc.
- Since inception of NRHM, mainstreaming of AYUSH has been taken up by co-locating AYUSH facilities. For the last three year period from 2014-15 to 2016-17 and the current year (2017-18 up to Sept.), 1,431 PHCs and equivalent level facilities, 1361 CHCs and equivalent level facilities and 190 DHs were taken up for co-locating AYUSH facilities).
- For the last three year period from 2014-15 to 2016-17 and the current year (2017-18 up to Sept). 277 additional facilities were operationalized as First Referral Units (FRUs), 1,650 PHCs/CHCs were strengthened to provide 24X7 services and 4,670 NBCCs, 204 SNCUs and 584 NBSUs were established.
- Rogi Kalyan Samiti (Patient Welfare Committee)/Hospital Management Society is a simple yet effective management structure. This committee is a registered society that acts as a group of trustees for the hospitals to manage the affairs of the hospital, to ensure involvement of the communities in oversight of the provisioning of health care and to redress public grievances.

National Health Policy, 2017

As per the 'National Health Policy, 2017' document, the situation has changed in majorly four ways from the last healthy policy fourteen years ago:

> First, the health priorities are changing. Although maternal and child mortality have rapidly declined, there is growing burden on account of noncommunicable diseases and some infectious diseases. The second important change is the emergence of a robust health care industry estimated to be growing at double digit. The third change is the growing incidences of catastrophic expenditure due to health care costs, which are presently estimated to be one of the major contributors to poverty. Fourth, a rising economic growth enables enhanced fiscal capacity. Therefore, a new health policy responsive to these contextual changes is required.

The primary aim of the National Health Policy, 2017, is to inform, clarify, strengthen and prioritize the role of the Government in shaping health systems in all its dimensions- investments in health, organization of healthcare services, prevention of diseases and promotion of good health through

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cross sectoral actions, access to technologies, developing human resources, encouraging medical pluralism, building knowledge base, developing better financial protection strategies, strengthening regulation and health assurance.

The following are some of its aims:

- Implementation of National Health Mission Free Drugs and Free Diagnostic initiative to provide essential drugs and diagnostics free of cost in public health facilities.
- Implementation of Janani Shishu Suraksha Karyakaram (JSSK), Rashtriya Bal Swasthya Karyakaram (RBSK), Rashtriya Kishor Swasthya Karyakaram (RKSK) and implementation of other National programmes like Revised National Tuberculosis Control Programme (RNTCP), National Vector Borne Disease Control Programme (NVBDCP), National Leprosy Eradication Programme(NLEP), National AIDS Control Programme (NACP) etc. where free treatment is provided to patients of Tuberculosis(TB), HIV/AIDS, Vector Borne, Leprosy diseases etc.
- Decision to transform Sub-Health Centres/PHCsto Health and Wellness Centres to provide comprehensive primary care, to undertake promotive and health promotion activities.
- Screening and Management of 5 common NCDs of hypertension, diabetes, and cancers of oral, cervix and breast.
- Pradhan Mantri National Dialysis Programme for free dialysis services to the poor in district hospitals.
- Making available tertiary health care services in the public sector through strengthening of hospitals, establishment of AIIMS institutions in the States and up-gradation of existing Government medical colleges across the country.
- Making available quality generic medicines at affordable prices to all, under 'Jan Aushadhi Scheme', in collaboration with the State Governments.
- Rashtriya Swasthya Bima Yojana (RSBY) which provides for smart card based cashless health coverage on family floater basis.

The National Health Policy,2017 states following targets for reduction in incidence and prevalence of certain disease conditions:

- o HIV/AIDS: Achieve global target of 2020 (also termed as target of 90:90:90)
- o Eliminate Leprosy by 2018, Kala-Azar by 2017 and Lymphatic Filariasis in endemic pockets by 2017

- o Eliminate Tuberculosis by 2025: Achieving and maintaining a cure rate of >85% in new sputum positive patients and reduce incidence of new cases.
- o Reduce prevalence of blindness to 0.25/ 1000 by 2025 and disease burden by onethird from current levels.
- o Reduce premature mortality from cardiovascular diseases, cancer, diabetes and chronic respiratory diseases by 25% by 2025.

Check Your Progress

1. When was the global strategy for the 'Health for All' adopted by the WHO, which was later endorsed by the UN General Assembly?
2. What was the main objective of the National Health Policy, 2002?

2.3 HEALTH CARE SERVICES

Although health care is a priority for good governance, it is also a good business for big investors. The health care sector is among the most rapidly growing sectors in the world economy.

Internationalization of services related to health is reflected in the materialization of new kinds of health care organizations, increase in technical advancement over the past decade, in the greater than before cross-border delivery of health services through the movement of personnel and consumers, cross-border electronic equipment transfers, foreign technology agreements, and other means. The globalization of health care is also reflected in the growing number of companies mainly engaged in joint ventures and collaborative arrangements in the health sector, and in the increased cross-border exchange and dissemination of information, education, and training in this sector. The globalization of health sector and related services is driven by many factors which can be listed as follows:

- o The decline in public sector expenditures and the rise in private sector participation in health care in many countries like India;
- o The development of associated sectors such as insurance and telecommunications and broadcasting;
- o Rapid increase in mobility of consumers and health service providers due to declining travel costs and greater ease of travel; and
- o Technological advancements enabling the cross-border delivery of many health services.

The enhancement in the trade services related to the health sector also attributes to the amplification of globalization of health sector. Further, this is not only happening in India but across the globe. With establishment of

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World Trade Organization (WTO), these trade services have become more streamlined, and with General Agreement on Trade in Services (GATS) coming into being, the services and trades in health sector have been given uniformity under international law.

Under international law, the health services can be traded in various ways. Borrowing from the characterization of various modes of supply under the GATS framework, trade in health services occurs via four modes of supply:

(a) **Cross-border delivery:** Cross-border delivery includes electronic delivery of health services or telehealth services. In this mode, the shipment of lab samples, diagnosis, and clinical consultation are done via traditional mail channels. This makes use of interactive audiovisual and data communications to provide services such as diagnosis, lab testing, second opinions, surveillance, transmission, consultations, access to specialized information, data, and records, continuing education, and upgrading of skills for the health care professionals through various programmes.

(b) **Consumption abroad:** Consumption abroad involves the movement of consumers to the country providing the services for diagnosis and treatment. Such trade is mostly done between developing and underdeveloped countries motivated by differences in cost, quality, and availability of treatment across countries, as well as factors such as existence of alternative medicines, natural endowments, long waiting lists for treatment in the source country, treatment procedures, and various other reasons like cultural, linguistic, and geographic proximity between sending and receiving countries.

(c) **Commercial presence**: Commercial presence involves the establishment of hospitals, clinics, diagnostic and treatment centers, and nursing homes in the country through direct investment route. Gradually, countries have become more open to foreign direct investment with the aim to upgrade and modernize their health care infrastructure and training facilities. To promote this, various countries have made their laws governing foreign direct investment lenient.

(d) **Movement of health personnel**: Movement of health personnel is a preferred mode of investment promotion for various countries, which includes movement of doctors, specialists, nurses, paramedics, midwives, technicians, consultants, trainers, health management personnel, and other skilled and trained professionals in various countries. Indeed, this mode in conjunction with 'consumption abroad' constitutes the bulk of trade in health services today. The features behind cross-border movement of health service providers include the wage difference between countries, the aptitude of professionals to

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search for better working conditions and standards of living, exploring the countries for greater exposure, exposure to international training and improved qualifications from prestigious universities abroad, and demands to supply for disparity between receiving and sending countries in the health sector.

The trade in health services means of movement of persons primarily the exports of health providers from developing to developed countries and between developing countries. The most prominent exporters in this mode are countries such as India, the Philippines, and South Africa whose nurses, doctors, and technicians emigrate to countries in the Middle East, the US, UK, and Australia. Especially in USA, majority of doctors and nurses are Indians.

The ability of a country to export health services is primarily dependent on both inherent and acquired advantages. It is pertinent to note that appropriate regulations, safeguards, and supporting policies have to be introduced if the goals of equity and efficiency are to be congregated.

There is no doubt that the trade in health care opens up opportunities for increased flow of health care professionals between countries, but at the same time it also results in brain drain. But, it is also possible to both facilitate retention of the health professionals and attract them back to the source country by raising standards, improving infrastructure, and creating more employment opportunities of comparable level in the health care sector. Thus, if safeguards are in place to guarantee access for the person in need, then trade can supplement the resources accessible for investment and lessen the pressure on the health care sector by expanding facilities for all in the country.

Barriers to trade in health services

Numerous constraints are there in the way of trade in health services. Few of them can be justified on the ground of public policy, but at the same time others are motivated by protectionist objectives and politico-economic reasons. The trade in health care services is also affected by restrictive investment regulations in related areas of health care, such as telecommunications, insurance, education, and pharmacy products which affect different modes of supply as well as cross border movement of goods in demand. In India, the foreign investment regulations, barring foreign private players in the insurance sector, limit the portability of insurance coverage across countries to reach at grassroots level. This, together with lack of recognition of qualifications of those rendering treatment and services to the foreign patients, restricts patient mobility across countries and thus the scope for consumption abroad in health services.

While addressing this issue, it is also important to note that the cross-border e-delivery of health services is presently limited because of absence of any regulatory frameworks to deal with malpractice liability in online

transactions, confidentiality and privacy of information in cyber space, recognition of parties, lack of insurance coverage in online health care sector, and absence of supportive regulation in cross-border payment arrangements.

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In addition to the above mentioned obstructions in trade in health services, there are other restrictions as well. These include:

- Indian regulations on foreign exchange controls affect overseas treatment of parents;
- The present regulations on repatriation and fees and expenses of foreign health care service providers affect commercial presence and movement of health professionals across countries;
- The legal provisions relating to visa and travel formalities affect consumption abroad and mobility of service providers;
- Discrimination against the foreign health professionals in the form of unsympathetic working conditions, especially in the nursing and paramedical segments of health care business;
- The domestic competition policies concerning price discrimination, advertising practices, and firm size are also serious impediments to trade of health care services.
- Lack of specific policies to promote such trades, in developing countries, like India.

At present, India is one of the most outstanding developing countries engaged in exporting health services to other countries including developed countries like USA. In international business, India exports health services mainly through the movement of health service providers such as doctors and nurses to both developed and developing countries. Mostly on short-term contracts Indian doctors, nurses, and technicians go the Middle East, the US, Canada, UK, and Australia, for training and stay there as economic migrants. At present, Indian government has bilateral agreements with six Middle East countries and some others for trading private and government doctors for short-term assignments. This kind of exchange of trade and service in health care is aimed to lessen the shortage of health professionals in these countries, while at the same time providing greater exposure to Indian medical professionals for skill upgrading and increasing the foreign exchange for the country.

India also exports health services through consumption abroad based on the low costs and high quality of treatment provided at special corporate hospitals of international standard. Patients from various countries come to India for treatment. Patients come from developed countries such as the UK and US as well as developing countries such as Bangladesh, Nepal, Sri Lanka, and countries in the Middle East for surgery and for specialized services in different areas, like neurology, cardiology, endocrinology, oncology, robotic

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surgery, nephrology, and urology .The main advantage for India in this mode of trade of services lies in the availability of highly qualified doctors, nurses, paramedics, and hospital professionals and their ability to provide high quality but affordable treatment.

A supplementary niche area for India in the case of consumption abroad by the international patients is traditional medicine. At present, India has a large number of alternate traditional medicines, including unani, ayurvedic, and homeopathic forms of medicine. The government has developed separate regulatory bodies for development of standards in these medical streams. By combining alternate systems of medicine with the allopathic system of treatment, holistic health care services have been developed at some health resorts in India. Numerous patients from abroad come to India for treatment through these alternate systems. The state of Kerala is the primary destination market for such patients. There is a lot of scope in development of India's comparative advantage in traditional medicine in future by combining health care services with tourism packages, and by augmenting health services to include spas, massages, thermal baths, and other rehabilitation services. In recent years, with the growing corporatization of the health sector in India, foreign direct investment has become increasingly important in India's health sector. India has gradually opened the health sector to FDI and in some cases has permitted 100 per cent foreign equity ownership. Transnational companies are investing a lot of money in setting up new hospitals with state-of-the-art equipment in India. There is also growing interest in outward commercial presence by corporate hospitals based in India.

In addition, a large number of specialized corporate hospitals are being built in collaboration between Indian and foreign companies. For instance:

- o A $40 million cardiac centre has been set up at Faridabad by a joint venture between Australia, Canada, and India.
- o In addition, Max India, which has a three-tier structure of medical services, including, consultation and diagnosis, multispecialty hospitals, and general hospitals, has invested ₹200 crore in India's health sector. It has tied up with HM International for clinical trials of drugs under research abroad.
- o The Fortis Health Care has invested ₹250 crore in setting up a 200 bed facility, with plans to increase the capacity up to 375 beds and to tie up with overseas partner's hospital specializing in cardiology at Mohali in conjunction with twelve cardiac and information centers in and around the town.
- o India's first corporate hospital, the Apollo group of hospitals, has set up a hospital outside the country and plans to invest ₹2,000 crore to build 15 new hospitals in India, Sri Lanka, Nepal, and Malaysia.

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- Further, corporate hospitals in India, including Wockhardt and Gleneagles International, also have major expansion plans in various developing cities as well as in the metros.

At the moment, the major limit to inward commercial presence in health services include foreign equity ceiling, quantity limits, and differential treatment for the acquisition of land by foreign companies, although there is a trend towards relaxation of such restrictions. Indian companies are increasingly investing in health facilities in collaboration with foreign partners.

Regardless of the numerous benefits linked with India's trade in health services, there is a general perception in country that there have been unfavorable effects of the trade on the public health care system and equity. It has been perceived that these benefits have been limited to the affluent urban population. The cost of getting treatment is increasing day by day, and the government is not investing money for the development of civil and government hospitals. For example, it is by and large alleged that the presence of specialized corporate hospitals has aggravated the existing dual market structure between the private and public health care system in India, as they are catering to foreign patients and to the affluent segment of the country. Private hospitals such as Apollo, Escorts, and Batra maintain international standards, while public sector hospitals and health care institutions are substandard in quality and facilities. Public at large believes that such dualism has encouraged a kind of internal drain of the a good number qualified professionals and specialists from the public health care system to the private corporate hospitals, which promise them the better remuneration and working conditions in the country.

In this context, the development of international law through General Agreement on Trade in Services (GATS) covers trade in health services, and aims to liberalize market access in this sector through multilateral negotiations. Health services under the GATS take account of general and specialized services of doctors, deliveries and related services, nursing services, physiotherapeutic and paramedical services, all hospital services, ambulance services, residential health facility services, and services provided by medical and dental laboratories. Professional services provided by doctors and nurses are separately treated from hospital services. However, the GATS do not cover all health services. A case in point of excluded activities is the provision of medical and hospital treatment directly through the government, free of charge. Nevertheless, health services provided directly by the private sector or by the public sector on a commercial basis are subject to negotiation and commitments under the GATS.

The trade in health services acquires many forms, including foreign direct investment in health services, movement of health professionals,

movement of consumers, and electronic delivery. Relative improvement in trade in health services is based on costs, natural endowments, availability of human, financial, and physical capital, presence of niche areas within the sector, and the supporting policy regarding environment and infrastructure. The most important constructive implications of trade in health services comprise increased exposure for health service providers, upgrading of infrastructure, earnings and remittances of foreign exchange, better availability of quality health services and public resources, and reduced pressure due to domestic capacity. The chief unconstructive implications of trade in health care services include creation of a two-tier structure within a country, brain drain of quality service providers to foreign countries, internal brain drain from the public health system to the private health care sector, overinvestment in specialized, crowding out of nationals and capital-intensive segments at the expense of investments in core health care services, and undesirable effects on equity in the public health sector.

The trade and investment in health care in country and cross border is regulated by various legislations, regulations, and rules enacted by central and state government. These laws include Indian Contract Act, Specific Relief Act, Foreign Exchange Management Act, various laws for the investment in health care sector in India, the Industrial Policy and Procedures issued by the Ministry of Commerce and Industry through the Department of Industrial Policy and Promotion (DIPP), Secretariat for Industrial Assistance, and tax laws. The Union Ministry of Health and Family Welfare are responsible for the implementation of national programmes, sponsored schemes and technical assistance concerning Indian health care industry.

2.3.1 Health Care Financing

Because of the present inefficiencies and inequities in the public health care system in India, a need for creative thinking and innovative solution has arise. Both in public and private sectors, there is a need for change in the existing structure of the health care system, which is fueled by the maiming health care problems in the country. Many efforts have been made by the government at national level in order to improve the quality of health care services for the poor. However, all the efforts made by the central government for the reform and improvement of public health care services have focused on the five-year plans.

On the other hand, India attracted a lot of investments and interests from the foreign sources due to the reforms brought on by the 1990's economic policies. New funding options were now available to India besides the long-term debt, which was the only funding option for the hospitals in India. These options were made possible through private equity, venture capital, external commercial borrowings, etc. Considering the rise in the activities in the Indian health care system, which include the set up of green

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field projects, expansions of existing hospitals, and acquisition of brown field facilities, it is only logical to conclude that there is a desperate need for innovative funding mechanism. Many players in the market are looking for the innovative modes of funding given the huge need gap, rapid growth rate, and capital-intensive nature of hospitals. They want something different from the traditional borrowing scheme of funding. Currently, debt financing is the dominant mode of funding in the investment landscape of Indian health care. Many private banks have started to venture in health care financing by developing a separate health care portfolio.

Health care finance is provided for various reasons, such as purchase of medical equipment, refinance of an existing lien on free medical equipment, balance transfers of existing term loans, and expansion of existing health care facilities. The loan can also be applied for ancillary equipments, like air conditioners and lifts, and other medical equipments by an applicant. An industry estimate suggests that India will require somewhere around 1.75 million additional beds by 2025 considering the success rate of medical technology in saving and improving lives and alleviating pain, injury, and handicap. Being capital intensive, health care technology requires a lot of investment. This makes health care finance an important issue among the professionals. In spite of the fact that the overall funding allocated for the health care nationally is comparatively high, 4.1 per cent of GDP, the funding allocated by the government is very low, less than 1 per cent of GDP, when compared with other emerging nations.

Avenues for health care funding in private sector India

There are various ways through which private, public, and other health care structures can be funded in India. Currently the investment landscape in health care is predominantly characterized by debt financing. But over the period, many private sector banks have developed a separate health care portfolio.

Various avenues for funding in private sector can be listed as follows:

- Debt financing - long term bank loan
- Foreign direct investment
- External commercial borrowing
- Private equity funds
- Individual investors
- Foreign institutional investors
- Venture capital funds

Banks loans/debt financing

Banks have been the first stop for debt source for financing expansion plans. Financial institutions like India Infoline Finance, Reliance Commercial

Finance, and HDFC Bank provide loans. Many banks have special schemes for medical professionals, health care organizations, and for purchase of medical equipments. Nationalized banks offers bank loans for the long-term financing of the hospital, which is over 50 per cent of the total long-term financing of the hospitals. At present most banks have a health care portfolio. In spite of having health care portfolios, the banks do not focus specifically on health care delivery organizations. Their portfolios primarily focus on pharmacy, biotech, and clinical research sectors. Banks, at present, do not focus on funding health care projects in Tier II and Tier III cities in India, but it seems that the growing presence of corporate players in these areas will encourage the lending institutions.

Non-Banking Financial Companies (NBFCs)

The last few years have seen the re-emergence of the NBFCs in the funding of the equipment. Though the cost of funds may be marginally higher than what is offered by banks, the advantage of this source is that they tend to settle for lesser quantum of margins for the asset purchase and generally do not insist on the collateral security. These NBFCs are either promoted by the manufacturers or backed by these organizations.

External Commercial Borrowing (ECB)

An emerging area of funding is the External Commercial Borrowing (ECB). This can be an option where the quantum of loans is larger and the finance of the borrower is strong. The advantage of ECB is that interest rates are relatively lower. But, it is not without the risk, which is the potential depreciation or volatility of the rupee. The risk is real and smaller organizations may not be in a position to manage this risk every effectively. This source of funding could be good opportunity for those organizations that have a good part of the revenue coming in the form of medical tourism, as it could provide some insulation in a natural hedge against exchange fluctuations. At present, services sector entities, like hotels, hospitals, and software sector, are allowed to avail ECB up to US$100 million per financial year for import of capital goods, under the approval route. Further, the government has now decided to permit entities in the hotels, hospitals and software sectors to avail ECB up to 100 million USD per financial year, under the automatic route, for foreign currency and/or rupee capital expenditure for permissible end use. As compared to India, the interest rates in US and European market are lower, and this is one of the most prominent reasons for the popularity of ECBs.

Foreign investment

The FDI policy, which allows 100 per cent foreign investment under automatic route, governs the role of foreign financing in the various formats of health care. FDI under the automatic route does not require prior approval either by

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the government of India or the Reserve Bank of India. The only obligation that the investors have is to notify the concerned regional office of RBI, that too within thirty days of receipt of inward remittances, and file the required documents with the same office within thirty days of issue of shares to foreign investors.

Private equity

Private equity is slowly and gradually becoming one of the most sought after form of funding. PE funds invest in only those companies which have a proven track record of profitability and sustainable growth. The reason that PE funds are sought after is that they do not only bring capital but also the management skill set and adequate strategic planning required for the growth of the organization. Most PE funds prefer investing in the health care sector, for it promises high growth and it is sort of recession proof. However, the soaring real estate cost issues relating to scalability, management bandwidth, workforce, lack of entrepreneurship, etc. are the major deterrents. Venture Intelligence, a research firm that tracks PE and venture capital (VC) activity, claims that over 42 per cent of the PE and VC investors, recently surveyed, feel that it is highly profitable to tap the market for health care services in semi-urban and rural areas. The firm also reports that around 20 per cent of new PE or VC fund corpuses are likely to be invested in the health care services.

Foreign institutional investors

Foreign institutional investors (FII) are investment funds registered in a country outside India. These investors include hedge funds, insurance companies, pension funds, and mutual funds. In order to participate in the Indian market, it is imperative for them to register with SEBI. FII are subject to regulatory compliance that places limits on FII ownership in Indian companies.

Venture capital funds

Venture capital funds are companies that specialize in financing new ventures, like bringing a new product to the market when the venture may need to attract financial funding. There are several categories of financing avenues. Ventures can be smaller, in which case they rely on family funding, loans from friends, and personal loans from banks. But these means of funding may not work with more ambitious projects, as they need more substantial funding, for which they may turn to private investors who use their own capital to cater for a venture's requirements.

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Recent private investments in health care

The following investments have been initiated by the private sector:

- o Bengaluru based Narayana Hrudayalaya Hospital is likely to invest ₹5,000 crore (US$ 930.53 million) for setting up a chain of 100 low-cost specialized hospitals and at least three more health cities in the country.
- o Fortis Health Care entered into a JV (joint venture) with DLF and established a tie-up with Ansal Properties for ₹6,200 crore. The aim is to set up a chain of 200-450 bed hospitals in thirty-one cities in India within three to five years.
- o Apollo Group has established a tie-up with Lavasa Lake City for ₹200 crore to set up a wellness center for the elderly people.
- o An expansion plan has been made by Max Health Care, which includes hospitals in Dehradun and two PPPs in Mohali and Bhatinda in Punjab.
- o Plans have been made to set up hospital facilities in Mysore, Trivandrum, Pune, Ahmedabad, Chandigarh, Dehradun, Gaziabad, Jalandhar, Lucknow, Meerut and Patiala, by Columbia Asia, which offers secondary and upgraded secondary care services, has plans to set up upcoming.
- o Hinduja Group has a tie-up with Dubai Government owned Limitless LLC for around $1 billion to start a chain of hospitals in India
- o Punj Lloyd Limited has invested in Global Health Limited for purpose of setting up the Medanta Medicity

Avenues for health care funding in private sector in India

Avenues of health care funding in private sector in India are:

- Annual government budget for rural health.
- Annual government budget for urban health.
- Government funding for community programmes.
- Incentives and subsidies.

Annual government budget for rural health

In 2005, the Central government launched the National Rural Health Mission (NRHM) in order to correct the necessary structural faults in the basic health care system. The idea was to improve the quality of life. The initiative taken by the government was to provide health care services to the people living in rural areas, while focusing on eighteen states. It is believed that this initiative was taken as a step forward in the direction of government's commitment to increase the health care spending 0.9 per cent of GDP to 2-3 per cent of GDP.

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NRHM not only strengthens sub-centers, PHCs, CHCs, and disease control programmes and promotes public-private partnerships (PPPs) for public health goals, but also seeks to set up a task group to focus on new health financing mechanisms. The role of this group will be to examine the introduction and rollout of the new financing mechanisms, including risk pooling for hospital care. The key elements of this mechanism are as follows:

- Payment of hospitals for services as reimbursement by the district health missions, on the principle of 'money follows the patient'.
- Standardization of outpatient, in-patient, and laboratory services and associated costs by a committee of experts in each state on a periodic basis.
- Monitoring of standards by a National Expert Group to give suitable guidance on protocols and cost comparisons.
- Payment of wage component for all existing CHCs on a monthly basis and reimbursement of other recurring costs for services from district health fund.
- Monitoring of any credible community based health insurance schemes and providing subsidies to cover a part of the premiums for the poor by the central government.
- Create a district health accounting system to monitor the district health fund management and take corrective action.

For successful implementation of NRHM initiative certain funding arrangements were envisaged:

- The NRHM was intended as an umbrella programme taking all the existing programmes of the Department of Health and Family Welfare under it.
- The budget head for NRHM was to be created at central and state levels and vertical health and family welfare programmes were to retain their sub-budget heads under the NRHM.
- For 2005-6, the outlay of NRHM was around ₹6,700 crore.
- An additional thirty per cent over existing annual budgetary outlays, every year, was anticipated by NRHM to fulfill the mandate of the National Common Minimum Programme in order to raise the outlays for public health from 0.9 per cent of GDP to 2-3 per cent of GDP.
- In order to support the mission's activity the states were expected to increase their contributions to public health budget by a minimum of 10 per cent every year.

Currently, a tax holiday of five consecutive years is being offered by the central government to any service provider earning profits from operating and maintaining a hospital in the rural area. ASSOCHAM (Associated Chambers

of Commerce and Industry of India) holds the view that the health care sector should be accorded with not only the benefits of infrastructure status but also with holiday schemes up to a period of ten years.

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Annual government budget for urban health care

According to the census 2011 the urban population of the country is more than 377 million, which 31.16 per cent of the total population of the country. There are a total of 468 urban agglomerations (UA)/towns (increase of 18.8 per cent from census 2001) comprising 70 per cent of the total urban population. About 15 per cent of the urban population and 23 per cent of the population living in UAs live in the slums.

The Ministry of Health and Family Welfare proposed to launch the National Urban Health Mission (NUHM), 2010-11 to 2016-17. As we have seen before, the idea behind this step was to meet the health challenges of the urban population with a special focus on urban poor living in listed and unlisted slums. People living in the slums in urban areas are vulnerable to lung diseases, like asthma and tuberculosis because of the poor environmental conditions and high population density in the slums. Slum dwellers also have a high incidence of vector borne diseases with twice as many cases of malaria and dengue among the urban poor than the other city dwellers. Therefore, the scheme intended to include all the state capitals along with 430 identified cities with population over one lakh. The NUHM aimed at strengthening the primary public health systems by filling the gaps in service delivery through private partnerships using a regulatory framework. It also intended to develop a community based risk pooling insurance mechanism and make special provision for inclusion of the most vulnerable among the poor.

The financial sharing ratio for NUHM between the central government and state will be 85:15 during the eleventh five-year plan and 75:25 during the twelfth five-year plan, with the 25 per cent state contribution in the twelfth plan being shared between the states and urban local bodies (ULB).

As learnt before, NRHM and NUHM was subsumed under the NHM. NHM has six financing components:

(i) NRHM-RCH Flexipool,

(ii) NUHM Flexipool,

(iii) Flexible pool for Communicable disease,

(iv) Flexible pool for Non communicable disease including Injury and Trauma,

(v) Infrastructure Maintenance and

(vi) Family Welfare Central Sector component

In FY 2018-19, GoI allocated ₹30,130 crore to NHM, a decrease of 2 per cent from the previous year. A break up of the total NHM budget

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indicates that this decrease is primarily driven by a decrease in allocations for Reproductive Child Health (RCH) Flexipool and Flexipool for Communicable Diseases by 30 per cent and 27 per cent, respectively. NUHM budget, however, saw a 34 per cent increase from ₹652 crore to ₹875 crore during this same time period. In contrast, allocations for NRHM has fallen by 5 per cent from ₹ 25,459 crore to ₹ 24,280 crore.

Government funding for community programmes

The key community health programmes initiated, sponsored, and monitored by Central government for the purpose of addressing the current disease burden on Indian population are:

- **Vector Borne Disease Control:** Vector borne diseases (VBD) are a group of communicable diseases transmitted by mosquitoes and other vectors. For example, malaria, dengue, *filaria*, *kala-azar*, and *chikungunya*. This programme aims at prevention and control of these VBDs and to make the investments sustainable by developing robust systems and supporting the local capacity.
- **Reproductive and Child Health Programme (RCH):** This programme focuses on the reducing the infant, child, and maternal mortality by improving the quality, coverage, and effectiveness of existing family welfare services. It works nationwide and is a component of NRHM.
- **TB Control Programme:** Tuberculosis (TB) is an infectious disease caused by mycobacterium, usually Mycobacterium Tuberculosis. An infected person is likely to infect 10 or more people in a year. The primary goal of this programme is to reduce the rate of transmission of infection and cut down the mortality and morbidity due to TB. This programme aims to achieve and maintain cure rate of 85 per cent and detection rate of at least 70 per cent of such cases.
- **National Programme for Control of Blindness:** This programme is completely sponsored by the Central government and was launched with the objective to reduce the prevalence of blindness from 1.4 per cent to 0.3 per cent. The programme aims to develop eye care facilities in every district, secure participation of voluntary organizations in eye care, and develop human resources for providing eye care services.
- **Leprosy Eradication Programme:** Leprosy is a chronic infectious disease caused by Mycobacterium leprae. It is one of the leading causes of permanent disability in the country. Though the programme is sponsored by the Centre, it is implemented by the states and supported as partners by the World Health Organization and the International Federation for Anti-leprosy Associations. As of March 2011, leprosy has been eliminated in thirty-two out of thirty-five states/union territories.

- **Iodine Deficiency Disorders Control Programme:** This programme is also completely supported by the Centre.

Incentives and subsidies

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Apart from the funding and/or sponsoring schemes, the central government for development of urban and semi-urban health, mostly in the Tier II and Tier III cities, also offers some incentives to promote the private service providers in the health care sector. These incentives are:

- 100 per cent FDI permitted under the automatic route.
- Five-year tax holiday for setting up hospitals in Tier II and Tier III cities from 2009 to 2013.

2.4 HEALTH CARE DELIVERY SYSTEM IN OUR COUNTRY

In India, healthcare delivery system is represented by the following five major sectors:

Table 2.1 *Five Major Sectors of Healthcare Delivery System in India*

Public Sector	Private Sector	Indigenous System of Medicine	Voluntary Health Agencies	National Health Programmes
Primary healthcare (PHC and sub-centres)	Private hospitals, nursing homes, dispensaries and clinics	Ayurveda and Siddha, Unani, Homeopathy, Unregistered practitioners	Shiksha, The art of Living Foundation, People Institute for Development and Training (PIDT), give India, Vision Age India and others	Major programmes: (National AIDS control programme, National Filaria Control Programme (NFCP), National Family Welfare Programme, National Leprosy Eradication Programme, National Reproductive and Child Health Programme)

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Health centres (CHC, rural hospitals, district hospitals, specialist hospitals and teaching hospitals)	General practitioners			Minor programmes: (National mental health programme, National diabetes control programme, National Water Supply and sanitation programme)
Health Insurance Schemes (ESIS, CGHS)				
Other agencies (defence services, railways and others)				

Fig. 2.1 *Functions of the Healthcare Delivery System*

Rights of the child

Fig. 2.2 *Right of the Child*

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Health Programmes Launched by The Central Government

The mission and objectives of the Ministry of Health and Family Welfare are as follows:

Mission	Objectives
1. Ensuring accessibility of quality healthcare across regions and communities with particularly emphasis on the underprivileged population. 2. Providing comprehensive primary healthcare delivery system which is efficiently linked to the secondary and tertiary care health delivery system. 3. Reducing the infant mortality rate. 4. Reducing the incidence of communicable diseases and non-communicable diseases. 5. Targeting population control in the country.	1. Improving access to primary health care services for all sections of the society. 2. Improving maternal and child health. 3. Ensuring reduction in the growth rate of population with the objective of achieving stabilization of population. 4. Developing human resources for achieving health goals. 5. Reducing the incidence of diseases in the society. 6. Strengthening secondary and tertiary healthcare.

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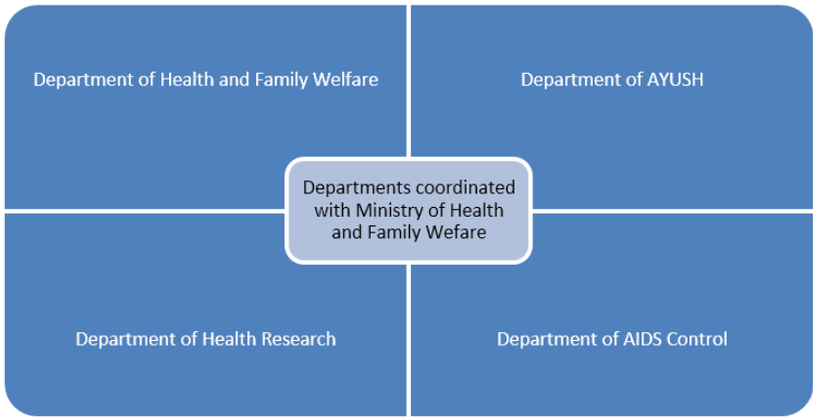

Fig. 2.3 *Department in Coordination with Ministry of Health and Family Welfare*

Problems Associated with Healthcare Delivery System in India

The most serious of all factors associated with the development of healthcare system in India is the financing factor and the various other constraints directly or indirectly related to it. The financing sector has the following components:

- The structure of healthcare system
- The behaviour of different stakeholders
- Quality of healthcare deliverables

Sources Responsible for the Framework of the Healthcare System

- **Local, state and central governments:** These are responsible for levying taxes.
- **Public sector bodies:** These are independent bodies that also impose taxes.
- **Private sector:** These are not-for-profit sector, which are associated with different types of insurances.
- **Households:** These are the consumers that pay fees for the various facilities.
- **Others:** The agencies that provide grants and loans.

Significance of tax

- The most reasonable system of financing in healthcare is taxation.
- A tax is the most appropriate means of organizing resources from the affluent sections of society to finance the healthcare requirements of the poor and needy.
- In India, the low income group (especially the BPL group), are not able to afford the expenses of the healthcare needs (out-of-pocket

expenditures). They have the more likelihood of falling ill due to innumerable reasons (low level of adequate nutrition, unhygienic living conditions, and so forth).

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Constraint of Resources

- The poor population have either limited or no access to insurance or private hospitals because of out-of pocket expenditure.
- Affluent class especially the urban population are easily covered under some form of social insurance.
- Access to medical services is limited to certain groups of population.
- The lower income group, especially the rural population or the group working in the unorganized sector can take benefit of only the tax-based public facilities. These facilities basically include free or subsidized healthcare services. The private healthcare facilities, once again, depends on their ability to pay.
- Thus, the equitable distribution of healthcare services is dependent on the level of healthcare services provided by the tax-based public facilities.
- The quality of healthcare is directly dependent on its funding.

Table 2.2 *Issues Related to Financing Healthcare System in India*

Financing of National Programmes-not as per need	• Misallocation of funds • Uncertainty in equitable distribution
Gross underfunding of National Health Programmes	• Existence of difference between policy and practice • Malfunctioning of the delivery system due to less financial support resulting in large out-of-pocket expenditures laid on households
Weak absorption capacity in the government	• Lack of swiftness in expenditure and fund utilization • Weak systemic and institutional functioning • Lack of planning of expenditure
Dysfunctional system of financing	• Budget allocation in a five-year cycle • Revenue budgets (salaries, purchase of drugs and medicines, repair and maintenance of machinery, and so forth) • Capital budgets (purchase of land, building construction, and so forth)
Complex design	• Funds not utilized properly • Interventions are time-consuming • Delay in the completion of projects

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Inadequate allocation of funds under externally funded projects	• 'EAP' (Externally Assisted Projects) are less resourceful • The procedures for project implementation are tedious and require multiple permissions • Recruitment procedures are time-consuming
Budgeting not functional	• Unplanned budgeting system
Weak financial capability	• Lack of trained staff • Poor or no audit system • Lack of computerized system

(Adapted from the Report of the National Commission on Macroeconimics and Health).

2.5 ENSURING HEALTH FOR ALL

Health and health care need to be distinguished from each other for no better reason than that the former is often incorrectly seen as a direct function of the latter. Heath is clearly not the mere absence of disease. Good Health confers on a person or groups freedom from illness - and the ability to realize one's potential. Health is therefore best understood as the indispensable basis for defining a person's sense of well-being.

The health of populations is a distinct key issue in public policy discourse in every mature society often determining the deployment of huge society. They include its cultural understanding of ill health and well-being, extent of socio-economic disparities, reach of health services and quality and costs of care. and current bio-medical understanding about health and illness. Health care covers not merely medical care but also all aspects pro preventive care too. Nor can it be limited to care rendered by or financed out of public expenditure within the government sector alone but must include incentives and disincentives for self-care and care paid for by private citizens to get over ill health. Where, as in India, private out-of-pocket expenditure dominates the cost financing health care, the effects are bound to be regressive.

Heath care at its essential core is widely recognized to be a public good. Its demand and supply cannot therefore, be left to be regulated solely by the invisible had of the market. Nor can it be established on considerations of utility maximizing conduct alone.

The universal health coverage has been the primary driving force in health related matters and the World Health Day 2018 too promoted the same theme: 'Universal health coverage: everyone, everywhere.'

Under the Sustainable Development Goals 3, the target for universal health coverage is also mentioned:

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Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all.

As per WHO, If countries are to achieve the SDG target, one billion more people need to benefit from UHC by 2023.

For providing good quality access for health services for all in India, the Government of India has launched the Ayushman Bharat scheme. You can learn the aim of the scheme through the introduction given on the Pradhan Mantri-Jan Aarogya Yojana (PM-JAY)'s website:

Under the ambit of Ayushman Bharat, a Pradhan Mantri Jan Arogya Yojana (PM-JAY) to reduce the financial burden on poor and vulnerable groups arising out of catastrophic hospital episodes and ensure their access to quality health services was conceived. PM-JAY seeks to accelerate India's progress towards achievement of Universal Health Coverage (UHC) and Sustainable Development Goal - 3 (SDG3).

Pradhan Mantri Jan Arogya Yojana (PM-JAY) will provide financial protection (Swasthya Suraksha) to 10.74 crore poor, deprived rural families and identified occupational categories of urban workers' families as per the latest Socio-Economic Caste Census (SECC) data (approx. 50 crore beneficiaries). It will have offer a benefit cover of Rs. 500,000 per family per year (on a family floater basis).

PM-JAY will cover medical and hospitalization expenses for almost all secondary care and most of tertiary care procedures. PM-JAY has defined 1,350 medical packages covering surgery, medical and day care treatments including medicines, diagnostics and transport.

To ensure that nobody is left out (especially girl child, women, children and elderly), there will be no cap on family size and age in the Mission. The scheme will be cashless & paperless at public hospitals and empanelled private hospitals. The beneficiaries will not be required to pay any charges for the hospitalization expenses. The benefit also includes pre and post-hospitalization expenses. The scheme is an entitlement based, the beneficiary is decided on the basis of family being figured in SECC database. When fully implemented, the PM-JAY will become the world's largest government funded health protection mission.

Check Your Progress

3. Name the modes of supply which constitute the bulk of trade in health services today.
4. List some of the reasons why healthcare finance is needed and provided.
5. Wat are the components of the financial sector in healthcare delivery system?

2.6 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

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1. A global strategy for 'Health for All' programme was adopted by WHO is 1981 and this was later endorsed by the UN General Assembly.
2. The main objective of NHP, 2002, was to achieve an acceptable standard of good health among the people, especially, the poor people.
3. Commercial presence and movement of health personnel constitutes the bulk of trade in health services today.
4. Some of the reasons why health care finance is provided include purchase of medical equipment, refinance of an existing lien on free medical equipment, balance transfers of exiting term loans, and expansion of health care facilities.
5. The financial sector in the health care delivery system include the following components: the structure of the healthcare system, the behaviour of different stakeholders and the quality of health care deliverables.

2.7 SUMMARY

- The healthcare system of India is vast and extensive but there remain wide differences in the quality of nutrition and diet taken by the rural and urban areas as well as in the public and private health care.
- India's Health Ministry was established with independence from Britain in 1947. The efforts have been made by the government as a priority in its series of five-year plans, each of which determines state spending priorities for the next five years. This National Health Policy was endorsed by the Parliament of India in 1983. This policy aimed at universal health care coverage by 2000, and the program was updated in 2002. This health care system in India is primarily administered by the states. India's constitution tasks each state with providing health care for its people.
- Keeping in view the constitutional directions aiming at elimination of poverty and ill health, the Government of India, soon after Independence, planned several approaches for healthcare delivery.
- The low access to the basic healthcare facilities is a common phenomenon in most of the developing countries. In order to provide minimum basic health facilities, it was resolved by the Health Assembly of the WHO to launch a movement known as 'Health for all by 2000 AD'.

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- In 1978, the Alma- Ata Conference re-affirmed 'Health for All' as the major social goal of all governments. In 1981, a global strategy for this programme was adopted by WHO, which was later endorsed by the UN General Assembly. India is a signatory to those declarations and has made efforts to extend health facilities to the vulnerable sections of its society.
- The National Health Policy (NHP), 1983, had hoped to provide 'Health for All by 2000 AD' particularly the poor and under-privileged through comprehensive primary healthcare services. The important aspects for the reforms were directed through the process of Planning and Health Policy (1983).
- The main objective of the NHP, 2002, was to achieve an acceptable standard of good health among the people, especially, the poor people. To make health services available to the people, the decentralization of public health system was targeted.
- National Rural Health Mission was launched in April 2005 in eighteen states to provide healthcare to the rural people particularly to the vulnerable section, children, and women. The aim was to provide comprehensive and integrated healthcare to the rural masses. In this mission, there is a provision to provide every village with trained female community health activist, known as Accredited Social Health Activist (ASHA).
- Internationalization of services related to health is reflected in the materialization of new kinds of health care organizations, increase in technical advancement over the past decade, in the greater than before crossborder delivery of health services through the movement of personnel and consumers, cross-border electronic equipment transfers, foreign technology agreements, and other means.
- Numerous constraints are there in the way of trade in health services. Few of them can be justified on the ground of public policy, but at the same time others are motivated by protectionist objectives and politico-economic reasons. The trade in health care services is also affected by restrictive investment regulations in related areas of health care, such as telecommunications, insurance, education, and pharmacy products which affect different modes of supply as well as cross border movement of goods in demand.
- There are various ways through which private, public, and other health care structures can be funded in India. Currently the investment landscape in health care is predominantly characterized by debt financing. But over the period, many private sector banks have developed a separate health care portfolio.

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- Avenues of health care funding in private sector in India are:
  i. Annual government budget for rural health.
  ii. Annual government budget for urban health.
  iii. Government funding for community programs.
  iv. Incentives and subsidies
- The basic health care system funded by the government is operated through the National Health Mission. This has two components NRHM and NUHM.
- In India, healthcare delivery system is represented by the following five major sectors: public sector, private sector, indigenous system of medicine, voluntary health agencies and National Health Programmes.

2.8 KEY WORDS

- **Health for all:** As a policy, it has been defined as a level of health that will enable every individual to lead a socially and economically productive life
- **PHCs:** Also known as primary health centers, these are the basic structural and functional unit of the public health services in developing countries
- **ASHA:** It refers to the Accredited Social Health Activist, introduced under the NRHM to work as the mediator between the community and the public health system.

2.9 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. How did the global thrust for Health for all by 2000 AD came about?
2. Write a short note on the National Health Policy, 1983.
3. What are the modes of supply of trade in health services?
4. Write a short note on ensuring health for all.

Long Answer Questions

1. Explain the significant points made by the National Health Policy: 2002.
2. Describe the barriers to trade in health care services.
3. Discuss the various avenues for funding in private sector in healthcare.

4. Explain the different key community health programmes initiated, sponsored and monitored by the Central government for the purpose of addressing the current disease burden on Indian population.
5. Discuss the problems and sources of healthcare delivery system in India.

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2.10 FURTHER READINGS

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UNIT 3 NUTRITIONAL REQUIREMENTS

Structure

3.0 INTRODUCTION

No doubt that everyone wants to remain fit and healthy. Food and nutrition play a very vital role in our growth and development. These are helpful for maintaining good health. The requirements of nutrition is essential for every individual but it is dispensable for the individuals who actively participate in games and sports. With the help of appropriate nutrition, sportspersons can enhance their performance.

In this unit, you will learn about the concept nutritional requirements.

3.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the concept of nutritional requirements
- Explain nutritional requirements of children of different age groups
- Describe nutritional requirements at infancy, early and middle childhood

3.2 INTRODUCTION TO NUTRITIONAL REQUIREMENTS

A balanced diet refers to the intake of edibles which can provide all the essential food constituents necessary for growth and maintenance of the body, in definite amount in which they are required by the body. A balanced diet means eating the right amount of foods from all food groups.

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'A diet which consists of all the essential food constituents, viz., proteins, carbohydrates, fats, vitamins, minerals and water in correct proportion is called balanced diet.'

In other words, 'Balanced diet is that diet which consists of various constituents of food in accurate and appropriate quantity and quality according to the requirement of an individual.'

In fact, every individual does not require same type of diet. The diet differs from individual to individual. The following points sums up a balanced diet.

1. A balanced diet must contain all the essential constituents in adequate amount.
2. There must be definite proportion between the different constituents of food. The proper ratio between proteins, fats and carbohydrates should be 1:1:4.
3. The food should be easily digestible.
4. Cooking of food is necessary because it sterilizes food stuff and makes it palatable and easilt digestible.

As mentioned earlier, nutritional requirements vary with the different individuals and the stages of growth they are in. In the following sections, we will discuss the concept of nutritional requirements.

Meaning of Nutrition

Every individual in this world wants to lead a healthy life. Food is the main basis for maintaining health. So, the knowledge of food and nutrition is essential for every individual. Generally, food and nutrition are essential and are considered synonym to one another, when actually it is not so. In fact, food comprises all those substances, which human beings consume for their survival. Food is a mixture of various substances, which are essential for life, whereas nutrition is a dynamic process which comprises the consumption of food to remain healthy. In fact, nutrition is essentially the process of nourishing or being nourished. The process by which a living organism assimilates food and uses it for growth and replacement of tissues it is called as nutrition.

Nutrition is defined as a science of food and its relationship with health. In other words, it can be said that nutrition is a science of foods which comprises the dynamic process in which the consumed food is digested nutrients are absorbed and distributed to the tissues for utilization and wastes are disposed of the body.

Macronutrients

Macronutrients constitute the majority of individual's diet. Hence, it can be said that macronutrints are chemical compounds or the nutrients that are taken

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in large amounts. They supply energy and are needed for the growth and maintenance of the body to perform the activity. They include carbohydrates, proteins, fats, and water.

1. Carbohydrates: Carbohydrates are the most important sources of energy. They contain the elements of carbon, hydrogen, and oxygen. The very first part of the name 'Carbo' means that they contain carbon. The second part of the name 'hydr' means they contain hydrogen. The third part of the name 'ate' means they contain oxygen.

In all carbohydrates, the ratio of hydrogen atoms to oxygen atom is 2 is to 1. Carbohydrates are actually the organic compounds that are important for different digestive operations in our body. There are lots of differences between the carbohydrates and other elements important for nutrition such as proteins and fats. Generally, it is seen that a diet rich in carbohydrates needs less amount of water in comparison to the diet rich in proteins and fats.

There are two main types of carbohydrates: simple carbohydrates and complex carbohydrates. Glucose, fructose, galactose, sucrose, maltose and lactose are simple carbohydrates. These carbohydrates are soluble in water. These are crystalline and sweet in taste so they are called as sugar. Starch, textiles, glycogen and cellulose are called carbohydrates which are complex or polysaccharides. These are not sweet in taste and are insoluble in water. They are not crystalline. The main difference between the types of carbohydrate is actually the difference between their chemical compositions. Simple carbohydrates have a smaller chain of chemical composition in comparison to the complex ones.

2. Proteins

Proteins contain carbon, hydrogen, oxygen, nitrogen and sometime sulphur as well. They are very large molecules, so they cannot be directly absorbed into our bloodstream. So they are turned into amino acids by our digestive system. There are 23 types of amino acids, out of these 9 amino acids must be available in our diet. 20 amino acids are used by the body to create blood, muscles, nail, skin, hair, and tissues in internal organs. Proteins form new tissues, repair the broken tissues, regulate the balance of water and acids, transport oxygen and nutrients and make antibodies. Excessive use of proteins and diet, especially animal proteins can result in heart diseases such as osteoporosis, stroke and kidney stones. The body requires only 0.36 grams of protein per pound of the ideal body weight. If proteins are not taken in the appropriate amount in the diet, then we may suffer from deficiency diseases. Marasmus and kwashiorkor are some of the protein deficiency diseases in children.

3. Fats: Fat contains carbon, oxygen, and hydrogen in the percentage of 76, 12 and 12 respectively. Fats are necessary for many body functions. They keep us warm and protect our organs they also help in the production of hormones.

They can be classified into different types and have different characteristics and react in different ways inside our body. There are different groups of fats and diet namely saturated fat, polyunsaturated and monounsaturated fat. The intake of saturated fats increases the chances of heart diseases, due to the cholesterol in the blood. Such fats are found in fast food, pastries, and biscuits. Fats are essential in our diet but the quantity of intake must be taken care and it should be limited in amount.

4. Water: Water is a compound which is made up of hydrogen and oxygen elements in the ratio of 2 is to 1. It is important for the transportation of nutrients into the bloodstream and the cells of our body. It is also important for the excretion of waste products from our body. It regulates the body temperature and is also essential for the maintenance of various reactions that are taking place in our body every moment. UNICEF says that water is not included in macronutrient but USDA (that is United States Dietary Association) includes it as a part of macronutrients. As a matter of fact, macronutrients are considered and taken in large quantity and water is also taken in large amount, therefore, it is considered as a macronutrient.

Micronutrients

Minerals and vitamins are included in the list of micronutrients required in a very small amount which extremely significant for the normal functioning of the body. The main function of these nutrients is to enable various chemical reactions occurring in our body. Minerals are further divided into two categories namely macrominerals and microminerals or trace minerals. The four leading micronutrients deficiencies worldwide are Vitamin A, Iron, Iodine and Zinc. We have learnt a little bit about the topic in Unit 1 of this book. Major health concerns for each of the micronutrient deficiencies are mentioned below:

Deficiency of Vitamin A causes childhood blindness or xerophthalmia. According to statistics, it is evident that, approximately 250 million children around the world do not consume sufficient quantity of vitamin A and as many as 500,000 children develop blindness every year due to Vitamin A deficiency. Further, weakening of immune system occurs as a result of Vitamin A deficiency due to which a person is unable to combat infectious diseases.

Iron deficiency is found to be one of the most prevalent micronutrient deficiency. Deficiency of iron results in abnormal cognitive functioning and reduce physical activity levels.

Iodine is one of the major micronutrient responsible for metabolism and thyroid functioning. The most common result of iodine deficiency is seen as Goiter. Iodine deficiency during pregnancy period can result in intellectual disability in the developing fetus.

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Zinc regulates immunity in an individual, which increases person's resistance towards infection. Women who have low zinc status prior to becoming pregnant will further deplete their zinc stores during pregnancy, unless they obtain zinc supplementation. Babies who are born to zinc deficient mothers are highly likely to be deficient as well.

Further, if the micronutrients are taken in adequate amount in the diet then effects of malnutrition and under nutrition can be overcome to a larger extent.

The explanation of micronutrients is given below:

1. Minerals

Minerals are very essential in our diet. Our 4% of the body weight is made up of minerals. They are required for healthy teeth, bones, and muscles. They are also used by the body for various activities which are the transmission of nerve impulse, the formation of hormones, maintenance of heartbeat, etc. As mentioned earlier, minerals can be classified into macro and microelements or trace minerals. Our body requires more amount of macrominerals than trace minerals. Macrominerals or macro elements such as calcium, phosphorus, sodium, fluorine, magnesium, potassium, and sulphur are required in our body in more amount.

2. Vitamin

Vitamin is chemicals which are required in a very small amount to keep our body healthy. If a particular vitamin is not present in the diet, it may cause the deficiency of disease. For example, if Vitamin C is not included then it will cause scurvy. In fact, all the vitamins are organic chemicals. There are two groups of Vitamins which are mentioned below:

1. Fat-soluble vitamins: Fat-soluble vitamin is those vitamins which are soluble in fat. These vitamins are composed of elements of carbon, hydrogen, and oxygen. These vitamins are vitamin A, vitamin D, vitamin E, and Vitamin K.
2. Water-soluble vitamin: These vitamins are soluble in water, they contain the element of Nitrogen and when sulfur. These vitamins are Vitamin B and Vitamin C. Earlier, the chemical names of all the vitamins but not known but now their chemical names are available.

3.2.1 Importance of Food and Nutritional Status: An Overview

It is very well established that right since the first living organism breathed for the first time billions of years ago, it needed food. Food is something without which growth, development and evolution would have been impossible. Every living thing on the face of the earth, irrespective of plants and animals, need nutrition to survive, grow and reproduce.

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The food chain in nature includes both plants and animals who are a part of it and even the tiniest ecosystem has a food chain for itself. Food is not only important for our survival but when humans are concerned, there are many other important points as explained subsequently:

(a) For survival: As mentioned above, without food, there is no survival. Therefore, the answer for why is food important is that, when you consume food, the body functions in a particular manner. Without a catalyst, there is no product formed and for all living things like plants, animals and humans, food is the catalyst. Hence, when you consume food, nutrition is provided to the body for the production of energy and, in turn, the body is functional. The food pyramid gives us an idea about its value in our lives. This is a biological and medical purpose of food as you need it for the cycle of life. Charles Darwin also supported the importance of food through the theory of ''survival of the fittest''.

(b) For development: The cycle of life revolves around birth, growth, development, reproduction and death. For an individual to complete a cycle from birth to death there is a constant necessity for nutrition and catalyst which is provided by the food which is consumed. The human body is one of the most complicated creations of nature as every pathway related to it is designed very uniquely. These pathways work together to function all the major human body systems and in turn keep the body fit. There is also a need to know why food safety is important, as we cannot consume spoiled and perished food as the fuel for our bodies.

Nutrition is critical for the survival of all living organisms and is required for the normal functioning of the body, repair of damaged tissues, and healthy growth and sustenance of the body. Every day, we eat a large variety of food items belonging to different foods groups. There are classified according to their composition, nutrient group. Each group has a set of different nutritional values and each nutrient is essential for our health and wellbeing. For proper functioning and to remain strong and healthy our body requires carbohydrates, proteins, fats, enzymes, vitamins, and minerals. However, the human body cannot synthesize all these nutrients on its own, and depends upon a lot of external sources for the same. For instance, nutrients like Vitamin C and essential fatty acids can only be acquired by the human body through a diet rich in each of these nutrients.

Nutritional status is a measurement of how well the nutrients in your diet meet the physiological a needs of your body. Health care professionals like registered dieticians, nurses and physicians are trained to review and assess many different parameters to assess a person's nutritional status. They do this through the use of medical tests and other tools that provide dietary information. Following are different types of measurements of nutritional status:

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(a) **Anthropometric measurements:** Anthropometry is the science of measuring the size, weight and dimensions of the human body. Height, weight and skinfold thickness can be used to assess fat stores, adequacy of body weight and risk of chronic disease. Using height and weight, clinicians can compare your current weight to your ideal body weight and usual body weight. A current body weight of less than 90 per cent of a person's ideal body weight or usual body weight may indicate a compromised nutritional status. Measurements of skinfold thickness can be interpreted to assess body fat stores.

(b) **Lab analysis:** Drawing a small amount of blood and sending it to the laboratory can provide medical professionals with useful information about your nutritional status.

(c) **Diet history:** A diet history is key to assessing nutritional status. Several different techniques can be used to collect a diet history. For a 24-hour recall, list all the foods eaten in the past day. Food frequency questionnaires review how often you eat certain foods in a given period of time. Keeping a food diary documents what you eat and when you eat it. Diet histories can also provide a helpful insight into cultural practices that affect nutrition, economic factors and physical challenges, such as difficulty chewing or swallowing that can interfere with adequate nutrition.

(d) **Drug-nutrient interactions:** When assessing nutritional status, it is also important to review your medications. Both prescription and over-the-counter medications can affect nutrition. Many drugs can cause a decrease in appetite, dry mouth, nausea, vomiting, or constipation. Clinicians can review your medication regimen to assess whether any medications might be responsible for decreases in food intake. It can also ensure that your eating habits are not interfering with the effectiveness of medications.

Important to know

The Nutritional status of an individual or particular group can be assessed by carrying out a survey and collecting information on the following aspects:

- Ill health or deficiency symptoms
- Height and weight
- Level of nutrients in blood and urine

Check Your Progress

1. Name the elements which constitute as protein.
2. Name two water-soluble vitamins.

3.3 NUTRITIONAL REQUIREMENTS OF CHILDREN OF DIFFERENT AGE GROUPS

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Whether it is a toddler or a teen, nutrition is important to his or her physical and mental development. Here's what children need, no matter what their age is.

Infancy

During this stage of life, it's almost all about the milk, whether it's breast milk, formula, or a combination of the two. Breast milk or formula will provide practically every nutrient a baby needs for the first year of life.

At about six months, most babies are ready to start solid foods like iron-fortified infant cereal and strained fruits, vegetables, and pureed meats. Because breast milk may not provide enough iron and zinc when babies are around six to nine months, fortified cereals and meats can help breastfed babies in particular.

Once you do start adding foods, don't go low-fat crazy. Although the AAP guidelines state fat restriction in some babies is appropriate, in general, you don't want to restrict fats under age two because a healthy amount of fat is important for babies' brain and nerve development.

Toddlers and Preschoolers

Toddlers and preschoolers grow in spurts and their appetites come and go in spurts, so they may eat a whole lot one day and then hardly anything the next. It's normal, and as long as they get a healthy selection, they will get what they need.

Calcium, the body's building block, is needed to develop strong, healthy bones and teeth. Children may not believe or care that milk "does a body good," but it is the best source of much-needed calcium. Still, there's hope for the milk-allergic, lactose-intolerant, or those who just don't like milk. Lactose-free milk, soy milk, tofu, sardines, and calcium-fortified orange juices, cereals, waffles, and oatmeal are some calcium-filled options. In some cases, pediatricians may recommend calcium supplements.

Fiber is another important focus. Toddlers start to say "no" more and preschoolers can be especially opinionated about what they eat. The kids may want to stick to the, beige and starchy diet (think chicken nuggets, fries, macaroni), but this is really the time to encourage fruits, vegetables, whole grains, and beans, all of which provide fiber. Not only does fiber prevent heart disease and other conditions, but it also aids digestion and prevents constipation.

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Gradeschoolers

It is not uncommon for a 6- or 7-year-old to prefer or lean towards vegetarian-food. This does not mean your child would not get enough protein; animal tissue isn't the only place we get protein. Rice, beans, eggs, milk, and peanut butter all have protein. So whether child at this stage goes "no-meat" for a week or for life, he or she will likely still get sufficient amounts of protein.

Areas that might be a little too sufficient are sugars, fats, and sodium.

This is a time when kids first go to school and have a little bit more choices in what they eat, especially if they're getting it in the cafeteria themselves. Cakes, candy, chips, and other snacks might become lunchtime staples.

The body needs carbs (sugars), fats, and sodium, but should be eaten in moderation, as too much can lead to unneeded weight gain and other health problems.

Packing the child's lunch or going over the lunch menu and encouraging him or her to select healthier choices can help keep things on track.

Preteens and Teens

As puberty kicks in, young people need more calories to support the many changes they will experience. Unfortunately, for some, those extra calories come from fast food or "junk" foods with little nutritional value.

Some adolescents go the opposite way and restrict calories, fats, or carbs. Adolescence is the time kids start to become conscious of their weight and body image, which, for some, can lead to eating disorders or other unhealthy behaviours. Parents should be aware of changes in their child's eating patterns and make family dinners a priority at least once or twice a week.

Like calories, calcium requirements are higher. Calcium is more important than ever during the tween and teen years because the majority of bone mass is built during this time. Encouraging kids to have milk, milk products, or calcium-rich alternatives, should help them get more calcium.

The child's gender may play a role in whether he or she needs more of a particular nutrient. For instance, teen girls need more iron than their male counterparts to replace what's lost during menstruation, and males need slightly more protein than girls. Although getting the children to eat healthy regardless of his or her age can be a constant battle, its one well worth fighting.

Adolescent growth spurt

Adolescents also undergo a very rapid growth during their puberty (called the pubertal growth spurt). During the pubertal growth spurt, they increase

rapidly both in weight and height. Therefore, they need a nutrient intake that is proportional with their rate of growth. The growth rate is very high right after birth (infancy). Then the growth rate slows down until the age of 12–14 years. At about 15–16 years (the pubertal period) there is a sharp rise in growth rate/velocity. After that, the growth rate slows down again.

Water makes up more than half of kids' body weight and is needed to keep all parts of the body functioning properly.

There's no specific amount of water recommended for children, but it's a good idea to give them water throughout the day, not just when they're thirsty. Babies generally don't need water during the first year of life. If the child doesn't like the taste of water, a bit of lemon or lime can be added for flavour. Fruits and veggies are also good sources of water. Kids should drink more water when ill, when it's hot out, or when engaged in physical activity.

3.3.1 Infancy and Early Childhood and Middle Childhood

The common feature of infancy, childhood and adolescence is that all these age groups are undergoing rapid growth and development. This in turn poses a heavy demand on their nutritional requirements. Small children and infants do not have a well-developed body nutrient store, and are therefore more vulnerable to infection. In addition, they have a larger surface area compared to their body size. All these factors increase their basal metabolic rate (BMR), resulting in an increased requirement for nutrients.

Requirements for macronutrients (proteins, carbohydrates and fats) and micronutrients are higher on a per kilogram basis during infancy and childhood than at any other developmental stage. These needs are influenced by the rapid cell division occurring during growth, which requires protein, energy and fat. Increased needs for these nutrients are reflected in daily requirements for these age groups, some of which are briefly discussed below.

Energy

While most adults require 25–30 calories per kg, a 4 kg infant requires more than 100 kilocalories per kg (430 calories/day). Infants of four to six months who weigh 6 kg require roughly 82 kilocalories per kg (490 calories/day). Energy needs remain high through the early formative years. Children of one to three years require approximately 83 kilocalories per kg (990 calories/day). Energy requirements decline thereafter and are based on weight, height, and physical activity.

As an energy source, breastmilk offers significant advantages over manufactured formula milk. Breastfeeding is associated with reduced risk for obesity, a wide range of allergies, hypertension, and type 1 diabetes. It is also linked with improved cognitive development; and with decreased incidence and severity of infections. It is also less costly than formula feeding. The list below outlines the nutrients and other constituents of breastmilk:

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- Water = 87–89%
- Vitamins (particularly vitamin A)
- Fat = 3–5%
- Energy = 60–70 kcal/100 ml
- Carbohydrate (lactose) = 6.9–7.2%
- Mineral = 0.2%
- Protein = 0.8–0.9%

Higher intakes of protein and energy for growth are recommended for adolescents. For most micronutrients, recommendations are the same as for adults. Exceptions are made for certain minerals needed for bone growth (e.g. calcium and phosphorus). Evidence is clear that bone calcium accretion increases as a result of exercise rather than from increases in calcium intake. Since weight gain often begins during adolescence and young adulthood, young people must establish healthy eating and lifestyle habits that reduce the risk for chronic disease later in life.

Water

Infants and children need plenty of water to drink, particularly when ill, or exposed to extreme temperatures.

Total water requirements (from beverages and foods) are also higher in infants and children than for adults. Children have a larger body surface area per unit of body weight and a reduced capacity for sweating when compared with adults, and therefore are at greater risk of morbidity and mortality from dehydration. Parents may underestimate these fluid needs, especially if infants and children are experiencing fever, diarrhoea or exposure to very cold or very hot temperatures.

Essential fatty acids

Requirements for fatty acids or fats on a per kilogram basis are higher in infants than adults. Some fatty acids play a key role in the central nervous system. However infants and children should not ingest large amounts of foods that contain predominantly fats, so it is important to get the balance right.

Increased nutrients required during infancy, childhood and adolescence

1. Infancy and childhood

Increased requirements of energy, protein, essential fatty acids, calcium and phosphorus.

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2. Adolescence

Increased requirements of energy, protein, calcium, phosphorus and zinc.

3. Nutritional requirements during adulthood

The nutritional needs in adults of 19–50 years of age differ slightly according to gender. Males require more of vitamins C, K, B1, B2 and B3, and zinc. Females require more iron, compared with males of similar age.

You have already seen that pregnant women and lactating mothers have particular nutrient requirements that are necessary for their own health as well as the health of their baby.

4. Nutritional requirements during later years

Elderly people are especially vulnerable to nutritional problems due to age related changes in their body (impaired physiological and anatomical capacity).

Possible nutritional issues in old age

- Problems of procuring and preparing foods
- Psychosocial problems
- Digestion problems
- Nutrient absorption problems
- Renal changes
- Memory loss (senile dementia), which may include forgetting to eat
- Sensory changes
- Physical problems like weakness, gouty arthritis and painful joints.
- Loneliness

Check Your Progress

3. What are some of the sources of calcium for toddlers and preschoolers who are milk-allergic, lactose-intolerant or just don't like milk?
4. Name the risks which are reduced due to breastfeeding.
5. Why are the total water requirements in infants and children higher than for adults?

3.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

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1. Proteins contain elements like carbon, hydrogen, oxygen, nitrogen and sometime Sulphur.
2. Two water-soluble vitamins are Vitamin B and Vitamin C.
3. Some of the sources of calcium for toddlers and preschoolers who are milk-allergic, lactose-intolerant or just don't like milk are lactose-free milk, soy milk, tofu, sardines, calcium fortified orange juices, cereals, waffles and oatmeals.
4. Breastfeeding is associated with reduced risk for obesity, a wide range of allergies, hypertension and type 1 diabetes.
5. The total water requirements in infants and children are higher than for adults because they have a large body surface area per unit of body weight and a reduced capacity for sweating when compared to adults.

3.5 SUMMARY

- A balanced diet refers to the intake of edibles which can provide all the essential food constituents necessary for growth and maintenance of the body, in definite amount in which they are required by the body. A balanced diet means eating the right amount of foods from all food groups.
- Every individual in this world wants to lead a healthy life. Food is the main basis for maintaining health. So, the knowledge of food and nutrition is essential for every individual.
- Food comprises all those substances, which human beings consume for their survival. Food is a mixture of various substances, which are essential for life, whereas nutrition is a dynamic process which comprises the consumption of food to remain healthy.
- Nutrition is defined as a science of food and its relationship with health.
- Macronutrients constitute the majority of individuals diet. Hence, it can be said that they are taken in large amounts. They supply energy and are needed for the growth and maintenance of the body to perform the activity. They include carbohydrates, proteins, fats, and water.
- Minerals and vitamins are included in the list of micronutrients required in a very small amount are extremely significant for the normal functioning of the body. The main function of these nutrients is to enable various chemical reactions occurring in our body minerals

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are further divided into two categories namely macrominerals and microminerals or trace minerals.

- It is very well established that right since the first living organism breathed for the first time billions of years ago, it needed food. Food is something without which growth, development and evolution would have been impossible. Every living thing on the face of the earth, irrespective of plants and animals, need nutrition to survive, grow and reproduce.
- During infancy, it's almost all about the milk, whether it's breast milk, formula, or a combination of the two. Breast milk or formula will provide practically every nutrient a baby needs for the first year of life. At about six months most babies are ready to start solid foods like iron-fortified infant cereal and strained fruits, vegetables, and pureed meats.
- Toddlers and preschoolers grow in spurts and their appetites come and go in spurts, so they may eat a whole lot one day and then hardly anything the next. It's normal, and as long as you offer them a healthy selection, they will get what they need. Calcium, the body's building block, is needed to develop strong, healthy bones and teeth.
- As puberty kicks in, young people need more calories to support the many changes they will experience. Unfortunately, for some, those extra calories come from fast food or "junk" foods with little nutritional value.
- Adolescents also undergo a very rapid growth during their puberty (called the pubertal growth spurt). During the pubertal growth spurt, they increase rapidly both in weight and height. Therefore, they need a nutrient intake that is proportional with their rate of growth. The growth rate is very high right after birth (infancy). Then the growth rate slows down until the age of 12–14 years. At about 15–16 years (the pubertal period) there is a sharp rise in growth rate/velocity. After that, the growth rate slows down again.
- The common feature of infancy, childhood and adolescence is that all these age groups are undergoing rapid growth and development. This in turn poses a heavy demand on their nutritional requirements. Small children and infants do not have a well-developed body nutrient store, and therefore are more vulnerable to infection.
- While most adults require 25–30 calories per kg, a 4 kg infant requires more than 100 kilocalories per kg (430 calories/day).
- Infants and children need plenty of water to drink, particularly when ill, or exposed to extreme temperatures. Total water requirements (from

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beverages and foods) are also higher in infants and children than for adults.

- Requirements for fatty acids or fats on a per kilogram basis are higher in infants than adults. Some fatty acids play a key role in the central nervous system. However, infants and children should not ingest large amounts of foods that contain predominantly fats, so it is important to get the balance right.
- Increased requirements of energy, protein, essential fatty acids, calcium and phosphorus is seen in infants.
- During adolescence, there is increased requirements of energy, protein, calcium, phosphorus and zinc.
- The nutritional needs in adults of 19–50 years of age differ slightly according to gender. Males require more of vitamins C, K, B1, B2 and B3, and zinc. Females require more iron, compared with males of similar age.
- Elderly people are especially vulnerable to nutritional problems due to age related changes in their body (impaired physiological and anatomical capacity).

3.6 KEY WORDS

- **Macronutrients:** It refers to the chemical compounds or the nutrients that are taken in large amounts
- **Nutritional status:** It is a measurement of how well the nutrients in your diet meets the physiological needs of your body
- **Anthropometry:** It is the science of measuring the size, weight and dimensions of the human body.

3.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Differentiate between simple and complex carbohydrates.
2. Write a short note on the importance of food and nutritional status.
3. What are the different types of measurements of nutritional status?
4. What are periods of development in which the growth spurt is high?
5. List the nutritional issues in old age.

Long Answer Questions

1. Describe the concept and types of macro and micronutrients.
2. Discuss the different nutritional requirements with reference to infants, toddlers, preeteens, teems as well as adults.
3. Explain the energy and nutrients needs of infants, children and adults.

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3.8 FURTHER READINGS

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UNIT 4 PLANNING BALANCED DIETS: INFANTS

Structure

4.0 INTRODUCTION

India has various climate and soil. Foods grown and consumed vary from place to place. Due to availability of market and transport facilities that are impossible to grow in our place are now available for us. This facilitates us to make wide variations in our daily menu. Though nutritive value tables are available for almost all the food consumed to get the nutritive value of a recipe one has to spend some time to calculate.

Professionals, in field of nutrition, use the food composition tables and recommended dietary allowances as their main tools. Using food composition tables one can formulate a nutritionally adequate diet which meets the need.

The socio economic and cultural aspects are also taken into consideration. Adequate diet is amount of food that keeps a person physically fit and maintain good health.

In this unit, you will first learn the basics of planning balanced diet for children of different age groups and then learn about recommended intake for infants.

4.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the concept of planning balanced diets for children of different age groups
- Describe the recommended dietary intakes for infants
- Explain the emotional and psychological aspects of infant feeding

4.2 PLANNING BALANCED DIET FOR CHILDREN OF DIFFERENT AGE GROUPS

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Many national and international communities worked to frame the recommended dietary allowances for various nutrients:

(a) Nutrition expert group ICMR India

(b) Food and Nutrition Board, National Research Council USA

(c) Panel on recommended allowances on nutrients departments of Health and social science services UK.

(d) Recommendations of FAO/WHO expert group recommended nutrient allowances. Infants may not be in a position to obtain milk from their mother in such cases milk from other mammals is utilized making some modification.

The following points reflect the need and importance of planning balanced diet of children belonging to different age groups:

1. Avoid deficiency
2. Enhance nutrition status of the individual
3. Provide appropriate measures of all nutrients to satisfy the body needs.
4. Formulate good habits
5. Selection of balanced diet for proper growth and development of an individual.
6. Avoid undernutrition, malnutrition and over nutrition.

Recommended dietary allowance are the levels of intake of essential nutrients to be adequate to meet the nutritional needs of practically healthy person. Allowances are the amount of nutrients to be consumed, loss during preparation and plate waste should be considered. Requirement is the individual's requirement which is dependent on physical, social, environmental, hereditary and other factors.

It is not possible to determine every individual's need in the world. So different recommended allowances are formulated for different communities. The difference especially is found in energy allowances. The disadvantages of these recommended allowance tables are:

1. Data on trace elements is limited.
2. Recommended allowances are not suitable to the people who require an increase or decrease amount of particular nutrients depending on pathology and medication.

The RDA are translated into diets with a wide range of foods which are called as food guides. The food guides are formulated separately for each

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region. Food guides of one region does not fit for the people of other region because the food stuff availability, food, habits, cultural pattern, and social economic status vary from east to west and from north to south.

Let us discuss some of the important minerals required for a balanced diet.

Calories

While estimating the energy requirements age, sex, body composition, body size, climate, environment, physical activity and physiological stage should be considered.

The recommended energy levels are average requirement that maintain normal health and normal weight in adults and support growth in children. The energy requirement vary from one individual to another.

Proteins

Proteins are necessary for growth and maintenance of the body.

Physiological stress conditions increase the need of protein.

The Net Protein Utilization (NPU) of Indian diets is lower than Western diet and it shows that the amount of protein in Indian diet should be more than Western diets.

Fats

Fats are essential for the absorption of all fat soluble vitamins.

Fats serve an important role in the maintenance of health of an individual. Fat supplies the essential fatty acids like linolenic acids and arachidonic acids. Inadequate supply of essential fatty acid leads to a deficiency disorder of the skin called phrynoderma. Excess fat in diet leads to hypercholesterolemia and antherosclerosis.

Calcium

Calcium is essential for calcification of bone, clotting of blood, muscle contraction, transmission of nerve impulse. Calcium deficiency in children produces decrease growth rate of loss of calcium from bones leads to hyperthy-roidism, osteoporosis, fractures, etc.

Hypercalcemia results in calcium deposition in soft bones, vomiting, gastrointestinal bleeding, anorexia, increased in blood pressure, etc. Optimal intake of calcium according to recommended allowances allows for strong bones and teeth.

Phosphorus

Calcium and phosphorus requirements are closely related. Phosphorus needs are 20% more than calcium. Large amount of phytin is present in the cereals, pulses and nuts. This interferes with the utilization of calcium and iron.

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Iron

Iron is the most important element in the body. Without iron, life is not possible. Iron forms the hemoglobin which carries the oxygen to various tissues. On an average 10% food iron is absorbed. The recommended allowance are framed based on this percent absorption.

The science of food, nutrients in it, their action, interaction and relation to health and disease; the processes by which an organism takes in, digests, absorbs and utilized the nutrients and disposes the end products is called nutrition. It is also concerned with the social, economic, cultural and psychological implications of the food.

The nutrients are required for the proper growth and development of the body. Some nutrients are required in large quantities however others are required in small quantity. Nutrition is a quantitative science which deals with the amounts of nutrients contributed by different foods and action of each in the functioning of the body.

Let us discuss certain crucial micronutrients including vitamins, etc.

Vitamin A

Vitamin A requirements are expressed in term of retinal or carotene. In India many children have Vitamin A deficiency. Therapeutic doses of Vitamin A are available free of cost in Primary Health Centre (PHC). The chief sources of Vitamin A like papaya and leafy vegetables consumption should be encouraged.

Thiamin

Thiamin requirements are directly proportional to the carbohydrate intake. It is essential in carbohydrate metabolism. Thiamin pyrophosphate is essential in oxidative decarboxylation of pyruvic acid an end product of carbohydrate metabolism.

Riboflavin

Riboflavin requirements are directly related to the calorie requirements. It plays an important role in metabolism of carbohydrates, proteins and fats. Riboflavin from riboflavin mononucleotide and riboflavin adenine dinucleotide which are part of enzyme or act as enzyme and hydrogen acceptor play an important role in the process of metabolism.

Nicotinic acid

Nicotinic acid requirements are also related to caloric requirements. NAD and NADP need nicotinic acid for their formation. These are hydrogen receptors and are involved in many enzyme reaction.

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Pyridoxine

Pyridoxine forms pyridoxal phosphate act in several enzyme reactions like transaminase system, amino acid decarboxylase system, conversion of tryptophan to Niacin, etc.

Folic acid

Folic acid conjugate by itself is not absorbed. Hence Folic acid requirement is expressed in terms of free Folic acid. Folacin is essential for DNA synthesis. Folacin inhibitors are used to enable tumor growth and cell proliferation.

Vitamin B12

Vitamin B12 occurs only in foods of animal origin. It needs an intrinsic factor for absorption.

Ascorbic acid

Ascorbic acid is also called as Vitamin C. It is rapidly absorbed from the intestine. It helps in the absorption of iron by synthesis of mucopolysaccharides glucoside functioning and metabolism.

Vitamin D

Vitamin D is essential for the absorption of calcium and phosphorus in the body. It aids in the calcification process and is necessary for the development of bones. Exposure to sunlight helps in meeting the vitamin D needs of the body.

In conclusion, it can be understood that planning balanced diet for children of different age groups will depend on factors like age, gender, physical activity, physiological stages of the body, including the body weights, heights and other related factors.

Check Your Progress

1. What is the importance of vitamin D for infants?
2. What is the role of protein in balanced diet?
3. State the role of riboflavin for healthy individual.

4.3 RECOMMENDED DIETARY INTAKES FOR INFANTS

Genetically acquired characteristics, prenatal quality of nutrition and adequacy of postnatal diet determines the growth and development of infants. Mammals produce milk to feed their offspring during their early life. Milk

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is specifically and specially designed nutrition for infant mammals. Milk of a particular mammal is ideal food for its infants. But, due to various other reasons infants may not be in a position to obtain food from their mother. In such cases, milk from other mammals is utilized making some modification like dilution, addition of sugar, etc.

Growth and development are two distinctive term that go hand in hand in case of normal children. Growth is an increase in size of body or any parts of the body whereas development is maturation of body tissues organs and Systems so that all functions can be carried out. After birth, growth occurs very rapidly in the first year of life.

In the first 5 to 6 months infants gain about 150 to 250 grams of weight and double the weight of the body. In the next 6 months they gain 100 to 150 gram thereby tripling the birth weight by the time of first birthday. Normally Birth length varies 50 to 55 cm and reaches 75 to 80 cm at the end of 1st year.

At birth infants possess 75 per cent water 12 to 15 percent fat and poorly developed muscles. At first birthday body fat increases to about 20 to 25 per cent and water content decreases to about 60 per cent. Bones contain more of water and cartilage at birth. The total amount of calcium content of the skeleton at the time of birth of a child is about 25 to 30 grams in weight which is tripled by the end of 1st year.

Growth and development of brain is rapid in fetal life and first 6 months of infancy. From 6 months of age brain does not grow but it develops up till the age of 5 years. 80 to 90 percent of adult size is achieved by 4th birthday. The digestive system is not fully developed in infants thus they will not be able to digest the proteins fats and simple carbohydrates at this age.

From third month onwards, gastric secretion starts increasing and salivation starts by second and third month. As we all know small sized animals have a rapid heartbeat when compared to large size ones, this rules apply to infants also. At birth and infants heartbeats 122–40 times per minute and the respiratory rate is also higher that is 20 times per minute. These rates gradually comes to normal as the infants grow. The kidneys cannot function normally and completely until the first birthday.

Muscular coordination is also very poor in infants, at birth a baby has only rooting reflex. Sucking, swallowing and breathing are the only functions carried out with muscular coordination.

For about three months baby can only suck. Later tongue movements are coordinated and solid food when kept on the tongue and taken into the mouth and is swallowed this is called as extrusion reflex. By the age of 6 months an infant has a better muscular coordination.

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Nutritional Requirements

The primary basis for the nutritional requirements of an infant is the amount of milk from mother ingested by a healthy infant. This data would be sufficient for calculating the nutritional needs of infant upto first six months. The requirements for the next six month is based on the consumption of a formula and a mixture of solid foods.

The requirements of different nutrients are briefly discussed below:

Protein

Healthy infants add about 3 to 4 grams of protein daily to their body.

Normal breastfed infant receives 1.5 to 2 grams of protein per kilogram per day which comes to about 2 to 2.5 grams of protein per kilogram per day during the first few days of the birth. Later it goes down to 1.5 grams by 6 month. Proteins from cow milk is less efficiently utilised than protein from human milk. Protein requirement per kilogram body weight can be made with 1.6 gram of human milk protein or 2 gram of cow milk protein.

Energy

Infants have high skin surface. Infants, body spend a lot of energy to regulate their body temperature and metabolic activities. The energy needs of infants for the first 6 months range from 95 to 140 kilo calories per kilogram and 80 to130 kilo calories per kilogram in the next six months. Half of this energy is used for maintaining the needs of basal metabolism. Babies who cry a lot and who are active need much more energy.

Carbohydrate

Lactose is the mean carbohydrate in an infant's diet which accounts to about 40% of calories from human milk. Lactose helps in the absorption of calcium and phosphorus and in maintaining and normal intestinal microflora. Other carbohydrates which are added to cows milk in preparation of formulas or commercial fees are sucrose, cane syrup and dextrimaltose.

Sucrose is easily available and cheap and has an advantage over lactose that it can be easily digested and absorbed more rapidly but less than glucose and maltose. So it is usually added to infant feeding formulas.

Fats

About 40 to 50% of calories in human milk and in most formula supplies are by fats. Fat provides essential fatty acid required for the infants. About 5% of the calories are derived from linoleic acid in the breastfed infants. Infants fed on other animal milk derive only 1.5 to 2% of it. So it is necessary to have addition of vegetable fat rich in linoleic acid that is desirable to the animal milk formulas when given to infants. Cholesterol is also essential for

synthesis of bile salts and for the development of central nervous system but the desirable level of cholesterol in an infant diet is not known.

Minerals

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The infants need many minerals for their proper growth and development. These minerals are supplied in the form of milk.

Human milk and cow's milk fulfill all the mineral needs except for iron. So infant needs based on animal milk should be fortified with iron. Infant food based on soyabean and peanut should be fortified with iodide because these foodstuff possess goitrogenic properties.

Vitamins

Infant fed on unfortified cow's milk need vitamin A, D, E, C and niacin in additional amount. Cow's milk is low in the above vitamin so infant's fed on animal milk need a supplement.

Table 4.1: *Nutritional Requirements of Infants*

Nutrients	0-6 Months age	6-12 Months age
Energy (K cals)	118/kg	108/kg
Proteins (g)	2.0/kg	1.7/kg
Calcium (g)	0.5-0.6	0.5-0.6
Iron (mg)	1	1
Retional (mg)	400	300
Thiamine (mg)	59/mg/kg	54/mg/kg
Riboflavin (mg)	71 mg/kg	65 mg/kg
Niacin (mg)	780 mg/kg	710 mg/kg
Vitamin B6 (mg)	0.3	0.4
Folic acid (mg)	25	025
Vitamin B12 (mg)	0.2	0.2
Vitamin D (I.U)	200	200
Vitamin C (mg)	20	20

4.3.1 Nutrient Intake of Infants

Adequate Intake (AI) is defined by The Institute of Medicine as the recommended dailyintake value based on observed or experimentally determined approximations of nutrient intake by a group (or groups) of healthy people that are assumed to be adequate.

A baby grows more rapidly physically during infancy than at any other stage in life. In the first few days of their life, most babies lose a bit of their body weight. However, within the next seven to ten days, they go back to their birth weight and then start growing further at a rapid rate, such that they

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reach the double of their birth weight in four to six months and triple it within completing their first year. Simultaneously, each organ system of the infant is also developing in order to accomplish increasingly complex functions. To make sure that the development rate is maintained, babies require adequate amounts of good-quality protein, essential fatty acids, vitamins, minerals, and other nutrients.

Babies also require an adequate number of calories to maintain the briskrate of growth and a sufficient supply of macronutrients—including carbohydrates, and fats—to bloom during this vital phase. In the first year after birth, breastfeeding is considered the finestsource of nourishment for a baby, with little or no supplemental foods required to maintain the adequate diet. We have already seen a general take on nutritional requiements of infants, let's see how breast-feeding is important in the following ways:

(a) Caloric intake: In the year 2002, the Institute of Medicine of the National Academies lay down the dietary reference intake (DRI) daily calorie range for babies from birth to six months of 520 to 570 calories, and 676 to 743 calories for babies between six and twelve months of age, with minor variations among males and females. Formula-fed babies usually take in more calories and undergo more weight gain than breast-fed babies. Actually, breastfeeding is said to reduce the chances of adult and adolescence obesity by 30 per cent.

(b) Protein and carbohydrates: Protein is crucial for a baby's tissue replacement and growth. For the first year, the DRI for daily protein consumption is slated between 9 and 13 grams each day. The primary source of protein in the first six months is breast milk or formula.

(c) Fats: Fats provide infants the energy for their liver, brain, and heart. The dietary recommendation for babies of less than one year is to take minimum 30 grams of fat every day. This amount is readily available in breast milk of a healthy, well-fed mother.

(d) Micronutrients: In the case of vitamins and minerals, the quality of the breastfeeding mother's diet is the most crucial factor. It is recommended that babies receive 400 IUs (10 mcg) of liquid vitamin D in the first week after birth.

Feeding the premature infants: Latest research confirms that the adequate feeding of preterm infants in the initial weeks after birth goes a long way in determining the later outcomes, in terms of neurological development, bone density, and general growth. The brain develops at a more rapid rate in infancy than at any other stage in life. International standards suggest that very low birth weight infants should gain an average of at least 18 g/k/d in weight and 0.9 cm/wk in height for normal brain growth. For this kind of serious growth, mother's milk may not be adequate and preterm kids may need to be given more specific types of formula feeds that cater to their special

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needs. However, preterm babies are very prone to infection and should only be fed by spoons and not bottle since it increases the chance of infection. The spoons, mixing cups should be sterilized before each use and the water used should be boiled or distilled. When the mother feeds the baby, she should be wearing surgical gloves and cover her mouth and nose with a surgical mask in order to avoid passing on infection. Family members except for the mother (and maybe the father) should avoid touching the baby without the doctor's consent.

Dietary Allowances- Supplementary Foods

Following are a few points considered while feeding infants:

(a) Oily and fried food: Oily foods prepared at home can be given, for example, *pakodas, laddoos, puris, dosa, vada* and so on, since they also have nutritive value. However, oily preparations bought from outside should be avoided. Also, the child should be allowed to select and not be force fed.

(b) Use of a mixer-grinder: Frequently, parents use the mixer-grinder to make the food into a paste form for the child. However, this may cause problems later because the child will not like to work hard to chew food when it can easily be served in semi-solid form. Therefore, the food should be given to a baby in nearly the same consistency as is consumed routinely at home.

(c) Addition of new dishes: The child should be allowed to get accustomed to a particular new food over a period of four-six days. Too many new foods should not be introduced in quick succession.

(d) Hot, spicy food: Highly spicy food should not be given to a child until the age of 5 years.

(e) Tea, coffee, chocolates, milk additives: A child does not require tea or coffee. Tea, coffee, and other powders also contain cocoa, chocolate and caffeine which may make the child addicted.

(f) Refined foods: Foods that contain refined flour such as, bread, noodles, biscuits, jam, toast, sauce, spaghetti, wafers, cold drinks, cakes and pastry should be avoided as they do not add value to physical and mental well-being in the long run. They contain very little fibre and a lot of harmful chemicals.

(g) Tinned milk and formula feeds: Tinned formula milk is available in powdered form which contains preservatives. A number of studies report that these powders have a high concentration of metal traces and other harmful chemicals. While preparing these foods, the exactly prescribed quantity of water should be added, otherwise the feed may become too diluted or may strain the baby's kidneys.

(h) Fruit juices available in market: These days, a number of manufacturers supply preserved fruit juices in can and box forms. It is infinitely better, however, to give the child either the whole fruit, or juice freshly squeezed at home, even if in small quantity. Ready-to-serve juices may contain harmful chemicals.

(i) Bottle for feeding: Using bottles to give milk, fruit juice and other fluids can be harmful because it increases the risk of vomiting, diarrhoea, ear infection, caries of tooth etc. Instead, using a cup and a spoon is healthier.

(j) Diet in illness: If a child falls ill, do not stop feeding at regular times. However, do not force-feed. The doctor's advice should be taken to feed a sick child.

(k) Foods rich in iron: Good sources of iron are dark green leafy vegetables, dates, raisins, black sesame, *moong dal*, *channa*, and turmeric.

(l) Foods rich in calcium: Good sources of calcium are milk and dairy products, white sesame (til) and green leafy vegetables contain high calcium.

(m) Milk: Milk has always been known as the richest source of good quality protein, calcium, vitamin-D, and vitamin-B12. If a child does not like milk, they can be offered dairy products like *paneer*, *kheer*, and curd. In the first year after birth, ordinary milk should be given only as a supplement to breast milk and not as a replacement. Only full cream milk should be given because cream has many useful qualities.

(n) Non-vegetarian food: A child living in a family that consumes non-vegetarian foods cannot escape it completely. However, latest research has indicated that non-vegetarian foods lead to heart disease, hypertension, joint problems, cancer, and intestinal problems. The only 'good' non-vegetarian food is seafood, such as fish and prawns.

Diet and Feeding Patterns during Infancy

Parents should take care that:

- Babies are offered food which has texture and consistency appropriate for the baby's development
- A child should be offered food at regular intervals at set times and not too much at once. For example, lunch may be divided into two feedings and served between 12 noon and 2 p.m.
- Solid food is introduced gradually and only when the babies are developmentally ready.

4.4 EMOTIONAL AND PSYCHOLOGICAL ASPECTS OF INFANT FEEDING

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When a child is born, he needs lot of support and care from his caretakers as he cannot move, talk, connect, ask and speak to others. Therefore, it becomes necessary for the caretakers at this age to develop an emotional bonding between mother and child and that is possible through breastfeeding the child properly. When a child is provided mother's milk in required amount, he feels satisfied and relieved. The child feels attached to the mother as he gets proper supplements through mother's milk. The emotional and psychological bonding begins to develop during the initial 6 months between mother and child as she feeds the child.

Importance of breastfeeding the infants over cow's milk

Human milk is superior to other animal milks in many ways. It helps to get the bacteria develop and suppress the invasion of pathogenic bacteria. Other animal milks or formulas have the danger of greeting contaminated with storing, transferring and bottling.

Immunoglobulins

Breast milk has immunoglobulin that fight against microorganisms. IgA, IgG and IgM are the immunoglobulin that are present in the human milk. These show antibody against E coli, poliovirus, pneumococcal and streptococcus.

Lymphoid cells

Breast milk possess lactoferrin in an iron binding protein which has bacteriostatic effect on E coli, the important bacterial pathogen in newborn. Human milk also possess 2 mg per ml of lysozyme which has antibacterial activity. Cow's milk has very little amount of lysozyme and lactoferrin.

Lactobacillus bifidus factor

Breast milk purchase a specific growth factor for promoting the growth of lactobacillus bifida, a specific species of lactobacillus.

The intestinal flora of infants fed on cow's milk formula is of mixed variety where as infants fed on breast milk have only lactobacillus bifidus. This is evident by the acid reaction of the stools of infant.

Breast milk when compared to cow's milk has higher contents of Vitamin C, iron, polyunsaturated fatty acid and cystine in proteins. Adding to this, it has low curd tension, high album in content, no buffering capacity and less load on kidney.

Milk supply the greater part of the required nutrients to the infants.

Other foods like fruit juices, egg yolk, strained vegetables, fruits, meat and pre cooked cereals provide the nutrients that are lacking in milk. Fruit juices given to infants are orange and tomato. These provide vitamin C and the organic acid which help to lower the curd tension of milk and aid in absorption of calcium. Egg yolk is fair source of iron which is lacking in human milk. Yolk can be added to infants diet from 5th month.

Strained fruits, vegetables and meat can be given from 5th to 6th month onwards. Pre cooked and iron fortified cereals are also given to infants and these form the first solid food of the body.

You have already learnt that that breastfeeding is extremely crucial and the primary source of food for infants, so to understand the emotional and psychological aspects of infant feeding, it is helpful to study the emotional and psychological aspects of breastfeeding.

- It helps the baby transition from pre-to-post birth and understand the continuity
- It helps the baby understand its physical being reassured through the physical closeness with the mother.
- It helps the mother get adopted to the mothering behaviour through the physical act breastfeeding.
- Breastfeeding also releases hormones like oxytocin and prolactin which is helps reduce stress in mothers

Check Your Progress

4. Mention three factors which determines the growth and development of infants.
5. State the energy needs for infants for the first 6 months.

4.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Vitamin D is essential for the absorption of calcium and phosphorus in the body. It aids in the calcification process and is necessary for the development of bones. Exposure to sunlight helps in meeting the vitamin D needs of the body.
2. Proteins are necessary for growth and maintenance of the body. Physiological stress conditions increase the need of protein. The NPU of Indian diets is lower than Western diet show the amount of protein in Indian diet should be more than Western diets.
3. Riboflavin requirements are directly related to the calorie requirements. It plays an important role in metabolism of Carbohydrates, proteins and

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fats. Riboflavin from riboflavin mononucleotide and riboflavin adenine dinucleotide which are part of enzyme or act as enzyme and hydrogen acceptor play an important role in the process of metabolism.

4. Genetically acquired characteristics, prenatal quality of nutrition and adequacy of postnatal diet determines the growth and development of infants.
5. The energy needs for infants for the first 6 months range from 95 to 140 kilo calories per kilogram.

4.6 SUMMARY

- Due to availability of market and transport facilities that are impossible to grow in our place are now available for us. This facilitates us to make wide variations in our daily menu.
- Though nutritive value tables are available for almost all the food consumed to get the nutritive value of a recipe one has to spend some time to calculate. Professionals in nutrition field use the food composition tables and recommended dietary allowances as their main tools. Using food composition tables, one can formulate a nutritionally adequate diet which meets the need.
- Many national and international communities worked on this aspect and frame the recommended dietary allowances for various nutrients.
- Recommended dietary allowance are the levels of intake of essential nutrients to be adequate to meet the nutritional needs of practically healthy person. Allowances are the amount of nutrients to be consumed, loss during preparation and plate waste should be considered. Requirement is the individual's requirement which is dependent on physical, social, environmental, hereditary and other factors.
- The RDA are translated into diets with a wide range of foods which are called as food guides. The food guides are formulated separately for each region. Food guides of one region does not fit for the people of other region because the food stuff availability food habits cultural pattern and social economic status vary from east to west and from north to south.
- There are different considerations required to ascertain the adequate intake of calories, proteins, fats, calcium, phosphorous, vitamins, and assisting acids.
- Genetically acquired characteristics, prenatal quality of nutrition and adequacy of postnatal diet determines the growth and development of infant.

NOTES

- Milk is specifically and specially designed nutrition for infant mammals. Milk of a particular mammal is ideal for food for its infants. But, due to various other reasons infants may not be in a position to obtain food from their mother. In such cases milk from other mammals is utilized making some modification like dilution, addition of sugar, etc.
- Growth is an increase in size of body or any parts of the body whereas development is maturation of body tissues organs and systems so that all functions can be carried out. After birth growth occurs very rapidly in the first year of life.
- The primary basis for the nutritional requirements of an infant is the amount of milk from Mother ingested by a healthy infant. This data would be sufficient for calculating the nutritional needs of Infant upto first six months. The requirements for the next six months is based on the consumption of a formula and a mixture of solid foods.
- Dietary reference intake (DRI) daily calorie range for babies from birth to six months of 520 to 570 calories.
- For the first year, the DRI for daily protein consumption is slated between 9 and 13 grams each day.
- The dietary recommendation for babies of less than one year is to take minimum 30 grams of fat every day.
- It is recommended that babies receive 400 IUs (10 mcg) of liquid vitamin D in the first week after birth.
- Human milk is superior to other animal meals in many ways. It helps to get the bacteria develop and suppress the invasion of pathogenic bacteria. Other animal milks or formulas have the danger of greeting contaminated with storing, transferring and bottling.

4.7 KEY WORDS

- **Recommended dietary allowance:** It refers to the levels of intake of essential nutrients to be adequate to meet the nutritional needs of practically healthy person.
- **Food guides:** It refers to the diets with a wide range of foods as per the RDA.
- **Adequate Intake:** It refers to the recommended daily intake value based on observed or experimentally determined approximations of nutrient intake by a group of healthy people that are assumed to be adequate.

NOTES

4.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. List the different organizations which frame recommended dietary allowances for various nutrients.
2. What is the need and importance of planning balanced diet for children belonging to different age groups?
3. State the disadvantages of recommended allowance tables.
4. Briefly explain the growth and development patterns of infants.
5. Write a short-note on the diet and feeding patterns that parents should be mindful of during infancy.
6. Briefly state the emotional and psychological effects of breastfeeding.

Long Answer Questions

1. Explain the different minerals and nutrients important for a nutritious diet.
2. Describe the recommended dietary intakes for infants.
3. Discuss the important points for consideration while feeding infants.
4. Explain the importance of breastfeeding the infant over cow's milk.

4.9 FURTHER READINGS

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BLOCK - II

NUTRITIONAL PROBLEMS

UNIT 5 PLANNING BALANCED DIETS: TODDLERS, PRESCHOOLERS, PREGNANT AND LACTATING WOMEN

Structure

5.0 INTRODUCTION

Balanced diet is not a rigid concept. It is in fact a dynamic one, which changes as per the varying factors and demands of age, sex and stage of growth. What works for an infant will not be sufficient or wholly right for an adolescent child, since the bodily requirements differ. Further, the region where the individual resides also has a bearing on their diet since the food production and availability changes with different locations.

In the previous unit, you have learnt about the planning and requirement of different diets for infants. In this unit, you will study the nutritional requirements of four very different groups. Two of them are related to children in the toddler and preschool category while the two are related to pregnant and lactating women.

5.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the planning and balanced diet for toddlers and preschoolers
- Describe the nutritional requirements for pregnant and lactating women
- Identify the factors affecting material nutritional status
- Explain the influence of lactation on nutrient needs

5.2 PLANNING BALANCED DIET FOR TODDLERS AND PRE SCHOOLERS

The growth and development of a preschool child is entirely dependent on the diet. Infections and infestations attack immediately when the diet is poor in quality. During the second year the child increases in height by 7 to 8 cm and games 3 to 5 kg of weight. During 3, 4 and 5 years the weight gain is 2 kg per year approximately. The water content of the body decreases gradually with addition of adipose tissue and mineralization of the bone.

The body protein increases to 18 percent of the body weight by 4 years of age from 14 percent at the first birthday. At this stage a deficit of as little as 10 kilocalories body weight leads to future growth failure and reduced nitrogen retention even when the protein intake is adequate.

A well nourished child will be alert, vigorous, quickly recover from fatigue, sleep well at night, normal in height and weight, have clean bright, straight well-formed teeth, un-bleeding gums, lustrous healthy hair from muscles, good appetite and regular bowel movements.

The nutritional requirement of a preschool child are given in the table below:

Table 5.1: *Nutritional Requirement of a Preschool Child*

Nutrient	Amount
Energy (K cals)	1220
Proteins (g)	22
Calcium (g)	0.4-0.5
Iron (mg)	20-25
Retinal	250
Thiamine (mg)	0.6
Riboflavin (mg)	0.7
Niacin (mg)	8
Vitamin B6 (mg)	0.6
Folic acid (mg)	100
Vitamin B 12	0.2-1.0
Vitamin D (I.U)	200
Vitamin C (mg)	40

Young children have a very keen taste of sensitivity. Mild flavored foods are preferred by preschool children. The temperature of the food also should not be hot or cold. The food given should not be sticky or gummy.

Foods that can be picked up with fingers are relished by the children. Plain fruit juices, milk, milk beverages, cheese, cookies can be given to the preschool children. Children enjoy colourful meal than ones having monotonous colors.

They also enjoy eating by their own than fed. They have a very little span of attention i.e they are easily diverted so the food should be attractive and tasty according to the child's likings.

Child should be fed when hungry. Energy foods vitamins and minerals should not be dumped with over enthusiasm as it may cause other health problems.

Protein calorie malnutrition and other deficiency diseases may occur easily with faulty food habits. Children are great imitators and they imitate their elders and parents. So it is the parent's duty to cultivate good food habits in the family. Non availability of foods, ignorance, superstitions and poverty are the factors responsible for nutritional disorders in the children.

For children, milk is an important food which is good source of all the nutrients except iron which is easily accepted by children.

Eggs, meat and fish are the rich sources of protein and B complex group of vitamins. But the cost of these foods may be out of reach for common man. So a common man may use legumes which are readily available and are almost equal to animal foods in nutrition. Nuts and oilseeds provide good amount of proteins and fat.

Ignorance and illiteracy of mothers may have a great impact on malnutrition and faulty food habits of children. So education of mothers is very essential to improve the nutritional status of the family.

The following table gives a balanced diet formula for children between the age group 1 to 3 years:

Table 5.2: *Balanced Diet Formula for Children between 1–3 years*

Food Item	**Vegetarian gm**	**Non – vegetarian**
Cereals	150	150
Pulses	50	40
Green leafy vegetables	50	50
Other vegetables, roots, tubers	30	30
Fruits	50	50
Milk	300	200
Fats and oils	20	20
Meat, fish and eggs	-	30
Sugar and Jaggery	30	30

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5.3 NUTRITIONAL REQUIREMENTS FOR PREGNANT AND LACTATING WOMEN

Pregnancy and lactation lays considerable stress on women. Nutritional needs during this period increase. But the society frames some rigid rules for pregnant women including the food she should eat and food she should not even touch.

The superstitions make the pregnant and lactating women vulnerable to contracting diseases leading to complications. Semi starvation of mother with a view of smaller baby and easy delivery is false. Restriction of salt and fluids to reduce incidence of toxemia and theory of maternal organism are proved to be false.

Neonatal mortality also increases with poor nourishment of the expectant mother. If mother has one or more following factors neonatal mortality or low birth weight infant may be the result.

1. Mother under 17 years
2. Small stature
3. Poor nutritional status
4. Low body weight
5. Low gain in weight during pregnancy
6. Smoking, alcoholism, etc.
7. Complications of pregnancy
8. Infections
9. Unfavorable social environment

Mother who are in a good nutritional state prior to conceiving and maintain that status all through pregnancy have fewer complications in pregnancy, parturition and have healthy babies. The mother's protein intake correlates well with infants' weight, length and physical condition.

Various researches claim that eclampsia was not found in women who had good diet all through the pregnancy. Underweight women produce smaller and premature babies. Over weight women had more still births. Pregnant adolescents have medically, nutritionally and prolonged labor and maternal death are common in such cases.

Changes during pregnancy

Pregnancy can be conveniently divided into three stages. Ovum becomes implanted in endometrium of the uterus where rapid cell proliferation occurs. The uterine glands and outer layers of germplasm near the embryo and placenta begins to develop. This stage extends over a period of 2 weeks. From 8th week to parturition rapid growth of foetus, production of milk and

preparation for labor takes place. Hyperplasia and hypertrophy occur with rate varying from organ to organ.

The placenta is the organ by which the foetus is attached by the means of umbilical cord and maintains connection with the mother. Water, oxygen and electrolytes diffuse from maternal circulation to fetal circulation through placenta membrane. Glucose and amino acid required for active transport from maternal circulation to fetal circulation. All substances are not filtered through this membrane. Undernourishment leads to small placenta formation and so is the transfer of nutrients due to which the baby born will be small. Progesterone is a hormone secreted by corpus luteum which brings about increase secretion by the endometrium as well as increase in lipid and glycogen stores of body. It also inhibits contraction of uterine muscles and prevents expulsion of embryo.

Progesterone and estrogen stimulates growth of mammary glands and inhibit lactogenic function of pituitary gland until the birth of infant. The total blood volume increases by one-third by the end of pregnancy. As the volume of blood increases the concentration of serum, albumin, hemoglobin and other constituents of blood decreases. Pregnant women have cravings and aversions. This is expecially found in first half of the pregnancy. Strong flavours such as coffee, meat, poultry induce nausea and vomiting. Some women have cravings for ice cream, sweets, fruits, etc. Pica is found in some women. Pica is appetite for abnormal non-food substances like chalk, mud, clay starch.

Basal metabolism increases during pregnancy which averages around 150 kilo calories per day during the second half of the pregnancy.

Gastric tone, motility and secretion reduce slightly.

The glomerular filtration rate is increased to clear various substances like creatinine, urea, uric acid, etc. Water secretion is high in mid pregnancy than in advance pregnancy. Due to stress on bladder frequent urination is seen.

The average weight gain at the end of pregnancy would be 10 to 12 kg.

Table 5.3: *Weight Gain and Properties during Pregnancy*

	Weight gain in first trimester (kg)	**Weight gain in second trimester (kg)**	**Weight gain in third trimester (kg)**
Foetus	Negligible	1.0	3.4
Placenta	Negligible	0.3	0.6
Amniotic fluid	Negligible	0.4	1.0
Increased uterine size	0.3	0.8	1.0
Increased breast size	0.1	0.3	0.5
Increased blood volume	0.3	1.3	1.5
Increased extracellular fluid	0	0	1.5

Nursing mothers produce 20 to 30 ounces of milk each day. The energy need to convert food energy to milk energy is 80 to 90 percent efficient. 100 ml of breastmilk supply 67 to 77 kilo calories. Thus, 850 ml of milk production needs 750 kilo calories. Fat deposits furnish 200 to 300 kilo calorie for first 3 months of lactation. Thus, an additional allowance of 500 kilo calorie to diet is recommended for a nursing mother. 100 ml of common milk contains 1.2 gram protein. Thus, 850 ml has 10 gram protein.

Conversion of dietary protein of milk protein is about 70 percent. Thus, an additional allowance of 20 gram protein is needed for every nursing mother.

Nutritional status

- The every day food regimen of a female needs to contain an extra 350 calories, 0.5 g of protein during first trimester, 6.9 g all through second trimester and 22.7 g for the duration of third trimester of pregnancy.
- Some micronutrients in particular are required in greater quantities at some point of these physiological periods. Folic acid, taken for the duration of the pregnancy reduces the chance of congenital malformations and increases the birth weight.
- The mother as well as the developing foetus need iron to meet the excessive needs of erythropoiesis (RBC formation).
- Calcium is essential, each in the course of being pregnant and lactation, for suited formation of bones and teeth of the offspring, for secretion of breast-milk wealthy in calcium and to stop osteoporosis in the mother. Similarly, iodine intake ensures suitable intellectual health of the growing foetus and infant.
- Vitamin A is required during lactation to enhance child and need to be taken by the lactating mother.

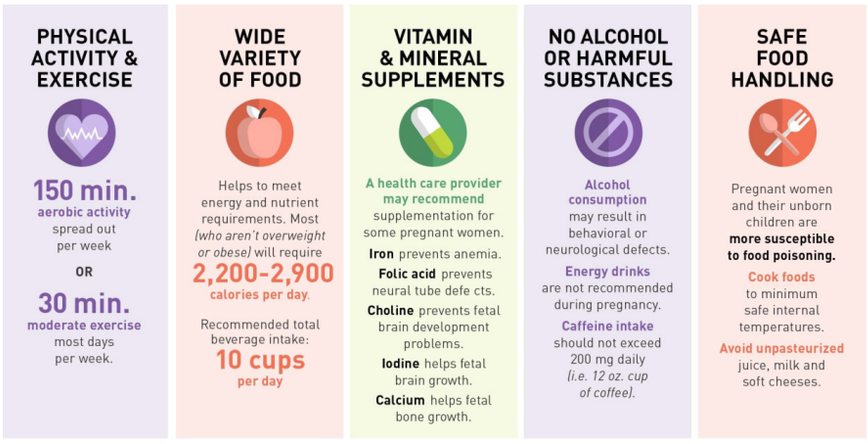

Fig. 5.1: *General Guidelines for Pregnant Women*

Importance of nutrition

- The pregnant/lactating lady has to consume a significant range of meals to make certain that her own nutritional wishes as well as those of her growing foetus are met.
- There is no precise need to alter the normal dietary pattern. However, the volume and frequency of utilization of the top-notch meals must be increased.
- Mother can derive most quantity of electrical energy (about 60 percent) from rice, wheat and millets. Cooking oil is a concentrated supply of each power and polyunsaturated fatty acids.
- Good healthy protein is derived from milk, fish, meat, rooster and eggs. However, a perfect combination of cereals, pulses and nuts additionally affords sufficient proteins.
- Mineral and vitamin necessities are met with the resource of ingesting a variety of seasonal vegetables specifically green leafy vegetables, milk and smooth fruits.
- Bioavailability of iron can be extended by using the utilization of fermented and sprouted grams and meals rich in weight loss programme such as citrus fruits.
- Milk is the quality source of biologically accessible calcium.
- Though it is possible to meet the necessities for most of various nutrients by a balanced diet, pregnant/lactating female are adviced to take day by day dietary supplements of iron, folic acid, diet B and calcium
- Adequate intake of a nutritious diet is reflected in most beneficial weight gain in the course of pregnancy (10 kg) by way of the expectant woman.
- She needs to pick meals prosperous in fibre (around 25 g/1000 kcal) like entire grain cereals, pulses and vegetables, to avoid constipation. She needs to take lots of fluids consisting of 8-12 glasses of water per day. Salt consumption must no longer be constrained even to forestall pregnancy-induced hypertension and pre-eclampsia.
- Excess intake of drinks containing caffeine like coffee and tea adversely affect fetal boom and hence, be avoided.
- In addition to following these dietary requisites, a pregnant female must bear periodic fitness check-up for weight gain, blood pressure, anaemia and acquire tetanus toxoid immunization.
- She requires adequate bodily exercise with adequate relaxation for 2-3 hrs all through the day.

NOTES

- Pregnant and lactating women should not indiscriminately take any tablets barring clinical advice, as some of them could be unsafe to the foetus/baby. Smoking and tobacco chewing and consumption of alcohol be avoided.
- Wrong meals superstitions and taboos ought to be discouraged. The most essential food protection problem is microbial meals borne illness and its prevention all through being pregnant is one of the important public health measure. Avoiding contaminated foods is necessary shielding measure in opposition to food borne illness.

Factors affecting maternal nutritional status

- Eat greater food all through pregnancy.
- Eat extra complete grains, sprouted grams and fermented foods.
- Take milk/meat/eggs in adequate amounts.
- Eat masses of greens and fruits.
- Avoid superstitions and food taboos.
- Do not use alcohol and tobacco. Take drugs only when prescribed.
- Take iron, folate and calcium dietary supplements regularly, after 14-16 weeks of the pregnancy and proceed the equal for the duration of lactation.
- Folic acid is critical for the synthesis of haemoglobin. Folic acid deficiency leads to macrocytic anaemia.
- Pregnant women want more of folic acid. Folic acid dietary supplements amplify delivery weight and limit congenital anomalies. Green leafy vegetables, legumes, nuts and liver are desirable sources of folic acid. 500 mg (0.5mg) folic acid supplementation is recommended preconceptionally and through out pregnancy for ladies with records of congenital anomalies (neural tube defects, cleft palate).
- Iron is wanted for hemoglobin synthesis, intellectual characteristic and to grant immunity in opposition to diseases.
- Deficiency of iron leads to anemia.
- Iron deficiency is common particularly in girls of reproductive age and children.
- Iron deficiency during being pregnant increases maternal mortality and low birth weight infants.
- In children, it increases susceptibility to infection and impairs mastering ability.
- Plant ingredients like leafy vegetables, legumes and dry fruits comprise iron.

NOTES

- Iron is also acquired via meat, fish and poultry products.
- Iron bio-availability is poor from plant ingredients but is suitable from animal foods.
- Vitamin C - prosperous fruits like gooseberries (Amla), guava and citrus improve iron absorption from plant foods.
- Beverages like tea bind dietary iron and make it unavailable. Hence, they ought to be avoided earlier than at some point of or soon after a meal.
- Commonly consumed plant based diets supply around 18mg of iron as in opposition to recommended intake of 35mg per day. Therefore, supplementation of iron (100 mg elemental iron, 0.5 mg folic acid) is endorsed for one hundred days at some point of being pregnant from sixteen week onwards to meet the demands of pregnancy.
- Breast-milk is the most herbal and best meals for regular growth and wholesome development of infants.
- Colostrum is prosperous in nutrients and its anti-infective properties are beneficial for infants.
- Breast-feeding reduces chance of infections.
- It establishes mother-infant contact and promotes mother-child bonding.
- It prolongs birth interval by fertility manipulate (delayed return of menstruation).
- Breast-feeding helps in retraction of the uterus.
- It has also been observed that incidence of breast cancers decrease in mothers who breast feed their children.

Recommended daily dietary allowances for pregnant and lactating women

Table 5.4: *RDA for Non-Pregnant, Pregnant and Lactating Women*

Nutrient	Non-Pregnant	Pregnant	Lactation
Vitamin A (µg/d)	700	770	1300
Vitamin D (µg/d)	5	15	15
Vitamin E (mg/d)	15	15	19
Vitamin K (µg/d)	90	90	90
Folate (µg/d)	400	600	500
Niacin (mg/d)	14	18	17
Riboflavin (mg/d)	1.1	1.4	1.6
Thiamin (mg/d)	1.1	1.4	1.4
Vitamin B6 (mg/d)	1.3	1.9	2

Nutrient	Non-Pregnant	Pregnant	Lactation
Vitamin B12 (µg/d)	2.4	2.6	2.8
Vitamin C (mg/d)	75	85	120
Calcium (mg/d)	1,000	1,000	1,000
Iron (mg/d)	18	27	9
Phosphorus (mg/d)	700	700	700
Selenium (µg/d)	55	60	70
Zinc (mg/d)	8	11	12

Table 5.5: *Typical Composition of Micronutrients in a Prenatal Vitamin*

Component	Amount	% Daily Value for Pregnant and Lactating Women
Vitamin A	4,000 IU as beta carotene	50%
Vitamin D3	400 IU as Cholecalciferol	100%
Vitamin E	11 IU as dl-Alpha Tocopheryl acetate	37%
Folic acid	800 µg	100%
Niacin	18 mg as niacinamide	90%
Riboflavin	1.7mg as thiamin mononitrate	85%
Thiamin	1.5 mg	88%
Vitamin B6	2.6 mg as pyridoxine hydrochloride	104%
Vitamin B12	4 µg as cyanocobalamin	50%
Vitamin C	100 mg as ascorbic acid	167%
Calcium	150 mg as calcium carbonate	12%
Iron	27 mg as ferrous fumarate	150%
Zinc	25 mg as zinc oxide	167%

Folic acid is the synthetic structure of the naturally occurring B vitamin, folate. Folic acid is the structure used in most nutrition supplements and meals fortification. As mandated by the Food and Drug Administration, in many instances fortified ingredients consist of bread, cereal, and pasta.

- Folate-rich meals sources are citrus fruits, dark-green leafy vegetables, nuts, and liver. Folate necessities enlarge for the duration of being pregnant as a result of swiftly dividing cells related to fetal growth. Notably, folic acid supplements (400-800µg daily) taken prior to idea can limit the chance for neural tube defects in the foetus.
- In order to limit the chance for neural tube defects in their offspring, girls are advocated to take folic acid from fortified meals or supplements day by day in addition to consuming a weight loss programme wealthy in meals sources of folate.

- Women with a records of a neural tube defect in a prior pregnancy should take a higher dose (4mg) of folic acid day by day for subsequent pregnancies. Deficiencies in folate have been associated with megaloblastic anemia in pregnancy, though no longer with other being pregnant consequences such as preterm beginning or stillbirths.
- Iron supplements have routinely been recommended in pregnancy because iron needs almost double in the course of pregnancy.
- A fashionable prenatal diet includes 27 mg of elemental iron.
- Vitamin C dietary supplements can help with iron absorption, whereas milk and tea can inhibit iron supplementation.
- Women with iron deficiency, described by using a ferritin level;15 μg/L, can amplify their hemoglobin with the aid of 2 g/dL over a one month duration with a day by day alternative of 60-120 mg of elemental iron.
- Common facet results of iron, such as belly pain, constipation, nausea, and vomiting are regularly reasons why ladies are now not compliant with iron supplementation. Iron-rich meals consist of purple meat, pork, fish, and eggs.
- Vitamin D is a fat-soluble nutrition that is primarily discovered in fortified milk or juice; herbal sources encompass eggs and fish such as salmon. The skin also manufactures vitamin D when it is exposed to sunlight.
- Regardless of the supply – oral ingestion vs. pores and skin absorption – similarly processing in the liver and then the kidney is required to create the energetic form, 1,25-dihydroxyvitamin D, which promotes calcium absorption from the intestines and thereby permits terrific bone mineralization and growth. Vitamin D deficiency is common in pregnancy, mainly in high-risk companies such as vegetarians, women who stay in cold climates, and ethnic minority ladies with darker skin. Severe vitamin D deficiency has been associated with congenital rickets and fractures. While Vitamin D levels can be measured by means of a serum stage of 25-hydroxy vitamin D, as most efficient degree during being pregnant now not been established. Furthermore, there is inadequate evidence to propose screening all pregnant female for diet D deficiency. If vitamin D deficiency is determined at some stage in pregnancy, then supplements (1000-2000 IU per day) can be given.In addition, hobbies nutrition D supplementation all through pregnancy to forestall preeclampsia is additionally not recommended.
- Vitamin A is critical for cell differentiation and proliferation as properly as improvement of the spine, heart, eyes, and ears.
- Although most micronutrients have a huge protection margin with little challenge for teratogenic effects, Vitamin A is one exception.

Excessive doses of Vitamin A (10,000 IU/day) have been related with cranial-facial (face, palate, ears) and cardiac beginning defects. The maximal supplement in being pregnant is 8000 IU/day. It is the retinol structure of Vitamin A that is related with teratogenic effects, not the carotenoid version found in food sources such as carrots.

Weight gain in pregnancy

- Pregnancy has historically been viewed a time for weight gain, and not weight loss. The compulsory weight reap in the course of pregnancy is about eight kg which accounts for the foetus, the placenta, amniotic fluid volume, and variations to maternal tissues (e.g., uterus, breast, blood volume).
- A weight gain much less than this quantity implies that current maternal adipose and protein stores would be mobilized in order to support the pregnancy. Metabolic changes of girls who lose weight for the duration of being pregnant are no longer well-described, but ketonemia, elevated urinary nitrogen excretion, and reduced gluconeogenic amino acid production result after a duration of fasting for the duration of pregnancy.
- Pregnancy is regularly regarded a time of 'accelerated starvation' due to the extend in insulin resistance, with an extended chance for creating ketonuria and ketonemia.This physiologic alternate is important to reflect onconsideration on in the putting of weight loss for the duration of pregnancy due to the fact maternal ketonemia or ketonuria may also as a result be related with odd fetal increase or later neurocognitive development.
- A woman's pre-pregnancy BMI determines the total quantity of weight obtain and fee of weight acquire at some stage in pregnancy.
- Women who are obese or have obesity have decrease tiers for recommended whole gestational weight attain compared to normal-weight women, yet 50 percent of all ladies exceed the gestational weight reap recommendations.
- One find out about located that women who obtain weight in the fabulous vary for their BMI throughout pregnancy have fewer adverse perinatal results than those gaining above the described thresholds.

5.4 INFLUENCE OF LACTATION ON NUTRIENT NEEDS

When most women who deliver an infant have adequate nutritional stores for breastfeeding. The maternal diet can influence the nutrient content of

breast milk, particularly the volume of milk produced, its protein content, its water-soluble vitamin content, and its fatty acid composition.

Vitamin and mineral supplementation of the maternal diet may not be necessary, except for the strict vegetarian or malnourished mother. Many physicians recommend the nursing mother continue her prenatal vitamins while lactating since the quality of the maternal diet may not be easy to ascertain. Special situations, such as diabetes, gastrointestinal problems, and inborn errors of metabolism, do not preclude breastfeeding if recommended adjustments to the maternal diet are made. The nutritional needs of infants weighing less than 1500 g or infants with special problems may be partially or fully met by breastfeeding. Specific adjustments to the maternal or infant diet may be required.

Many chemicals and drugs are excreted into breast milk. Seldom is breastfeeding contraindicated because of drugs or environmental contaminants, although an awareness of potential effects may make the mother avoid unnecessary exposure to these substances. Breastfeeding may have to be suspended temporarily when certain radionuclides are used for diagnosis or treatment, or while the mother is receiving chemotherapy. Afterward, it may be resumed.

Infectious agents, such as those of hepatitis, herpes, tuberculosis, or acquired immune deficiency syndrome, may be transmitted to the infant through breast milk. Temporary or permanent cessation of breastfeeding may be recommended. The only absolute contraindication to breastfeeding is galactosemia in the infant.

Special maternal or infant needs requiring dietary changes on either part sometimes are used as reasons to discourage breastfeeding. For a motivated mother who wants to nurse her infant, the specific recommendations in this unit are designed to help her to provide for both her own and her infant's nutritional needs. These recommendations are intended to be used to promote rather than discourage breastfeeding.

Check Your Progress

1. What are some of the factors responsible for nutritional disorders in the children?
2. Name the organ by which the fetus maintains a connection with the mother.
3. What is needed to meet the excessive needs of erythropoiesis?
4. Name the element which helps in iron absorption from plant foods.
5. List some of the infectious agents which may be transmitted to the infant through breast milk.

NOTES

5.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Non availability of foods, ignorance, superstitions and poverty are the factors responsible for nutritional disorders in the children.
2. Placenta is the organ by which the foetus is attached by the means of umbilical cord and maintains a connection with the mother.
3. The mother as well as the developing foetus need iron to meet the excessive needs of erythropoiesis (RBC formation).
4. Vitamin C is the element which helps in iron absorption from plant foods.
5. Some of the infectious agents which may be transferred to an infant through breast milk include hepatitis, herpes, tuberculosis, or acquired immune deficiency syndrome.

5.6 SUMMARY

- The growth and development of a preschool child is entirely dependent on the diet. Infections and infestations attack immediately when the diet is poor in quality.
- A well-nourished child will be alert, vigorous, quickly recovering from fatigue, sleep well at night, normal in height and weight, have clear bright straight well-formed teeth, un-bleeding gums, lustrous healthy hair, firm muscles, good appetite and regular bowel movements.
- Protein calorie malnutrition and other deficiency diseases may occur easily with faulty food habits. Children are great imitators and they imitate their elders and parents. So, it is the parent's duty to cultivate good food habits in the family. Non availability of foods, ignorance, superstitions and poverty are the factors responsible for nutritional disorders in the children.
- Ignorance and illiteracy of mothers may have a great impact causing malnutrition and faulty food habits of children. So, education of mothers is very essential to improve the nutritional status of the family.
- Pregnancy and lactation lays considerable stress on women. Nutritional needs during this period increases, but the society frame some rigid rules for pregnant women including the food she should eat and food she should not even touch.
- Neonatal mortality also increases with poor nourishment of the expectant mother. Mothers who in a good nutritional state prior to

conceiving and who maintain that status all through pregnancy have fewer complications in pregnancy, parturition and have healthy babies.

- Pregnancy can be conveniently divided into three stages. Ovum becomes implanted in endometrium of the uterus where rapid cell proliferation occurs. The uterine glands and outer layers of germplasm near the embryo and placenta begins to develop. This stage extends over a period of 2 weeks. From 8th week to parturition rapid growth of foetus, production of milk and preparation for labor takes place.
- The everyday food regimen of a female need to contain an extra 350 calories, 0.5 g of protein during first trimester and 6.9 g all through second trimester and 22.7 g for the duration of third trimester of pregnancy.
- Some micronutrients in particular are required in greater quantities at different stages of pregnancies. These include Folic acid, iron, calcium and Vitamin A.
- The pregnant/lactating lady have to consume a significant range of meals to make certain that her own nutritional wishes as well as these of her growing foetus are met. There is no precise desire to alter the normal dietary pattern. However, the volume and frequency of utilization of the top notch meals must be increased.
- Breast-milk is the most herbal and best meals for regular growth and wholesome development of infants.
- When most women who deliver an infant have adequate nutritional stores for breastfeeding. The maternal diet can influence the nutrient content of breast milk, particularly the volume of milk produced, its protein content, its water-soluble vitamin content, and its fatty acid composition.

5.7 KEY WORDS

- **Neonatal mortality**: It refers to the statistical rate of infant death during the first 28 days after live birth
- **Eclampsia:** It refers to a condition in which one or more convulsions occur in a pregnant woman suffering from high blood pressure, often followed by coma and posing a threat to the health of mother and baby
- **Placenta:** It is the organ by which the foetus is attached by the means of umbilical cord and maintains connection with the mother
- **Pica:** It is a psychological disorder characterized by an appetite for substances that are largely non-nutritive
- **Teratogens**: These are pathogens which halt the pregnancy or produce a congenital malformation (a birth defect)

5.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. Write a short note on the growth and development of a preschool child.
2. What are the factors responsible for neonatal mortality or low birth weight infant?
3. Write a short note on weight gain in pregnancy.
4. What is the influence of lactation on nutrient needs?

Long-Answer Questions

1. What must be kept in mind while planning balanced diets for toddlers and preschoolers?
2. Examine the bodily changes that a woman goes during pregnancy.
3. Describe the importance of nutrition for pregnant and lactating mothers.
4. Discuss the factors affecting maternal nutritional status.

5.9 FURTHER READINGS

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UNIT 6 NUTRITIONAL PROBLEMS-I

NOTES

Structure

6.0 INTRODUCTION

Up till now, you have studied the concepts of nutrition, nutritional requirements and planning balanced diets for children of different age groups. But, what happens when the diets are not sufficient to meet the nutritional requirements of the different age groups? Nutritional deficiency diseases, as the name suggests occurs when the child does not receive the stipulated levels of nutrition. As per data from UNICEF and NHFS 4: In India 20 per cent of children under five years of age suffer from wasting due to acute undernutrition. More than one third of the world's children who are wasted live in India. Fourty-three per cent of Indian children under five years are underweight and 48 per cent (i.e. 61 million children) are stunted due to chronic undernutrition, India accounts for more than 3 out of every 10 stunted children in the world. In this unit, you will study the nutritional problems with an overview of major symptoms of deficiency diseases of children along with a special focus on protein-energy malnutrition and exophthalmia.

6.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the concept of deficiency diseases and their symptoms
- Describe Protein-energy malnutrition
- Explain the nature, clinical features, causes and treatment of exophthalmia

6.2 MAJOR DEFICIENCY DISEASES OF CHILDREN AND THEIR SYMPTOMS

NOTES

To understand the major deficiency diseases of children in India, one must first get acquainted with the child health situation in India. In this section, we will refer to the data presented by the Niti Aayog's National Nutrition Strategy as published in 2017.

- The rationale for investing in Nutrition is globally well recognized – both as a critical development imperative, as well as crucial for the fulfillment of human rights.
- India is home to the largest number of children in the world. Nearly every fifth young child in the world lives in India. It is estimated that there are about 43 crore children in the age group of 0-18 years.
- In India, undernutrition levels have remained persistently high – especially in utero, in the early years of life, in adolescent girls and in women across the life cycle-especially in disadvantaged /excluded community groups and those living in areas or conditions of high nutritional vulnerability and multiple deprivations.
- Deficiencies of key vitamins and minerals such as Vitamin A, Iron, Iodine and Zinc continue to coexist and interact with protein and energy deficits and need to be addressed synergistically, through a multipronged approach.
- Vitamin A Sub-clinical Vitamin A Deficiency (VAD) is a well-known cause of morbidity and mortality, especially among young children and pregnant women. Vitamin A deficiency limits the growth of young children, weakening their immunity and in cases of acute deficiency, leading to blindness and to increased mortality.
- Iron Deficiency Anemia (IDA) is common across all age groups, but highest among more vulnerable young children, adolescent girls, pregnant and lactating women. The consequences of IDA in pregnant women are increased risk of low birth weight or premature delivery, peri-natal and neonatal mortality, inadequate iron stores for the new-born, lowered physical activity, fatigue and increased risk of maternal morbidity. Iron deficiency impairs growth, cognitive development and immune function. It reduces the performance level of children in school and makes them less productive as adults.
- Iodine Deficiency Disorder (IDD) constitute the single largest cause of preventable brain damage worldwide, leading to learning disabilities and psychomotor impairment.
- Zinc deficiency results in the stunted growth of children. Zinc deficiency compromises the effectiveness of the immune system, increasing

the incidence and severity of infections such as diarrhea disease and pneumonia.

Deficiency Diseases in Children and their symptoms

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- **Rickets:** It is caused due to the deficiency of Vitamin D, calcium and potassium. It is characterized by weak and soft bones, bowed legs and bone deformities.
- **Goiter:** It is caused due to the deficiency of iodine. It leads to enlarged thyroid glands causing hypothyroidism, poor growth and development of infants in childhood, cretinism and even mental retardation.
- **Anaemia:** It is a disease caused by the deficiency of iron. Its symptoms included a decrease in the red blood cell count or hemoglobin in the body, resulting in fatigue, weakness, dyspnoea and paleness of the body.
- **Kwashiorkor:** It is a deficiency disease caused by lack of protein and energy in the body. It is characterized by anorexia, an enlarged liver, irritability and ulcerating dermatoses.
- **Marasmus:** It is also caused by protein and energy malnutrition. This disease starts with the swelling of legs followed by hands and the whole body. Rough skins, less hair on head with hair colour changing to reddish brown are symptoms of marasmas. Affected children look pale and lack enthusiasm.
- **Osteoporosis:** It is caused by deficiency of calcium and vitamin D. It leads to unhealthy, soft and brittle bones that are prone to fractures and defects in the spine structure.

6.3 PROTEIN-ENERGY MALNUTRITION

Before learning about the protein-energy malnutrition, you should get acquainted with the basics of protein, energy and malnutrition.

1. Protein

Muller in 1838 identified organic substance which is most important of all known substances. It was named as protein.The word protein was derived from the Greek word ‘proton’ which means first place.Protein now means a nitrogenous constituent of protoplasm of all plant and animal tissues.Protein is necessary for innumerable functions in the body primarily for synthesis of all the body tissues.

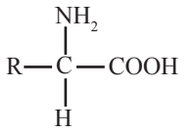
Composition

Proteins are made up of amino acids as units in various proportions and arrangements.They possess carbon, hydrogen, oxygen, nitrogen and sulphur

in few amount.Some proteins have phosphorus and small amount of iron including copper. The presence of nitrogen makes protein different from carbohydrates and fats.Protein on average have 16 per cent nitrogen.Protein molecules are larger than carbohydrates and lipids molecules and form colloidal solutions.

Structure

Proteins are made up of amino acids.Amino acids are organic compound with amino group and acid or carboxyl group.The structure of amino acid can be represented as below:



R is the carbon chain it may be straight or branched chain of an aromatic heterocyclic ring structure or a sulphur grouping.Amino acids with one amino and one carboxyl groups and one amino group are acid in reaction and those with two amino groups and one carboxyl group are basic in reaction.These amino acids are linked to each other by a peptide linkage that is amino group of an amino acid is linked to the carboxyl group of other by removal of a water molecule.The amino acid naturally occurring in proteins have been classified under the following heads:

1. Mono amino monocarboxylic acid
2. Mono amino dicarboxylic acid
3. Diamino monocarboxylic acid
4. Sulphur containing amino acids and
5. Aromatic amino acids heterocyclic amino acids

These are as shown in the following table:

Table 6.1: *Types o Amino Acids*

Mono amino mono carboxylic acid	(a) Glycine (b) Alanine (c) Valine (d) Levcine (e) Isoleucine (f) Nor leucine (g) Serine (h) Threonine
Mono amino di carboxylic acid	(a) Aspartic acid (b) Glutamic acid

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Diamino mono carboxylic acid	(a) Arginine (b) Lysine
Sulhur containing amino acids	(a) Cysteine (b) Methinine (c) Cystine
Aromatic amino acids and heterocyclic amino acids	(a) Phenylalanine (b) Tyrosine (c) Tryptophan (d) Histidine (e) Proline (f) Hydroproline

Classification of proteins

Proteins are classified in a number of basis as per their physical and chemical properties, physical shape as well as nutritional properties:

Physical and chemical properties

According to this classification of proteins are divided into:

(a) Simple proteins

(b) Conjugated proteins and

(c) Derived proteins

Let's discuss these in detail.

(a) Simple Proteins

These on hydrolysis by acids, alkalis or enzyme yield only amino acids and their derivatives.

(i) Albumins

These are soluble in water and are heat coagulable.They are precipitated from solution by saturating with ammonium sulphate. Examples include egg albumin, lacta albumin and serum albumin.

(ii) Globulin

These are insoluble in water but soluble in neutral salt solution. They are heat coagulable and can be precipitated by half saturation with ammonium sulphate. These are present along albumin.

(iii) Glutelins

These are not soluble in neutral solvents, but are soluble in dilute acids and alkalis. For example wheat proteins.

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(iv) Prolamines

These are soluble in 70 to 80 per cent alcohol. for example Proteins in wheat (gliadin), maize (zein), barley.

(v) Fibrous Proteins

They are characteristic of the skeletal structures of animals and external protective tissues.They are present in skin, hair, bones and book containing amino acid is rich in sulphur.

(vi) Histories

They are soluble in water dilute acid and salt solution but insoluble in very dilute ammonia.On hydrolysis they yield several amino acids among which basic ones like arginine are predominant. Examples include nucleic acids and hemoglobin.

(vii) Protamine

They are strongly basic proteins with low-molecular-weight, water soluble and not-heat coagulable. They are found in sperm cells, hence component of sperm nucleoprotein.

(b) Conjugated proteins

The proteins in this group are combined with the non protein group called as prosthetic group.

Nucleoproteins are the compounds of proteins with nucleic acid, glycoproteins are the protein molecules with carbohydrate group, and phosphoproteins are the protein with phosphorus group, chroma proteins are the prosthetic group that is colored. Lipo- proteins are the proteins in combination with phospholipids occur in the blood serum, egg yolk and milk. Metalloproteins are the proteins in combination with metals like iron, copper, zinc, magnesium.

(c) Derived proteins

Derived proteins are the products of denaturation of partial digestion of proteins.

Primary protein derivatives

These are the derivatives of protein molecules due to hydrolytic changes which involve only slight alterations.

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The proteins are insoluble product formed as a incipient action of very dilute acids or enzymes. Meta proteins on treatment with acid or alkali the corresponding acid or alkali metal protein is formed which is insoluble in neutral solvents.

Coagulated proteins are the denatured insoluble proteins which are formed due to the action of heat on the action of alcohol on the protein structure.

Secondary protein derivatives

Secondary protein derivatives are the product formed due to the partial digestion of proteins.

Proteases are soluble in water but cannot be coagulated by heat.

They can be precipitated by saturating it with Ammonium Sulphate.

The **peptones** are soluble in water but cannot be coagulated by heat of precipitated by Ammonium Sulphate.

The **peptides** have two or more amino acids they form as a result of hydrolytic cleavage of peptones.

2. Energy

Next to air and water, the body requires a continuous source of energy to stay alive and keep all the organs and systems functioning efficiently.

Just as every engine requires fuel to keep going, the human body too required fuel in the form of food as a source of power to work continuously. The human body is far more complex than any machine invented and as long as there is energy it cannot be turned off.

The first and foremost function of food is the supply energy to the body. This takes priority over building of new tissues repair of wear and tear and regulation of body functions.For example, if diet contains adequate protein but is deficient in carbohydrate and fat, the protein will be oxidized to meet the energy needs first and balance used for other functions.

When food is digested, the complex nutrient carbohydrate fat protein and broken down into monosaccharide fatty acid glycerol and amino acid respectively.These simple forms are absorbed into the bloodstream and supplied to the millions of cell in the body to be oxidized by a series of complex steps to release the energy.

Forms of energy

Energy is defined as the ability to do work. It exist in several forms. The major forms of energy important in nutrition are as follows:

Chemical energy in the food light of solar energy for the synthesis of vitamin D in the skin and for photosynthesis in plants.

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Mechanical energy for the movement of muscles electrical energy for the functioning of brain and the Nerve cells.

Heat energy is generally produced when energy is converted from one form to the another the energy from food is finally converted into heat energy.

The various forms of energy are interconvertible.Living cells are capable of releasing the energy stored in the certain nutrients. This energy is used to perform various activities in the cell such as synthesis of proteins, maintaining warmth and contraction of the muscles.The energy from the breakdown of food is stored in the body in the form of high energy compound adenosine triphosphate.Adenosine triphosphate act as a store of energy. Rich phosphate bones living cells can use energy in the form of energy rich phosphate bonds.

6.3.1 Types and Causes of Malnutrition

Malnutrition refers to insufficient, excessive, or imbalance consumption of nutrients and in developed countries the diseases of malnutrition are frequently related to nutritional imbalance or excessive consumption of nutrients.

Types of malnutrition

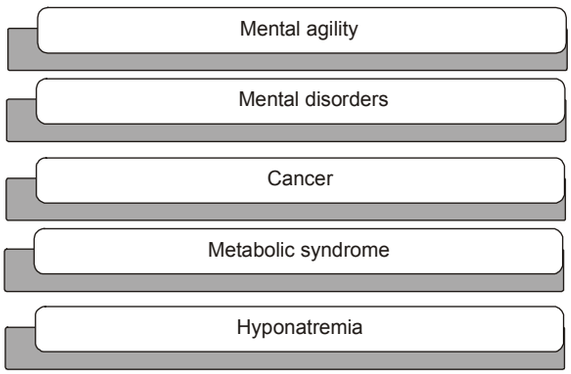

Fig. 6.1: *Types of Malnutrition*

Mental agility: According to research, the major alertness that improves the awareness of nutritious meal choices and establishing long-term habits of healthy eating has a positive effect on cognitive and memory capacity, increasing a student's potential to process and retain academic information.

Mental disorders: Nutritional supplements treatment may be appropriate for treating major depression, bipolar disorder, schizophrenia and obsessive compulsive disorder, the four most common mental disorders in developed countries. Supplements that have been studied most for mood elevation and stabilization include eicosapentaenoic acid and docosahexaenoic acid (each of which are an omega-3 fatty acid contained in fish oil, but not in flaxseed oil), vitamin B12, folic acid, and inositol.

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Cancer: According to a study by the international agency for research for cancer, in the developing nations, cancers of the liver, stomach and oesophagus were more common, often linked to consumption of carcinogenic preserved foods, such as salted or smoked food, and parasitic infections that attack organs. Lung cancer rates are rising rapidly in poorer nations because of increased use of tobacco. However, in developed countries cancers of the colon, rectum, breast and prostate caused by obesity, lack of exercise, diet and age are very common.

Metabolic syndrome: Several lines of evidence indicate lifestyle-induced hyperinsulinemia and reduced insulin function in response to insulin resistance as decisive factors in many disease states. For instance, hyperinsulinemia and insulin resistance are strongly related to chronic inflammation, which in turn is strongly linked to a variety of unfavourable developments such as arterial microinjuries and clot formation as in heart disease and exaggerated cell division as in cancer. Hyperinsulinemia and insulin resistance–the so-called metabolic syndromes–are characterized by abdominal obesity in combination with elevated blood sugar, elevated blood pressure, elevated blood triglycerides, and reduced HDL cholesterol.

Hyponatremia: Excess water intake, without replenishment of sodium and potassium salts, causes hyponatremia, which can further result in water intoxication at more detrimental levels.

The important illnesses caused by improper nutrient consumption are as follows (refer Table 6.2):

Table 6.2: *Illness Caused by Improper Nutrient Consumption*

S. No.	Nutrients	Deficiency of Nutrient	Excess of Nutrient
1	Energy	Starvation, marasmus	Obesity, diabetes mellitus, cardiovascular disease
2	Simple carbohydrates	None	Diabetes mellitus, obesity
3	Complex carbohydrates	None	Obesity
4	Saturated fat	Low sex hormone levels	Cardiovascular disease
5	Trans fat	None	Cardiovascular disease
6	Unsaturated fat	None	Obesity
7	Fat	Malabsorption of fat-soluble vitamins, rabbit starvation (if protein intake is high), during development: stunted brain development and reduced brain weight	Cardiovascular disease
8	Omega-3 fats	Cardiovascular disease	Bleeding, haemorrhages
9	Omega-6 fats	none	Cardiovascular disease, cancer

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10	Cholesterol	During development: deficiencies in myelinization of the brain.	Cardiovascular disease
11	Protein	Kwashiorkor	Rabbit starvation
12	Sodium	Hyponatremia	Hypernatremia,hypertention
13	Iron	Anaemia	Cirrhosis, Cardiovascular disease,
14	Iodine	Goitre, hypothyroidism	Iodine toxicity(Goitre, hypothyroidism)
15	Vitamin A	Xerophthalmia and nightblindness, low testosterone levels	Hypervitaminosis A (cirrhosis, hairlosses)
16	Vitamin B1	Beriberi	
17	Vitamin B2	Cracking of skin and corneal unclearation	
18	Niacin	Pellagra	Dyspepsia, cardiac arrhythmias, birth defects
19	Vitamin B12	Pernicious anaemia	
20	Vitamin C	Scurvy	Diarrhoea causing dehydration
21	Vitamin D	Rickets	Hyper vitaminosis D (dehydration, vomiting, constipation)
22	Vitamin E	Nervous disorders	Hypervitaminosis E (anticoagulant: excessive bleeding)
23	Calcium	Osteoporosis, tetany, carpopedal spasm, laryngospasm, cardiac arrhythmias	Fatigue, depression, confusion, anorexia, nausea, vomiting, constipation, pancreatitis, increased urination
24	Magnesium	Hypertension	Weakness, nausea, vomiting, impaired breathing and hypotension
25	Potassium	Hypokalemia, cardiac arrhythmias	Hyperkalemia, palpitations

Source: *Compiled by author*

6.3.2 Protein-Energy Malnutrition: Meaning and Forms

As the National Health Portal defines the protein-energy malnutrition:

It more commonly affects children between the ages of 6 months and 5 years. PEM has many short-term and long-term physical and mental effects, including growth retardation, lowered resistance to infections, and increased mortality rates in young children. Two major forms are marasmus and kwashiorkor. Let us study these two in detail:

Marasmus

Marasmus results from prolonged starvation. The affected child (or adult) is very thin (skin and bones), most of the fat and muscle mass having been expended to provide energy. Marasmus is the most frequent form of PEM in conditions of severe food shortage. Associated signs of the condition are

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(a) A thin "old face"

(b) "Baggy pants" (the loose skin of the buttocks hanging)

(c) Affected children may appear to be alert in spite of their condition.

(d) There is no edema of the lower extremities.

(e) Prominent ribs

Kwashiorkor

Kwashiorkor usually affects children aged 1-4 years. The main sign is edema, usually starting in the legs and feet and spreading, in more advanced cases, to the hands and face. Because of edema, children with kwashiorkor may look "fat" so that their parents regard them as well fed. Other signs of kwashiorkor are:

(a) Hair changes: loss of pigmentation; curly hair becomes straight, easy pluck-ability.

(b) Skin lesions and depigmentation: dark skin may become lighter in some places, especially in the skin folds; outer layers of skin may peel off (especially on legs), and ulceration may occur; the lesions may resemble burns.

(c) Children with kwashiorkor are usually apathetic, miserable, and irritable. They show no signs of hunger, and it is difficult to persuade them to eat.

Check Your Progress

1. Name some amino acids naturally occuring in proteins.
2. What is energy and what are the different forms of energy?
3. Illustrate the structure of protein.
4. What are globulins?

6.4 EXOPHTHALMIA-NATURE, CAUSES, CLINICAL FEATURES AND TREATMENT

Exophthalmos describes a condition where the eyeball protrudes from the eye socket, making it appear to bulge. It can affect one or both eyes. Depending on how severe it is, exophthalmos can cause eye problems such as corneal dryness and conjunctivitis, which is an inflammation of the membrane lining the eye. In the long-term, symptoms tend to improve, but this can take years. There is a possibility that the eyes may continue to bulge if treatment is not received. Exophthalmos is not a condition, but the sign of a disorder. Commonly, it can signal a problem with the thyroid gland. Graves' disease

is the most common cause of exophthalmos. Graves' disease and thyroid disorders affects the thyroid gland.

Graves' disease is an autoimmune disease that causes hyperthyroidism. A person with hyperthyroidism has an overactive thyroid gland that produces excess hormones and causes it to grow. The thyroid is in the neck, below the Adam's apple. The hormones it produces help to regulate growth, the rate of metabolism and other important functions of the body. The hormones are called thyroxine and triiodothyronine, and they are normally kept in balance.

Thyroid eye disease is a condition where the soft tissues and muscles around the eyes become swollen and inflamed. It is often due to hyperthyroidism, and sometimes to hypothyroidism, which is caused by an underactive thyroid gland. Hyperthyroidism or hypothyroidism may not cause the eyes to protrude immediately. It may take some time for this to happen.

In a healthy person, the immune system attacks pathogens, the organisms and substances that are bad for us. These include some bacteria, viruses, parasites, cancer cells, and fungi. However, in certain people, the immune system starts attacking normal tissue. This is described as an autoimmune reaction. Graves' disease is an example of such an autoimmune reaction. Experts are not sure why autoimmune diseases occur. If a person's immune system attacks the thyroid gland, it may react by producing extra hormones. The autoimmune antibodies can attack the muscles and soft tissue surrounding the eyes, which can cause them to protrude from the sockets. This can lead to: dry or gritty eyes redness puffy eyes inflammation and swelling vision problems. Anywhere from 25-50 percent of people with this condition will have an eye involvement. Interestingly, eye involvement can occur up to 10 years before the diagnosis of thyroid problems is made and up to 20 years after. The immune cells that attack the thyroid in Graves' disease also accumulate within the eye socket. The fatty tissue and muscles around the eye become large, pushing the eye forward and out.

Clinical Features Symptoms and Causes

A person who has Graves' exophthalmos may experience the following symptoms: pain in the eyes, dry eyes, eye irritation, photophobia, or sensitivity to light lacrimation, or eye secretions, and shedding of tears diplopia, or double vision caused by weakening of the eye muscles, blurred vision blindness if the optic nerve is compressed, difficulty in moving eyes, as the eye muscles are affected feeling pressure behind and around the eyes. Other signs and symptoms of Graves' disease not related to the eyes include irregular heartbeats, anxiety, elevated blood pressure, increased appetite, weight loss, diarrheoa, and sleeping problems.

While Graves' disease is the most common disorder that can cause the eyes to protrude, it is not the only one. Other symptoms like protruding eye,

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can also happen if there is something in the eye socket that pushes the eyeball forward. This could be: a cancerous or non-cancerous tumor, a blood clot, an eye injury, orbital cellulitis (infection of tissue around the eye), abnormalities within the brain. Anybody who notices that one or both eyes are starting to bulge should seek medical attention.

Common cause

Fig. 6.2: *Exophthalmos is a symptom of Graves' disease.*
Image credit: Jonathan Trobe, M.D, 2011

Diagnosis

A physician can normally notice a protruding eye by looking at it, but as exophthalmos is normally a sign of some disease or condition, tests will be needed to find the cause.

Tests may include:

- A blood test to see if the thyroid gland is functioning properly.
- Measurement of the degree of protrusion, using an exophthalmometer.
- Imaging scans, such as a CT scan or an MRI, to examine the orbit, or eye socket. A scan can detect a tumor or any abnormality in or around the eyes.
- A CT scan or MRI of the brain to evaluate the structure of the brain.

Exophthalmos tends to be a progressive disease, and symptoms get worse over time. Therefore, treatment should begin as soon as possible.

Treatment

The ophthalmologist or eye specialist will monitor the person regularly.

Treatment depends on several factors, including the cause, the person's age, and their general health.

Quitting smoking is recommended for anyone with this condition. Smoking has been shown to worsen exophthalmos and make it more difficult to treat.

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If the person has thyroid problems, the doctor will treat the underlying cause and bring thyroid hormone levels back to normal. While treating the thyroid problem is important, that alone may not resolve the exophthalmos. Often other treatments need to be added.

There are a variety of medical options for exophthalmos. Surgery can be helpful for those individuals with more severe eye involvement.

Non-surgical options for treatment can include:

- natural tears for eye lubrication
- sunglasses for light sensitivity
- corticosteroids
- medications that decrease the immune response, such as cyclosporin
- medications that block certain antibodies, such as rituximab (Rituxan)
- radiotherapy

In the case of radiotherapy, low dose radiation treatment is usually reserved for more severe cases and is often combined with corticosteroids.

Surgical options for treatment can include:

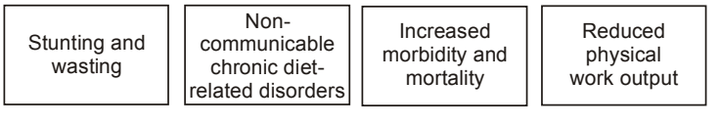
- **Orbital decompression**: Enlarging the orbit of the eye can make more room for the eye and its muscle and tissue.
- **Eye muscle surgery**: This can be done to correct abnormal eye muscles.
- **Eyelid surgery**: This works by protecting the cornea and outer eyeball from damage.

6.5 MANAGEMENT OR PREVENTION OF NUTRITIONAL DEFICIENCY DISORDERS

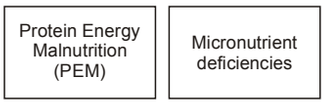
Health and nutrition are the most important contributory factors for human resource development in the country. India has been classified by the World Bank as a country with a lower middle income economy and it ranks 130 in terms of human development among 189 countries.

Important to know

Malnutrition leads to:



The following are the nutrition problems frequently encountered particularly among the rural poor and urban slum communities:



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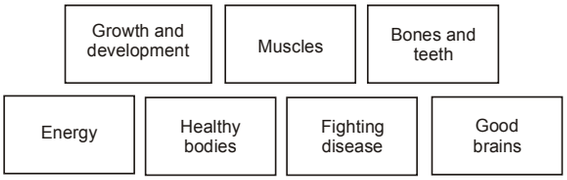
The following are important functions of foods:



Now we shall focus on management measures of a few nutritional deficiency disorders.

(a) Management of iron deficiency: The most common symptom of iron deficiency is fatigue. But this symptom alone is not enough to diagnose iron deficiency. Iron deficiency can lead to a microcytic, hypochromic anaemia. Diagnosis of iron deficiency anaemia requires laboratory evidence of this kind of anaemia along with evidence of iron deficiency. Serum ferritin is often used as the initial assessment of iron deficiency. When ferritin levels are over 100 Nano gram/mL iron deficiency anaemia is unlikely. When ferritin levels are less than 45 ng/mL, iron deficiency anaemia is more likely.

Oral **iron** supplementation is first-line treatment for the majority of patients with iron deficiency anaemia. The goal of treatment is to increase hemoglobin levels by 1 gram/dL every 2-3 weeks.

Ferrous sulfate 325 mg (providing 65 mg elemental iron) three times daily is usually recommended for treating iron deficiency anaemia. It is effective, generally well tolerated, and inexpensive. For those who don't tolerate ferrous sulfate, other formulations can be tried. However, it is important to keep in mind that different formulations provide different amounts of elemental iron. For dosing, aim to provide 50-100 mg elemental iron three times daily.

Several factors can impact on iron absorption. We have to give importance to these factors, otherwise, iron consumed may not be absorbed by the body. Iron needs an acidic environment for optimal absorption. Therefore, medications that reduce stomach acid can decrease iron absorption. In addition, components of certain foods can bind to iron and decrease its absorption. Tannins in tea and wine and polyphenols in coffee can bind iron in the GI tract.

A good first step in preventing iron deficiency is to eat foods high in iron content such as fruits and green leafy vegetables. In addition, many iron fortified breakfast cereals are now available in the market.

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(b) Management of iodine deficiency: The only known function of iodine in the body is the synthesis of thyroid hormone in the thyroid gland. The thyroid gland takes up 10 per cent to 80 per cent of absorbed iodine. When dietary iodine intake is insufficient, there are consequences related to thyroid function. Iodine deficiency can ultimately result in goitre, hypothyroidism, and decreased cognitive function. Iodine deficiency is particularly concerning in pregnant women because it can result in severe mental impairment in the newborn.

For patients at risk, the best bet is to prevent iodine deficiency by ensuring adequate intake of iodine-rich foods or using iodine-fortified salts or supplements. Marine animals concentrate iodine from seawater. As a result, seafood is one of the best sources of dietary iodine. In addition, seaweed, commonly used in Asian cuisine, is also a rich source of iodine.

(c) Management of folate deficiency: Folate is a general term that refers to several different forms of folic acid. Folic acid, or pteroylmonoglutamic acid, is the form used in vitamin supplements and fortified foods. Folate in food is pteroylpolyglutamate. People are at risk for folic acid deficiency when serum levels of folate are less than 3 nano gram/mL and red blood cell folate levels are less than 140 nano gram/mL. Folic acid deficiency can result in a progressive anaemia over time. Whereas iron deficiency causes a microcytic, hypochromic anaemia, folic acid deficiency results in a macrocytic anaemia. Overtime, as folic acid deficiency-related anaemia progresses, patients can develop symptoms of anaemia including weakness, fatigue, cognitive difficulty, headache, shortness of breath, and others.

Folic acid deficiency is usually treated with a folic acid supplement, 250-1000 mcg daily. For more severe deficiency with macrocytic anaemia, 1-5 mg daily is typically used until hematology normalizes. These higher doses are also commonly used to for deficiencies in patients with malabsorption disorders.

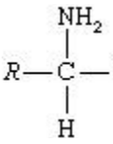
To meet nutrient requirements, the recommended dietary allowance (RDA) is 400 microgram /day for most adults. In women who are pregnant the RDA is 600 microgram /day and 500 microgram/day for breastfeeding women. These intake levels can be achieved through supplements or through the intake of appropriate foods. The most abundant dietary source of folate is green leafy vegetables. Folate in food is about 60 per cent to 90 per cent bioavailable. Synthetic folic acid in supplements is almost 100 per cent bioavailable.

NOTES

Check Your Progress

5. What are the functions of the hormones produced by the thyroid gland?
6. Graves' disease is an example of which type of reaction?
7. List the symptoms of folic acid deficiency-related anaemia.

6.6 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The amino acid naturally occurring in proteins have been classified under the following heads:
   (i) Mono amino monocarboxylic acid.
   (ii) Mono amino dicarboxylic acid.
   (iii) Diamino monocarboxylic acid.
   (iv) Sulphur containing amino acids and
   (v) Aromatic amino acids heterocyclic amino acids
2. Energy is defined as the ability to do work it exist in several forms. The major forms of energy important in nutrition are as follows:
   (i) **Chemical energy** in the food light of solar energy for the synthesis of vitamin D in the skin and for photosynthesis in plants.
   (ii) **Mechanical energy** for the movement of muscles electrical energy for the functioning of brain and the Nerve cells.
   (iii) **Heat energy** generally produced when energy is converted from one form to the another the energy from food is finally converted into heat energy.
3.  Structure of protein
4. These are insoluble in water but soluble in neutral salt solution. They are heat coagulable and can be precipitated by half saturation with Ammonium sulphate. These are present along albumin.
5. The hormones produced by the thyroid gland helps to regulate growth, the rate of metabolism and other important functions of the body.
6. Graves' disease is an example of autoimmune reaction.
7. The symptoms of folic acid deficiency-related anaemia are weakness, fatigue, cognitive difficulty, headache, shortness of breath, and others.

6.7 SUMMARY

NOTES

- In India, undernutrition levels have remained persistently high – especially in utero, in the early years of life, in adolescent girls and in women across the life cycle-especially in disadvantaged /excluded community groups and those living in areas or conditions of high nutritional vulnerability and multiple deprivations.
- Deficiencies of key vitamins and minerals such as Vitamin A, Iron, Iodine and Zinc continue to coexist and interact with protein and energy deficits.
- The following are some of the deficiency diseases in children: Rickets, Goiter, Anaemia, Kwashiorkor, Marasmus, and Osteoporosis.
- Protein is necessary for innumerable functions in the body primarily for synthesis of all body tissues. Proteins are made of amino acids as units in various proportions and arrangements.
- Proteins are classified in a number of basis as per their chemical properties, physical shape as well as nutritional properties. They can be divided into simple proteins, conjugated proteins and derived proteins.
- Next to air and water, the body requires a continuous source of energy to stay alive and keep all the organs and systems functioning efficiently.
- The major forms of energy important in nutrition are as follows: chemical energy, mechanical energy and heat energy.
- Malnutrition refers to insufficient, excessive, or imbalance consumption of nutrients and in developed countries the diseases of malnutrition are frequently related to nutritional imbalance or excessive consumption of nutrients.
- Types of malnutrition include: mental agility, mental disorders, cancer, metabolic syndrome and hyponatremia.
- Protein-energy malnutrition more commonly affects children between the ages of 6 months and 5 years. PEM has many short-term and long-term physical and mental effects, including growth retardation, lowered resistance to infections, and increased mortality rates in young children. Two major forms are marasmus and kwashiorkor.
- Marasmus results from prolonged starvation. The affected child (or adult) is very thin (skin and bones), most of the fat and muscle mass having been expended to provide energy.
- Kwashiorkor usually affects children aged 1-4 years. The main sign is edema, usually starting in the legs and feet and spreading, in more advanced cases, to the hands and face.

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- Exophthalmos describes a condition where the eyeball protrudes from the eye socket, making it appear to bulge. It can affect one or both eyes. Depending on how severe it is, exophthalmos can cause eye problems such as corneal dryness and conjunctivitis, which is an inflammation of the membrane lining the eye.
- Graves' disease and thyroid disorders diagram of the thyroid gland Graves' disease affects the thyroid gland.
- Health and nutrition are the most important contributory factors for human resource development in the country.
- Oral iron supplementation is first-line treatment for the majority of patients with iron deficiency anaemia.
- The best bet to prevent iodine deficiency is by ensuring adequate intake of iodine-rich foods or using iodine-fortified salts or supplements.
- Folic acid deficiency is usually treated with a folic acid supplement, 250-1000 mcg daily.

6.8 KEY WORDS

- **Protein:** It refers to the organic substance or the nitrogenous constituent of protoplasm of all plant and animal tissues.
- **Exophthalmos:** It describes a condition where the eyeball protrudes from the eye socket making it appear to bulge.
- **Autoimmune disease:** It is a condition in which your immune system mistakenly attacks your body.
- **MRI scan:** It is a type of scan that uses strong magnetic fields and radio waves to produce detailed images of the inside of the body.

6.9 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Write a short note on the symptoms of the major deficiency diseases in children.
2. What is the structure and composition of protein?
3. What are the different types of proteins?
4. Briefly explain the forms of energy.
5. Write a short note on the types and causes of malnutrition.

Long Answer Questions

1. Discuss the two major forms of PEM.
2. Describe the nature, causes, symptoms and diagnosis of exophthalmos.
3. Explain the treatment of exophthalmos.
4. Write an essay on the management and prevention of nutritional deficiency disorders.

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UNIT 7 NUTRITIONAL PROBLEMS-II (OTHERS)

Structure

7.0 INTRODUCTION

The UN has declared the decade between 2016-2025 as the UN Decade of Action on Nutrition, to help achieve SDG target 2.2 (By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons) and meet the commitments made at the Second International Conference on Nutrition in 2014. As per the WHO's Global Nutrition Report, 22 per cent of the children globally are stunted, 7.5 per cent are wasted and 5.6 per cent are overweight. Nutritional problems severely affect the growth and development of children in terms of both physical and mental aspects. It is important to identify and study these nutritional problems so as to ensure that they are prevented and treated properly. In the previous unit, you learnt about the protein-energy malnutrition and the thyroid related deficiency disease of exophthalmia. In this unit, you will learn about some other nutritional problems including the deficiency of 'B' complex, Vitamin 'D' deficiency and Vitamin 'C' deficiency.

7.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the 'B' complex deficiency
- Describe the Vitamin 'D' deficiency
- Explain the Vitamin 'C' deficiency

7.2 B COMPLEX DEFICIENCY

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Why is vitamin B important? Do you ever wonder why doctors always tell you to eat a balanced diet? Say you to love pineapple chicken, for example. Pineapples and chicken are both good for you, right? So why can't you just live off pineapple chicken?

The reason is that the building blocks for good health come from a variety of foods, even if they are from the same family of nutrients. Such is the case with vitamin B, a key player in maintaining cell health and keeping you energized. Not all types of vitamin B do the same thing. Additionally, the different types of vitamin B all come from different types of foods.

Vitamin B_{12}, for example, is found primarily in meat and dairy products whereas B_7 and B_9 (and, to some degree, B_1 and B_2) are found in fruits and vegetables. Deficiencies of any of these can lead to health problems. Sometimes a doctor will prescribe a supplement when they think you're not getting enough vitamin B. Certain groups, such as older adults and pregnant women, need larger amounts of some types of vitamin B.

Certain conditions, such as Crohn's disease, Celiac disease, HIV, and misuse of alcohol can result in poor absorption of vitamin B.

Symptoms of a deficiency depend on what type of vitamin B you lack. They can range from fatigue and confusion to anemia or a compromised immune system. Skin rashes also can occur.

Scientist have discovered eleven water soluble B complex proteins of which 8 are considered essential for humans. These are collectively referred to as vitamin B-complex. They differ from each other in their structure distribution of food stability and symptoms that result from the deficiency. They are:

1. Thiamin (Vitamin B_1)
2. Niacin (Vitamin B_3)
3. Riboflavin (Vitamin B_2)
4. Pyridoxine (Vitamin B_6)
5. Pantothenic acid (Vitamin B_5)
6. Biotin (Vitamin B_7)
7. Folic acid (Vitamin B_9)
8. Cyanocobalamin (Vitamin B_{12})

They are all water soluble. These 8 vitamins are grouped together because their functions are closely related. The remaining three B complex vitamins namely para-aminobenzoic acid (PABA),choline and inositol play and active role in the cell metabolism but the diet and intestinal synthesis can make good this requirement.

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The B complex vitamins which are essential in human nutrition are broadly grouped into the following categories:

1. Classic deficiency disease vitamins:
   - (a) Thiamine — Beriberi
   - (b) Riboflavin — Ariboflavinosis
   - (c) Niacin — Pellagra
2. Anaemia preventing vitamins
   - (a) Pyridoxine — Hypochromic anaemia
   - (b) Folic acid — Macrocytic anaemia
   - (c) Cyanocobalamin — Pernicious anaemia
3. Recently discovered coenzyme factors
   - (a) Pantothenic acid
   - (b) Biotin

Let us discuss these vitamins in detail.

1. Classic Deficiency Disease Vitamin

(a) Thiamine (Vitamin B1)

Thymine functions mainly as a coenzyme thymine pyrophosphate which is required in the breakdown of glucose to yield energy. It helps to maintain a healthy nervous system. It is required for normal appetite and digestion.

Sources: Food rich in vitamin and protein such as per liver, pulses, groundnut and eggs are good sources. Whole grain and enriched cereals, par-boiled rice, unpolished rice and sprouted pulses contribute B_1. Soybean is also a rich source.

Effect of cooking and processing

Vitamin B_1 is easily destroyed by cooking food in neutral or alkaline medium. Losses are greater when food is cooked at high temperatures or overcooked and minimal amount of water must be used.

Deficiency

Symptoms of deficiency occur because the tissue cells are unable to receive sufficient energy from glucose.So they cannot carry out their normal functions. The gastrointestinal, nervous and cardiovascular systems are specially affected.Early symptoms of deficiency include irritability, depression, poor appetite, tingling and numbness of the leg. A severe deficiency causes Beri-beri.

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Beriberi is of two types:

- Dry beriberi

  Polyneuritis or inflammation of the nerves numbness of extremities muscle weakness and cramps are the main symptoms.

- Wet beriberi

  Severe oedema, enlargement of the heart, palpitation and increase in the heart beat rate are seen in the wet beri-beri.

A person may suffer from either type of beri-beri. Beri-beri is also known as rice eaters disease because it is seen in people whose chief diet consist of polished rice.

Prevention: Par boiling rice to retain B_1

(b) Riboflavin

Vitamin B_2 riboflavin performs the following functions:

- Just like B_1 is a vital factor in carbohydrate metabolism, B_2 is vital in protein metabolism.
- As a coenzyme in carbohydrate metabolism, B_2 is a constituent of coenzyme flavin mononucleotide and flavin adenine dinucleotide.

  Requirement is 0.55 MG per 1000 calories.

Sources: Milk and cheese are rich in B_2. Organ meats, eggs, dark green leafy vegetables and enriched cereal foods.

Effect of cooking and processing

B_2 is sensitive to light.If milk is kept in clear glass bottle three-fourth of B2 is lost in a short time.Cooking in open containers and in excess water is harmful.

Deficiency

The deficiency of B_2 results in swelling of lips with chielosis, cracks in the skin at the corners of the lips that is angular stomatitis, redness and swelling of the tongue or glossitis. Eyes looking bloodshot, eye fatigue, itching, burning, watering and sensitivity to bright light that is photophobia.

(c) Niacin

Niacin or nicotinic acid is a vitamin intimately connected with several metabolic function it takes part in, as a component. It is known as Vitamin B_3.

Functions

Like B_1 and B_2 Niacin is also required for enzyme that bring about breakdown of glucose amino acids and fatty acid to provide energy and for the release of energy from the food.As a constituent of two coenzymes nicotinamide

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adenine dinucleotide and nicotinamide adenine dinucleotide phosphate to release energy from carbohydrates proteins and fats.

For healthy skin, normal gastrointestinal tract and maintenance of the nervous system.Because this vitamin takes part in many reaction of energy metabolism in the breakdown of proteins carbohydrates and fat its requirement is related to the calorie intake (6.6 mg per 1000 calories).

Sources

Protein rich foods such as poultry, fish, meat, groundnut, beans and peas are good sources.Grains are fair sources except maize and rice, green leafy vegetables, potato, milk, eggs and cheese are poor sources of niacin but rich sources of tryptophan.

Effect of cooking and processing

It is more stable of all vitamin B complex. Fairly stable to heat, acid, alkali, light, oxidation and autoclaving.

Deficiency

It is seen in low protein or Maize based diet.Pellagra which means rough skin is characterized by 4 D's: diarrhoea dermatitis dementia and death. Deficiency begins with weakness headache loss of appetite and weight and a sore and a swollen tongue.Dermatitis is asymmetrical and is on exposed parts of the body fore arms, legs and hands and is aggravated by sunlight. Dementia, depression, confusion, poor memory, delirium and hallucination occur in severe deficiency.Without treatment it results and death.

2. Anaemia Preventing Vitamins

Folic acid, Vitamin B_{12} and Vitamin B_6 help in the formation of the red blood corpuscles or hemoglobin and help in preventing anaemia.

(a) Folic Acid B_9

Folic acid or folacin derive its name from latin word folium which means leaves.

Sources

Liver, kidney, green leafy vegetable, whole pulses and yeast and in fermented food such as Idli, Dhokla and dosa.Some bacteria present in the intestinal tract are capable of synthesizing the vitamin.

Functions

In order to perform its functions, Folic acid needs to be converted in its active form. Vitamin C is needed for this conversion.It is a component of specific enzymes required for the formation of DNA and haeme in the RBCs.

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Deficiency

Deficiency results in megaloblastic anaemia which is common in underdeveloped countries among the vulnerable age group.In Folic acid deficiency, the bone marrow releases large nucleated cells in the circulation of the blood.The anaemia is a macrocytic, megaloblastic anemia.Megaloblasts are large nucleated cells or a immature RBCs. Other symptoms are weakness loss of weight. Hemoglobin level may fall as low as 2 to 4 gram per 100 ml and blood transfusion may be needed.Normal hemoglobin level is 11.5 to 14.5 gldL for women and 12.5 to 16.5 gldL per cent for adult men.

(b) Cyanocobalamin (Vitamin B_{12})

It is only found in the foods of animal origin. Liver, kidney, milk, eggs and cheese are good sources. Small amounts of animal protein in the diet take care of vitamin B_{12} requirement.

Functions

It helps Folic acid in the synthesis and maturation of RBC and is essential for the formation of myelin sheath around the nerve fibres.

Deficiency

Vitamin B_{12} deficiency results weather in megaloblastic anaemia or in Pernicious anaemia.The latter is more common and it serious.Megaloblastic anemia is seen in strict vegetarians who do not consume milk.It is because of a dietary deficiency of Vitamin B_{12}.Pernicious anaemia occurs due to the absence of intrinsic factor in the person's gastric juice so even if that provides enough vitamin B_{12} it will not be absorbed.

Symptoms

The person appears well nourished with respect to body weight.

Skin and eyes are pale, tongue is raw and red, mouth ulcers are present.There is numbness tingling sensation and a feeling of pins needles in the fingers as nervous system is affected.Hemoglobin level is low and megaloblasts appear in the blood.Treatment of pernicious anaemia involves injections of vitamin B_{12} throughout the life as oral dose is cannot be absorbed due to the lack of intrinsic factor.

(c) Pyridoxine(Vitamin B_6)

Liver, kidney, meat, whole grain, cereal, soya beans and groundnuts are the sources of pyridoxine.

Functions

- Essential for the synthesis and breakdown of amino acids.
- Helps in the conversion of tryptophan to niacin.

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- Conversion of linoleic acid to arachidonic acid.
- Needed for the synthesis of haeme.
- Production of antibodies.

The requirement increases with an increase in protein content of the diet.

Deficiency

Anemia is hypochromic anemia because hemoglobin is not synthesized for the red color of RBCs.Red blood cells are pale in colour. Depression and sleepiness are other symptoms.Deficiency occurs along with other nutrient deficiencies for example Protein-Calone Malnutrition (PCM) and Vitamin B complex deficiency.

3. Pantothenic Acid and Biotin

They are both coenzymes required for the release of energy from carbohydrates fats and proteins.

Pantothenic acid or vitamin B_5 is a water soluble vitamin. It is synthesized in microorganisms from B-alanine and pantoic acid.

Biotin is synthesized in the intestinal tract. Both the vitamins are widely present in the foods and deficiency is rare in normal circumstances. Egg white contains a protein avidin that interferes with absorption of biotin from the intestinal tract. Only raw egg whites can cause a deficiency as avidin is inactivated when cooked.Having a few raw egg whites in a week is not harmful and do not cause deficiency

7.3 VITAMIN C DEFICIENCY

Vitamin C is also known as the fresh fruit and vegetable vitamin and it was discovered as an acid in lime juice which prevented scurvy among British sailors on long voyages at sea.

It was named as ascorbic acid because of its anti-scorbutic and anti-scurvy properties.It is highly soluble in water and most easily destroyed as compared to all other vitamins.It is readily oxidized and destroyed by heat and presence of alkali.It is lost when food is dehydrated.

Functions

- Synthesis of collagen which is intracellular cementing substance that keep cells in the bone and muscles tissue together.
- Making hemoglobin by helping in absorption of iron from food.
- Healing of wounds and fractures.
- Increasing resistance to infections and fever.

- Proper growth during periods of increase needs or during rapid growth.
- As an antioxidant like Vitamin E it prevents oxidation of Vitamin A and unsaturated fatty acid.

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Deficiency

Deprivation of Vitamin C results and defective formation of the intercellular cementing substance.

Symptoms

- Poor wound healing because collagen is not synthesized.
- Increased susceptibility to infection.
- Painful joints and bleeding gums.
- Skin bruises by slightest injury.
- Severe deficiency causes Scurvy the symptoms are swelling infection and bleeding of gums and anaemia.

Excessive intake

The benefits of consuming mega doses of Vitamin C to prevent the common cold and cancer is still controversial.An increase in take beyond the RDA is advised in certain cases such as surgical cases infections and drug therapy but benefits of mega doses of 1 to 5 gram daily is still under study.

Sources

Fresh citrus fruit such as orange, sweet lime, grapefruit, lemon other fruits and vegetable such as guava,amla, cabbage, capsicum, green chilies, green leafy vegetables and tomatoes are excellent sources of Vitamin C.

Cereals and pulses are poor sources of Vitamin C but when dry pulses are sprouted ascorbic acid is formed in them. 85 per cent of the vitamin is found in the grain and 15 per cent of the sprout.Green gram contains thrice as much as Vitamin C as compared to the Bengal gram.

Sprouted pulses are good alternative to fresh fruits and vegetables during the periods of scarcity sprouts can be lightly steamed consumed raw. Berries such as ziziphus, strawberries, gooseberries and cashew nut are seasonal rich sources.Amla is the richest source providing 600 mg per 100 gram as compared to oranges which provide 30 MG per 100 gram.Amla contains 20 times as much as Vitamin C as compared to orange.Heating and dehydration reduces the vitamin C content of all the fresh fruits except Amla which retains some Vitamin C in the preserve.

Effect of cooking on vitamins

Water soluble vitamins are more easily loss during cooking and storing of food.Losses occur due to the oxidation or exposure to Air which is catalyzed

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by enzymes.Blanching fruits and vegetables which need to be refrigerated or frozen destroy the enzymes reserves Vitamin C.High temperature, prolonged heating and alkaline medium favored destruction of vitamins.

To retain maximum vitamins in our food observe the rules.

7.4 VITAMIN D DEFICIENCY

Vitamin D it is a fat soluble vitamin.The two important forms are Vitamin D_2 and Vitamin D_3.Vitamin D3 is produced when 7-dehydrocholesterol in the skin is exposed to the ultraviolet rays in the sun.Vitamin D differs from other fat soluble vitamins because it is synthesized in the body and we do not depend on our diet for it.Being fat soluble, Vitamin D requires fat for its absorption.

Functions

- Absorption of calcium and phosphorus from the small intestine requires the presence of Vitamin D and the hormones of parathyroid and thyroid gland.
- Mineralization of bones and teeth after calcium and phosphorus is absorbed require Vitamin D to ensure that these minerals are deposited in the bones and teeth to strengthen them.
- Regulation of calcium and phosphorus levels in the blood.

Sources

Sunlight is a main source of vitamin D.The precursor in skin is converted to active Vitamin D_3. Barriers such as clothing, suit, fog, window glass and melanin interfere with the synthesis of Vitamin D.Sunscreen lotions with high SPF also prevent vitamin D formation. It is found in fish, liver, oil, fortified milk, Vanaspati and margarine. Natural food such as butter, milk, and fish have it all in the small amounts.

Hypervitaminosis D

Large doses of vitamin D can be toxic and excessive use of fortified foods lead to loss of appetite, vomiting, diarrhoea, growth failure and calcification of soft tissues and even the kidney stones.

Deficiency

Vitamin D deficiency leads to lower absorption of calcium, low serum levels of calcium and reduced bone mineralization. Bones cannot withstand the weight and bend into deformities. Rickets is seen in the infants and children especially dark skinned children. Bones are soft and yield to pressure.Joints are enlarged and there is delayed closing of the skull bones.

Symptoms of rickets include enlarged skull, pigeon chest, muscle development, potbelly and bowed legs and knocked knees.

Osteomalacia or adult rickets is more common in women who consume and died deficient in calcium, phosphorus, and vitamin D, and have had several pregnancies. The softening of bones leads to a deformed spine, rheumatic pain in the legs and lower back, a waddling gate and spontaneous fractures.

Check Your Progress

1. State the primary source of vitamin B_{12}.
2. Which vitamin's deficiency causes Pellagra?
3. How was vitamin C discovered?
4. Define Hypervitaminosis D.

7.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The primary source of vitamin B12 is meat and dairy products.
2. The deficiency of vitamin B3 or Niacin causes Pellagra.
3. Vitamin C was discovered as an acid in lime juice which prevented scurvy among British sailors on long voyages at sea.
4. Large doses of vitamin D can be toxic and excessive use of fortified foods lead to loss of appetite, vomiting, diarrhoea, growth failure and calcification of soft tissues and even the kidney stones. This is known as Hypervitaminosis D.

7.6 SUMMARY

- The reason is that the building blocks for good health come from a variety of foods, even if they are from the same family of nutrients. Such is the case with vitamin B, a key player in maintaining cell health and keeping you energized. Not all types of vitamin B do the same thing. Additionally, the different types of vitamin B all come from different types of foods.
- Certain conditions, such as Crohn's disease, Celiac disease, HIV, and misuse of alcohol can result in poor absorption of vitamin B. Symptoms of a deficiency depend on what type of vitamin B you lack. They can range from fatigue and confusion to anemia or a compromised immune system. Skin rashes also can occur.

- Scientist have discovered 11 water soluble B complex proteins of which 8 are considered essential for humans. These are collectively referred to as Vitamin B-complex. They differ from each other in their structure distribution of food stability and symptoms that result from the deficiency. They are:
  1. Thiamin (Vitamin B_1)
  2. Niacin (Vitamin B_3)
  3. Riboflavin (Vitamin B_2)
  4. Pyridoxine (Vitamin B_6)
  5. Pantothenic acid (Vitamin B_5)
  6. Biotin (Vitamin B_7)
  7. Folic acid (Vitamin B_9)
  8. Cyanocobalamin (Vitamin B_{12})
- Classic deficiency disease vitamins: (a) Thiamine, (b) Riboflavin and (c) Niacin Pellagra. Their deficiency causes Beriberi, ariboflavinosis, and pellagra respectively.
- Anaemia preventing vitamins include: (a) Paradoxin, (b) Folic acid and (c) Cyanocobalamin. Their deficiency causes hypochromic anaemia, macrocuptic anaemia and pernicious anaemia respectively.
- Recently discovered coenzyme factors: (a) Pantothenic acid (b) Biotin
- Vitamin C is also known as the fresh fruit and vegetable vitamin and it was discovered as an acid in lime juice which prevented Scurvy among British sailors on long voyages at sea.
- Vitamin C was named as ascorbic acid because of its anti-scorbutic and anti-scurvy properties. It is highly soluble in water and most easily destroyed as compared to all other vitamins. It is readily oxidized and destroyed by heat and presence of alkali. It is lost when food is dehydrated.
- Deprivation of Vitamin C results and defective formation of the intercellular cementing substance.
- Vitamin D is a fat soluble vitamin. The two important forms are Vitamin D_2 and Vitamin D_3. Vitamin D_3 is produced when 7 dehydrocholesterol in the skin is exposed to the ultraviolet rays in the sun. Vitamin D differs from other fat soluble vitamins because it is synthesized in the body and we do not depend on our diet for it. Being fat soluble it requires fat for its absorption.
- Vitamin D deficiency leads to lower absorption of calcium, low serum levels of calcium and reduced bone mineralization. Bones cannot withstand the weight and bend into deformities. Rickets is seen in the infants and children especially dark skinned children.

NOTES

7.7 KEY WORDS

- **Coenzyme:** It is an organic non-protein compound that binds with an enzyme to catalyze a reaction
- **Par boil:** It refers to the process of boiling briefly as a preliminary or incomplete cooking
- **Polished rice:** It refers to white rice or milled rice that has had its husk, bran, and germ removed
- **Scurvy:** It is a disease resulting from the deficiency of Vitamin C, which results in decreased red blood cells, gum disease, changes to hair, and bleeding from the skin

7.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. List some of the conditions which can result in poor absorption of vitamin B.
2. Write a short note on biotin.
3. State the sources of Vitamin B_1.
4. What are the functions of Vitamin C?

Long Answer Questions

1. Discuss the classic deficiency disease vitamin B.
2. Write short notes on: (a) Folic acid, (b) Cyanocobalamin and (c) Pyridoxine.
3. Describe the sources, deficiency, excessive intake and effect of cooking on vitamin C.
4. Explain the functions, sources, and deficiency of Vitamin D.

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UNIT 8 COMMON CHILDHOOD AILMENTS AND ACCIDENTS

Structure

8.0 INTRODUCTION

A healthy brain development of a child is majorly dependent on the quality of child care a child receives. There are many common childhood illnesses that if parents can comprehend them beforehand, they can catch and cure them before they progress too far. The unit talks about such ailments and also about the first aid for common accidents for children and adults.

In this unit, you will study about the common childhood ailments and their approved treatments. The unit also introduces the common childhood accidents and associated first aids. Besides, the unit throws light on the methods to prevent injuries and accidents and tells the techniques for proving first aid.

8.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the prevention and management of common childhood ailments
- Examine common childhood accidents and first aid
- Explore the methods to prevent injuries and accidents
- Describe the basic first aid procedures

8.2 COMMON CHILDHOOD AILMENTS-PREVENTION AND MANAGEMENT

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All children deserve high-quality medical care. As a parent, it is important to be aware of the most up-to-date treatment guidelines so you can be sure your child is getting the best possible care. The following information from the American Academy of Pediatrics (AAP) lists some of the most common childhood illnesses and their approved treatments. The treatments discussed here are based on scientific evidences and best practices. However, there may be reasons why your pediatrician has different recommendations for your child, especially if your child has an ongoing medical condition or allergy.

Your pediatrician will discuss any variations in treatment with you. If you have any questions regarding appropriate care for your child, please discuss them with your pediatrician.

Sore Throat: This bacterial infection is common in children and can be painful. However, a sore throat that is caused by a virus does not need antibiotics. In those cases, no specific medicine is required, and your child should get better in seven to ten days. In other cases, a sore throat could be caused by a bacteria called streptococcal (strep throat). Strep cannot be accurately diagnosed by simply looking at the throat. A lab test or in-office rapid strep test, which includes a quick swab of the throat, is necessary to confirm the diagnosis of strep. If positive for strep, your pediatrician will prescribe an antibiotic.

It is very important that your child take the antibiotic for the full course, as prescribed, even if the symptoms get better or go away. Steroid medicines (such as prednisone) are not an appropriate treatment in most cases of sore throat. Babies and toddlers rarely get strep throat, but they are more likely to become infected by streptococcus bacteria if they are in child care or if an older sibling has the illness. Although strep spreads mainly through coughs and sneezes, your child can also get it by touching a toy that an infected child has played with.

Ear Pain: Ear pain is common in children and can have many causes—including ear infection (otitis media), swimmer's ear (infection of the skin in the ear canal), pressure from a cold or sinus infection, teeth pain radiating up the jaw to the ear, and others. .

To tell the difference, your pediatrician will need to examine your child's ear. In fact, an in-office exam is still the best way for your pediatrician to make an accurate diagnosis. If your child's ear pain is accompanied by high fever, involves both ears, or if your child has other signs of illness, your pediatrician may decide that an antibiotic is the best treatment.

Amoxicillin is the preferred antibiotic for middle ear infections—except when there is an allergy to penicillin or chronic or recurrent infections. Many

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true ear infections are caused by viruses and do not require antibiotics. If your pediatrician suspects your child's ear infection may be from a virus, he or she will talk with you about the best ways to help relieve your child's ear pain until the virus runs its course.

Urinary Tract Infection: Bladder infections, also called urinary tract infections or UTIs, occur when bacteria build up in the urinary tract. A UTI can be found in children from infancy through the teen years and into adulthood.

Symptoms of UTI include pain or burning during urination, the need to urinate frequently or urgently, bedwetting, abdominal pain, or side or back pain. Your child's doctor will need a urine sample to test for a UTI before determining treatment. Your doctor may change the treatment depending on which bacteria is found in your child's urine.

Skin Infection: In most children with skin infections, a skin test (culture or swab) may be needed to determine the most-appropriate treatment. Tell your doctor if your child has a history of Methicillin-resistant Stophylococcus Aureus (MRSA), staph infection, or other resistant bacteria or if he or she has been exposed to other family members or contacts with resistant bacteria.

Bronchitis: Chronic bronchitis is an infection of the larger, more central airways in the lungs and is more often seen in adults. Often the word 'bronchitis' is used to describe a chest virus and does not require antibiotics.

Bronchiolitis: Bronchiolitis is common in infants and young children during the cold and flu season. Your doctor may hear 'wheezing' when your child breathes. Bronchiolitis is most often caused by a virus, which does not require antibiotics. Instead, most treatment recommendations are geared toward making your child comfortable with close monitoring for any difficulty in breathing, eating, or signs of dehydration. Medicines used for patients with asthma (such as albuterol or steroids) are not recommended for most infants and young children with bronchiolitis. Children who were born prematurely or have underlying health problems may need different treatment plans.

Pain: The best medicines for pain relief for children are acetaminophen or ibuprofen. Talk to your pediatrician about how much to give your child, as it should be based on your child's weight. Narcotic pain medications are not appropriate for children with common injuries or complaints such as sprained ankle, ear pain, or sore throats. Codeine should never be used for children as it is been associated with severe respiratory problems and even death in children.

Common Cold: Colds are caused by viruses in the upper respiratory tract. Many young children—especially those in child care—can get 6 to 8 colds per year. Symptoms of a cold (including runny nose, congestion, and cough) may last for up to ten days. Green mucus in the nose does not automatically mean that antibiotics are needed; common colds never need antibiotics. However, if a sinus infection is suspected, your doctor will

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carefully decide whether antibiotics are the best choice based on your child's symptoms and a physical exam.

Bacterial Sinusitis: Bacterial sinusitis is caused by bacteria trapped in the sinuses. Sinusitis is suspected when cold-like symptoms such as nasal discharge, daytime cough, or both last over ten days without improvement. Antibiotics may be needed if this condition is accompanied by thick yellow nasal discharge and a fever for at least 3 or 4 days in a row.

Cough: Coughs are usually caused by viruses and do not often require antibiotics. Cough medicine is not recommended for children 4 years of age and younger, or for children 4 to 6 years of age unless advised by the doctor. Studies have consistently shown that cough medicines do not work in the 4-years-and-younger age group and have the potential for serious side effects. Cough medicines with narcotics—such as codeine—should not be given to children.

8.3 INTRODUCTION TO COMMON CHILDHOOD ACCIDENTS AND FIRST AID

Accidents are the injuries that happen to an individual all of a sudden, unknowingly and unintentionally. An accident may happen to any individual at any stage and can result in a injury or to death. However, it had been seen that accidents are more common to children within age group 1 to 12 years. As the children during this age group possess lot of energy and they are curious about the environment. Therefore, it is a general habit of the children belonging to childhood to look for new things, explore new toys and areas and surprising themselves and others. Because of lot of energy production at this age group, children usually are unaware about themselves and surroundings. Thus resulting in accidents. Therefore it is necessary for the parents and children to have knowledge in advance about the common childhood problems and accidents so that they can protect their child .

Predisposing factors to the causation of accidents are of two types: Environmental factors and Childhood factors.

We shall give the main factors in each category of accidents described in the text.

(i) **Environmental Factors**: There are things in the child's environment at home and outdoor that may predispose or lead the child to get an accident. For example: poorly arranged furniture in the house can make a child fall and injure himself or herself, unprotected cooking place can cause burns to a child. Fruit trees or ladders in homes may tempt a child to climb and result in a fall. Similarly, outdoor pools of water including unfilled quarry with accumulation of water may

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lead to drowning. A fine example is the overcrowded city slums are particularly bad environment for children.

(ii) **Childhood Factors:** These are factors centred on the child. They include the normal curiosity, exploration nature and imitation of a child, a child in learning phase has no experience that what kind of acts can land them into accidents. Boys are more explorative and get into accidents more frequently than girls. But girls are more affected by accidents in cooking place at home than boys.

(iii) **Abnormal factors:** Some abnormal factors like birth defects in a child that can lead into accidents include: a child with epilepsy, a child with a handicap.

(iv) **Burns and scalds**: Burns are injuries on the body caused by dry heat, while scalds are injuries on the body caused by moist heat. Small children are often burned or scaled since they often play close to fire and cooking pots and have not yet learned wisdom through experience. Remember the saying that once bitten twice shy. Dry heat can be caused by any of the following:

- Burning house.
- Fire or hot objects or exposure to sun.
- Contact with an electric current or by lighting.
- Friction from a revolving wheel or fast moving rope.
- Strong acids and alkalis such as sulphuric acid or caustic soda.

Moist heat can come from boiling hot water, such as tea, porridge or steam. If the burn is wide spread it can cause systemic complications. For example:

- o Large amounts of fluid are lost from the burned surface causing shock.
- o Pain can also contribute to state of shock.
- o Anaemia is caused by blood loss and other causes.
- o Secondary infection can also occur.
- o Later on unsightly scars on the face or contractures of limbs may occur during healing.

8.4 PREVENTING INJURIES AND ACCIDENTS – GIVING FIRST AID

If someone is injured, the first step is to check whether you and the injured individual are at a safe place or not.

If the injured person is unconscious but breathing, and has no other injuries that would stop him/her being moved, place the person in the recovery

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position until help arrives. Keep the person under observation to ensure he/she continue to breathe normally, and do not obstruct his/her airway.

If someone is unconscious and not breathing or if a person isn't breathing normally after an incident, call an ambulance or talk to the police so as to keep yourself and the patient safe. If someone is bleeding heavily the main aim is to protect the person. If you have plastic or temporary gloves use them to stop the flow of blood and call the ambulance immediately.

Ensure that nothing is embedded inside the wound. If there is, take care not to press down on the object. Instead, press firmly on either side of the object and build up padding around it before bandaging, to avoid putting pressure on the object itself.

If nothing is embedded, apply and maintain pressure to the wound with your gloved hand, using a clean pad or dressing if possible; continue to apply pressure until the bleeding stops use a clean dressing to bandage the wound firmly if bleeding continues through the pad, apply pressure to the wound until the bleeding stops and then apply another pad over the top and bandage it in place; do not remove the original pad or dressing, but continue to check that the bleeding has stopped.

If a body part, such as a finger, has been severed, place it in a plastic bag or wrap it in cling film and make sure it goes with the casualty to the hospital.

If someone has burn or scald, cool the burn immediately. Keep the burnt area in water for atleast 10 minutes so that the patient does not feel pain or burning sensation for a longer period of time. If the burnt area is covering majority of body parts, call the ambulance immediately. One should be cautious while cooling a large amount of area in babies or children, as it may cause hypothermia. Make sure not to apply any cream, lotion or balm to the burnt area. Protect yourself and the injured person in such case. While cooling the burn, remove the jewellery or clothing if it is attached to the burnt area.

For chemical burns, wear protective gloves. If any child gets burnt in the chemistry laboratory or near any chemical factory make sure that the burnt area is put under water for at least 20 minutes. However, if any damage related to burning happens near the chemical area/industry, an antidote is always available.

Check Your Progress

1. What causes strep throat in children?
2. What causes ear pain in child?
3. What is Bronchiolitis and how is it caused?
4. What do you mean by dry heat and moist heat?
5. What first aid should be given for burns?

8.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

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1. Strep throat is a bacterial infection which is very common in children. Strep throat is caused by a bacteria named as streptococcal. The bacteria is highly communicable and can spread through coughs or sneezes, or via shared food.
2. Ear pain can have many causes like ear infection (otitis media), swimmer's ear (infection of the skin in the ear canal), pressure from a cold or sinus infection, teeth pain radiating up the jaw to the ear and many more.
3. Bronchiolitis is usually caused by a viral infection. During the cold and flu season, bronchiolitis is very common in infants and young children. It causes bronchioles to swell which results in breathing problems. The infection is often caused by virus, which does not require antibiotics.
4. Dry heat leads to burns in the body, while moist heat results in scalds. Examples of dry heat include fire, a hot iron, or the sun. Moist heat can come from boiling hot water, such as tea, porridge or steam.
5. If someone has burn or scald, cool the burn immediately. Keep the burnt area in water for at least 10 minutes so that the patient does not feel pain or burning sensation for a longer period of time. If the burnt area is covering majority of body parts, call the ambulance immediately. One should not apply any cream, lotion or balm to the burnt area. While cooling the burns, one should also remember to remove the jewellery or clothing if it is attached to the burnt area.

8.6 SUMMARY

- As a parent, it is important to be aware of the most up-to-date treatment guidelines so you can be sure your child is getting the best care possible.
- Sore throats are common in children and can be painful. However, a sore throat that is caused by a virus does not need antibiotics.
- Ear pain is common in children and can have many causes— including ear infection (otitis media), swimmer's ear (infection of the skin in the ear canal), pressure from a cold or sinus infection, teeth pain radiating up the jaw to the ear, and others.
- Bladder infections, also called urinary tract infections or UTIs, occur when bacteria build up in the urinary tract.
- Chronic bronchitis is an infection of the larger, more central airways in the lungs and is more often seen in adults.

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- The best medicines for pain relief for children are acetaminophen or ibuprofen. Talk to your paediatrician about how much to give your child, as it should be based on your child's weight.
- Bacterial sinusitis is caused by bacteria trapped in the sinuses. Sinusitis is suspected when cold-like symptoms such as nasal discharge, daytime cough, or both last over ten days without improvement.
- Cough medicine is not recommended for children 4 years of age and younger, or for children 4 to 6 years of age unless advised by your doctor.
- Burns are injuries on the body caused by dry heat, while scalds are injuries on the body caused by moist heat.
- Accidents are the injuries that happen to an individual all of a sudden, unknowingly and unintentionally. Predisposing factors to the causation of accidents are of two types: Environmental factors and Childhood factors.

8.7 KEY WORDS

- **Penicillin:** It refers to a drug that kills bacteria and is used to treat infections.
- **Antibiotics:** It refers to a medicine that inhibits the growth of or destroys microorganisms.
- **Staph Infection:** It refers to an infection caused by bacteria commonly found on the skin or in the nose.
- **Narcotic:** It refers to a drug that relieves pain but induces drowsiness or insensibility.
- **Quarry:** It refers to a large and deep pit, from which stone or other materials have been extracted.
- **Scald:** It refers to a burn or other injury caused by hot liquid or steam.
- **Hypothermia:** It refers to a serious medical condition in which a person's body temperature falls below the usual level.
- **Antidote:** It refers to a medicine taken or given to counteract a particular poison.

8.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. Name some of the most common childhood ailments.
2. What are the reasons behind Urinary Tract Infection (UTI)?

3. Write short notes on:
   (a) Bronchitis (b) Common Cold (c) Bacterial Sinusitis
4. Differentiate between burns and scalds.

Long-Answer Questions

1. Discuss the methods to prevent some of the common childhood ailments.
2. Analyse the environmental and childhood factors responsible for childhood accidents.
3. Describe the first aid techniques used in various injuries.

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BLOCK - III

FOOD SUPPLEMENTATION

UNIT 9 NUTRIENT DEFICIENCY PROGRAMMES

Structure

9.0 INTRODUCTION

Body requires many micronutrients for the prevention of diseases and its development. These micronutrients are not formed naturally in the body and thus the body gets them from the diet we take. Nutritional deficiency occurs when the body does not get the essential quantity of nutrient from food we take. This gives rise to a number of health problems because of nutritional deficiencies.

A National Nutrition Policy was prepared in 1993 by the Department of Women and Child Development, Government of India for improving the complex problem of malnourishment and attaining the ideal state of malnutrition. It is found that mostly the undernourishment and illness leading to ill-health is found in the females, infants and children below 13 years of age.

At national and international levels, more importance is given to nutrition and it is considered an important factor for the development of a nation. Nutritional happiness is considered as the financial asset and requirement for the development of the nation.

The Constitution of India also gives importance to the public health of its people as its prime duty. It is deeply concerned with the standards of living and nutrition of its citizens. Therefore, time and again many types of nutritional programmes are being taken up by the Government of India to overcome the problem of malnutrition.

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In this unit, you will learn about the Nutrient Deficiency Control programmes in India. The National Prophylaxis Programme for Prevention of Blindness due to Vitamin A Deficiency is an important ongoing nutrition deficiency control programme which will also be discussed in detail.

9.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the concept of Nutrient Deficiency
- Describe the Nutrient Deficiency Control Programmes in India
- Explain the objectives of nutrient deficiency control programmes

9.2 NUTRIENT DEFICIENCY CONTROL PROGRAMMEMES

Malnutrition is a big problem in India and the Government has launched a variety of programmes to deal with the problem of malnutrition. In 1993, the formulation of the National Nutrition Policy by the Government of India was done. Government of India has launched many programmes out of which some are not functional now, but some are still running very successfully.

The overview of the important nutrient deficiency control programmes in India will be discussed in this unit.

To tackle the problem of malnutrition in India, the government started three control programmes:

1. National Prophylaxis Programme for Prevention of Blindness due to Vitamin A

   Deficiency
2. National Nutritional Anemia Control Programme
3. National Iodine Deficiency Disorders Control Iodine Deficiency Disorders Control Programme (NIDDCP)

Deficiency of any particular vitamin or mineral has become a very common feature now-a-days in children and even adults. The reason for this deficiency is the insufficient intake of nutrient in the form of food in their diet for a long time. These disorders can be prevented if one takes a diet rich in vitamins/minerals and other nutrients. Due to the cost factor the underprivileged, poor people find it difficult to afford such food. The Government also faces problems in making this food readily accessible to the lower economic classes of our society quite frequently.

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As a substitute strategy, the 'prophylaxis (preventive) programme' have been launched. These programmes specifically target illness due to lack of nutrients in the food. Vitamins and minerals, which are prepared commercially and supplied to food insecure section of the society through structured programmes. These programmes help people get quality food with all the nutrients which are required in an average human being of a given age group. As these programmes are very useful in covering the gap they are called nutrient deficiency control programmes or prophylaxis programmes and are of nature of 'stop-gap arrangement'. As and when the economic status of these families changes for the better and they start consuming balanced diets with greater quality, these programmes are expected to be ratchet down.

You will learn about the three of these stop-gap arrangement programmes and learn about the methods they apply for distribution, their target addressees and their primary goals. But in this unit, you will only examine the programme for prevention of blindness due to the deficiency of Vitamin A.

9.3 NATIONAL PROPHYLAXIS PROGRAMME FOR PREVENTION OF BLINDNESS DUE TO VITAMIN A DEFICIENCY

Deficiency of Vitamin A has become the principal public health nutritional crisis in India. For the precise operation of visual cortex, incubation and maturation, preservation of epithelial cellular uprightness, immune defense and reproduction, vitamin A (VA) is a crucial component needed in minute amounts. When the deficiency of vitamin A is coupled with shortage of proteins in the body this nutritional deficiency occurs. Due to vitamin A deficiency over six million children in India per year are suffering from partial blindness. There can even be the complete loss of vision due to vitamin A deficiency.

The National Prophylaxis Programme against Nutritional Blindness due to Vitamin A Deficiency (NPPNB due to VAD) was started in 1970. Its explicit endeavour was curing the menace of nutritional blindness due to keratomalacia. There was an unaccepted increase in xerophthalmic blindness in 1950s and 1960s in the country. The central government sponsored the programme 100 percent. The eligibility of children was restricted between 9 months to 3 years of age under the National Child Survival and Safe Motherhood (CSSM) Programme in 1994. Prophylactic mega dose administration of Vitamin A was chiefly prescribed for it was considered to be best for blindness prevention and capable of declining 23 per cent infant mortality.

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To implement this programme, primary health centers and village level sub centers appointed multipurpose female workers and other paramedics for the administration of vitamin A solutions to protect children between 6 months to 5 years. Before extending to the whole of the country it had initially started in only 7 states. Since 2007 the revision mandated that children from 9 months to 5 years were also to be covered by the programme. Ever since its inception the prevention of deficiency as well as treatment of the deficiency has been the main focus area of the programme.

The family as well as the society faces terrible implications of blindness. Therefore, the country has started a precautionary programme of supply of huge doses of vitamin A. Our liver has the potential to store excess Vitamin A in stellate cells as retinyl ester which is taken in excess of average need. This is the origin of this programme. The excess vitamin A is used from the liver whenever there is a requirement in the body. In other words, our body retains its excess vitamin A in the liver which acts as the 'saving bank' and uses the savings to fulfill the fall in supply by internal compensation.

Let us have a look at the specifics of the programme:

Objectives: The national prophylaxis programme for prevention of nutritional blindness aims at preventing blindness due to inadequate supply vitamin A in food of children (between 6 months to 5 years).

Target Group: The eligibility criteria for this programme is all children upto the age of 5 (mostly those dwelling in impoverished area like slums).

Dose and Distribution Strategy: Every child from the age of **1** and up to the age of **5** years is given **2ml** of Vitamin A oral supplements containing **200,000 IU**. The bottle of vitamin A once opened is utilized within 6-8 weeks. Also, the Vitamin A solution is stored in cold dark place away from sunlight. By the fifth birthday, 9 oral doses of vitamin A must be given to the child. An infant from the age of **6** up to the age of **11** months is given A dose of **100,000** IU. These doses are administered in infants during the injection of measles vaccine due the ease and efficiency of the process for infants.

Fig. 9.1: *Vitamin A solution*

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A mother-child immunization card which is regularly issued is used to keep a tab on the dosage of Vitamin A up till the age of 2. Similarly, growth monitoring cards or registers are used for keeping a tab of dosage of vitamin A solution till the child is 5 years in age, under Integrated Child Development Services (ICDS) Programme. The Auxiliary Nurse Midwife (ANM) –a functionary belonging to Department in Ministry of Health and Family Welfare distributes vitamin A.

In a state for a population of 3000-5000 people, there is an ANM. She takes care of family welfare and the task of educating the people about good practices, the value of good nutrition and a healthy lifestyle. Once in six months the health worker is supposed to actually administer the required dose at the 'door-step' of the recipient. The health worker is recommended to cover all the children as and when she receives the delivery of vitamin A supplements, in as small of a time frame by home visits. Integrated Child Services (ICDS) is sometimes called into action, then Anganwadi workers are mandated to help with the supply and delivery of vitamin A supplements and administration.

During the implementation of the programme, the expectant and nursing females and female acceptors of family planning are given supplements of iron and folic acid consisting of 60 mg elemental iron (180 mg of ferrous sulphate and 0.5 mg of folic acid) for 100 days. For the children in the age group 1-5 years of age are given supplements consisting of 20 mg elemental iron (60 mg of ferrous sulphate and 0.1 mg folic acid) is given for a span of almost 3 months.

Children and Pregnant females with hemoglobin level sub 10 gm per cent and 8 gm per cent levels respectively are covered under this programme. Regular screening test is done, and severe cases of anemia are referred to Primary Health Centers. The programme strategy also educates people about health and nutrition to improve overall food consumption and promote intake of iron and folate rich foods also the food product which increase the iron absorption in our body.

For vitamin A complementation (VAS) and implementation, primary health centres and sub-centre are presently responsible. The female multipurpose worker and other paramedics are responsible for administering vitamin A solution at the village level sub-health centres. For the implementation of the programme, the Integrated Child Development Services (ICDS) functionaries are also called into action. Those left out from this system for those outliers multiple and frequent drives have to be undertaken every 6 months to include every last one of the children reeling though this problem.

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Check Your Progress

1. When was the National Prophylaxis Programme against Nutritional Blindness due to Vitamin A Deficiency (NPPNB due to VAD) was started?
2. Name the organ in human body which has the potential to store excess Vitamin A.

9.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The National Prophylaxis Programme against Nutritional Blindness due to Vitamin A Deficiency (NPPNB due to VAD) was started in 1970. Its explicit endeavour was curing the menace of nutritional blindness due to keratomalacia.
2. Liver is the organ which has the potential to store excess Vitamin A in stellate cells as retinyl ester.

9.5 SUMMARY

- Body requires many micronutrients for the prevention of diseases and its development. These micronutrients are not formed naturally in the body and thus the body gets them from the diet we take. Nutritional deficiency occurs when the body doesn't get the essential quantity of a nutrient from food we take. This gives rise to a number of health problems because of nutritional deficiencies.
- A National Nutrition Policy was prepared in 1993 by the Department of Women and Child Development, Government of India for improving the complex problem of malnourishment and attaining the ideal state of malnutrition. It is found that mostly the undernourishment and illness leading to ill-health is found in the females, infants and children below 13 years of age.
- Malnutrition is a big problem in India and the Government has launched a variety of programmes to deal with the problem of malnutrition. In 1993, the formulation of the National Nutrition Policy by the Government of India was done. Government of India has launched many programmes out of which some are not functional now, but some are still running very successfully.
- To tackle the problem of malnutrition in India, the government started three control programmes:

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1. National Prophylaxis Programme for Prevention of Blindness due to Vitamin A

   Deficiency
2. National Nutritional Anemia Control Programme
3. National Iodine Deficiency Disorders Control Iodine Deficiency Disorders Control Programme (NIDDCP)

- As a substitute strategy, the 'prophylaxis (preventive) programme' have been launched. These programmes specifically target illness due to lack of nutrients in the food.
- Prophylaxis programmes help people get quality food with all the nutrients which are required in an average human being of a given age group. As these programmes are very useful in covering the gap they are called nutrient deficiency control programmes or prophylaxis programmes and are of nature of 'stop-gap arrangement'.
- Deficiency of Vitamin A has become the principal public health nutritional crisis in India. For the precise operation of visual cortex, incubation and maturation, preservation of epithelial cellular uprightness, immune defense and reproduction, vitamin A (VA) is a crucial component needed in minute amounts.
- The National Prophylaxis Programme against Nutritional Blindness due to Vitamin A Deficiency (NPPNB due to VAD) was started in 1970. Its explicit endeavour was curing the menace of nutritional blindness due to keratomalacia. There was an unaccepted increase in xerophthalmic blindness in 1950s and 1960s in the country. The central government sponsored the programme 100 percent.
- To implement this programme, primary health centers and village level sub centers appointed multipurpose female workers and other paramedics for the administration of vitamin A solutions to protect children between 6 months to 5 years. Before extending to the whole of the country it had initially started in only 7 states. Since 2007 the revision mandated that children from 9 months to 5 years were also to be covered by the programme. Ever since its inception the prevention of deficiency as well as treatment of the deficiency has been the main focus area of the programme.
- For vitamin A complementation (VAS) and implementation, primary health centres and sub-centre are presently responsible. The female multipurpose worker and other paramedics are responsible for administering vitamin A solution at the village level sub-health centres. For the implementation of the programme, the Integrated Child Development Services (ICDS) functionaries are also called into action. Those left out from this system for those outliers multiple and

frequent drives have to be undertaken every 6 months to include every last one of the children reeling though this problem.

9.6 KEY WORDS

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- **Prophylaxis Programmes:** These refer to preventive programmes which specifically target illness due to lack of nutrients in the food, vitamins and minerals
- **Keratomalacia:** a softening and ulceration of the cornea of the eye resulting from severe systemic deficiency of vitamin A
- **Integrated Child Development Services (ICDS) Programme:** It is one of the flagship programmes of the Government of India for children and nursing mothers, as a response to the challenge of providing pre-school non-formal education on one hand and breaking the vicious cycle of malnutrition, morbidity, reduced learning capacity and mortality on the other.

9.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What are the three nutrient deficiency programme run in India?
2. Which age group of children is prone to vitamin A deficiency?
3. What is the target group of vitamin A deficiency programme?

Long Answer Questions

1. What was the implementation strategy adopted for National Prophylaxis Programme against Nutritional Blindness due to Vitamin A Deficiency?
2. Explain the dose and distribution strategy of National Prophylaxis Programme against Nutritional Blindness due to Vitamin A Deficiency.

9.8 FURTHER READINGS

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UNIT 10 NUTRIENT DEFICIENCY CONTROL PROGRAMMES

Structure

10.0 INTRODUCTION

The popular public health problem in India is the disorders caused due to nutrient deficiency. The main reasons of these disorders are lack of food intake, lack of quality as well as quantity of food. A part from this there is lack of knowledge, safe water child care etc. To improve the nutritional conditions in India Government has started many nutrient deficiency programmes. The efforts of the government have reached a little proportion of the population and thus these efforts has to be increased several hundred-fold to have a substantial impact on the problem.

In this unit, you will study about various nutrient deficiency control programmes initiated by the government. In addition to this, you will also learn about iodine deficiency disorders control programmes.

10.1 OBJECTIVES

After going through this unit, you will be able to:

- Explain the concept of nutrients deficiency control programmes in India
- Describe the objectives of National Nutrition Anaemia Control Programme
- Discuss the execution and objectives of nutrient deficiency control programmes
- Explain National Iodine Deficiency Disorders Control Programme

10.2 NATIONAL NUTRITION ANAEMIA CONTROL PROGRAMME

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Today in our great nation we are facing a serious public health challenge of Anaemia. Anaemia is very common in pregnant females, infants, young children and adolescents. The quality of life is badly effected due to poor health, poor physical and mental productivity etc. The National Nutritional Anaemia Control Programme (NNACP) aims to drastically reduce the number of incidences of anaemia in females of reproductive age. The Primary Health Centers and its subcenters implement the programme.

Anaemia poorly affects the following:

- Mental performance
- Social development
- Motor development
- Coordination language development
- Educational achievement
- Increase illness from infection

The Ministry of Health and Family Welfare in India organized a National Consultation on Control of Nutritional Anaemia in October 1997 to review the epidemiology of nutritional anaemia and the existing policy on nutritional anaemia control.

The government has given emphasis on three strategies which are as follows:

1. Promotion of food with a lot of iron.
2. Furnishing of iron and folate in the form of supplements for the groups which are more likely to develop anaemia, and
3. To identify and treat people with acute anaemia.

The Adolescent Division of the Ministry of Health and Family Welfare (MoHFW), Government of India has developed the National Iron plus Initiative (NIPI) guiding principle in 2013.

The key policies of the Ministry of Health and Family Welfare are the Prevention and control of anaemia for dropping maternal, infant and childhood mortality and enhancing maternal, infant and adolescent health status. Anaemia is a major factor for maternal deaths in India upto 20 per cent of these deaths can be traced back to anaemia.

Under the provision given by this programme, supplements of iron and folic acid consisting of 60 mg iron (180 mg of ferrous sulphate and 0.5 mg of folic acid) are given to the expectant and nursing mothers as well as female acceptors of family planning. For the children of the age of 1 till the age of

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5 be given supplement of iron consisting of 20 mg iron (60 mg of ferrous sulphate and 0.1 mg folic acid) on a daily basis for a period of up to 3 months.

All the children and pregnant females who have haemoglobin level sub 10 gm per cent and 8 gm per cent respectively are the chief focal point of the programme. In 1975-76 there were 3.52 million beneficiaries under this programme which rose to 41.20 million in 1988-89. The eligible beneficiaries for the prophylaxis programme identified so far are more than 30 million females and 50 million children.

National Guidelines for Control of Iron Deficiency Anaemia:

To eliminate anaemia as a major public well-being issue among pregnant females, infants and adolescents (4-6) National Guidelines for Control of Iron Deficiency Anaemia were developed .

There were four main objectives of these guidelines:

1. To bring the grave negative effects of a population with anaemia causing damage to the health, physical and mental well being and their ability to be economically productive individuals into focus of the concerned programme director of health related activities.
2. To outline supplementation protocols of Iron and Folic Acid (IFA) across the life cycle.
3. To define minimum normal treatment practice for health center based management of placid, temperate and extreme anaemia divided by stages of treatment.
4. To designate roles of service providers and recognize stages of service delivery.

Table 10.1: *Supplementation programme and service delivery*

Ages	Dosage	Procedure	Delivery mechanism
6-60 months	1ml of IFA oral supplements consisting 20 mg of iron and 100mcg of folic acid	Bi-weekly from 6 to 60 months	Done through ASHA inclusion within the MCP Card.
5-10years	Supplements of 45mg of iron and 400mcg of folic acid	Weekly from 5 to10 years and once in 2 years de-worming	Done by teachers in school and through Anganwadi centers (AWC). Outside of schools

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10-19 years	Supplements of 100mg of iron and 500mcg of folic acid	Weekly from 10 to19 years and once in 2 years de-worming	Done by teachers in school and through Anganwadi centers (AWC). Outside of schools
Pregnant and Lactating Females	Supplements of 100mg of iron and 500mcg of folic acid	1 iron supplement tab daily for 100 days, after the first trimester, then at 14-16 weeks of gestation. Post partum should be resumed for 100 days	Done through ASHA inclusion within the MCP Card.
Females in reproductive age group	Supplements of 100mg of iron and 500mcg of folic acid	Weekly for the whole reproductive period	Done through ASHA while the house visits take place

Table 10.2: *Hemoglobin levels to diagnose Anaemia*

Age Group	No Anaemia	Placid	Temperate	Extreme
Children from 6 to 59 months	>11	10-10.9	7-9.9	<7
Children from 5 to 11 months	>11.5	11-11.4	8-10.9	<8
Children from 12 to 14 months	>12	11-11.9	8-10.9	<8
Females(15 years and above)	>12	11-11.9	8-10.9	<8
Pregnant females	>11	10-10.9	7-9.9	<7

Source: *Hemoglobin concentration for the diagnosis of anaemia and assessment of severity. WHO*

Check Your Progress

1. How does anaemia affect the body?
2. Who are the intended recipients of the National Anaemia Control Programme?
3. What is National Iron Plus Initiative?

10.3 NATIONAL IODINE DEFICIENCY DISORDERS CONTROL PROGRAMME

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You must have seen that some people have an enlarged thyroid gland. This is known as Goitre. This happens because of the deficiency of iodine in the body. It is not only Goitre but many other disorders also occur in the body due to iodine deficiency.

Deficiency of iodine may cause following disorders:

- Goiter i.e swelling of thyroid gland
- Impaired brain functions
- Damage to peripheral nerves
- Heart diseases and heart related disorders
- Miscarriages and still birth
- Hypothyroidism
- Failing vision, hearing, and speech
- Spasticity
- Mental retardation and reduced intelligence

Iodine is a very essential micronutrient. For the normal human growth and development we require at least 100-150 micrograms of iodine daily.

Iodine Deficiency Disorders (IDD) is the inadequacy of iodine levels required by an average human in the food/diet. It affects a variety of people across the age, gender and socioeconomic spectrum. People young or old, men or women, middle or low class (less prevalent in high class as access to good quality food comes easy).During pregnancy, iodine deficiency directly decreases the availability of iodine to the foetus.

Iodine Deficiency Disorders have been with us from generations and it has affected a lot of population all over the world. More than a billion people all across the continents are constantly under jeopardy from Iodine Deficiency Disorders. According to an estimate, over 350 million people in our country are prone to be deficient, while the number of people already in distress due to IDD is more than 71 million.

In India there were a few extensive surveys and they indicated that the problem of goitre stretches from Kashmir to Kerala. National Goiter Control Programme (NGCP) was commenced by the government of India in 1962 after realizing the magnitude of the problem. Scientists at AIIMS conducted a study in Kangra Valley which became foundation to the programme. According to the study if iodized salt is added to the consumption of the general population replacing the common salt used, the number of goiter cases come down significantly. To cover the wide range of problems associated with iodine

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deficiency disorder like Goiter, impaired brain functions, damage nerves, heart diseases and heart-related disorders, miscarriages and stillbirth etc National Goiter Control Programme (NGCP) was rebranded as the National Iodine Deficiency Disorder Control Programme (NIDDCP) in August 1992.

GOAL: To decrease the occurrence of IDD's in the whole nation is the government's ambition of NIDDCP.

Objectives

The chief intentions of National Iodine Deficiency Disorders Control Programme (NIDDCP) are as follows:

- Conducting surveys of Iodine Deficiency Disorders to gauge the impact of the problems.
- To instate a regular supply of iodine rich salt replacing the use of common salt.
- To do impact assessment of IDDs and the effect of iodine rich salt for every 5 years.
- To monitor in the laboratory effects of samples of the iodine rich salt and samples of urinary iodine excretion to gauge iodine content in the body.
- To provide health and lifestyle habit instruction.

Iodine Deficiency Disorder Cell of Directorate General of Health Services:

The Central Nutrition and Iodine Deficiency Disorders cell at the Directorate General of Health Services (DGHS) is responsible to put into practice NIDDCP in the country.

The significant undertakings of IDD are as follows:

- The states/UTs are given Technical guidelines to follow.
- To maintain a pretty good partnership with ministry of transport and industry
- To maintain Inter sectoral synchronization at Central level.
- To manage the variety of aspects of NIDDCP in states and union territories
- To monitor IDDs through various surveys in states and union territories
- To provide human capital by training the personnel involved in NIDDCP
- To research and provide more successful and efficient advice after collection, compilation and examination of relevant data from states/ UT

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- To monitor the quality of iodine rich salt at manufacturing level with the help of salt commissioner and at the allocation & customer level with the help of state health directorate.
- To monitor the delivery and supply of iodine rich salt in states and union territories
- To manage the economical and other corporal facets of all the IDD cells at level

Achievements of Programme

- Our private sector has been permitted production by the liberalization of salt production policy. The salt commissioner has licensed 824 private units.
- For the transportation of iodine rich salt the Ministry of Railway is providing priority arrangements.
- Central government has banned the sale of non iodine rich salt in country post 2005.
- The benchmark for the iodine rich salt has been laid based on prevention of food adulteration act 1954.
- Establishment of IDD cell by DGHS.
- Establishment of IDD control cell in states and union territories.
- To promote the consumption of iodine rich salt central government funded awareness campaign for health education take place.
- For training of human resource and sample check of iodine content in salt, separate lab has been setup.
- Testing kits have been made available for on the spot quality check of iodine salts and also to ensure that high quality iodine salts are consumed

To combat the problems of iodine deficiency disorder worldwide WHO has called in massive preventive measures supported by bilateral agreements between government and agencies ICCIDD i.e. International Council for Control of IDD. This initiative was intended to slow down and decrease the prominence of Iodine deficiency at levels as low as villages to as large as the global stage.

This massive initiative is hugely dependent on the corporation of the salt industry itself. They have a key role in saving the population from the dangers of iodine deficiency. There burden is a humanitarian one where they must look past self interest and think about the general public.

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Check Your Progress

4. What nutrient deficiency causes Goitre?
5. What is National Goiter Control Programme?

10.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Anaemia is a medical condition which consists of lack of red blood cells, which results in pale skin and weakness. Anaemia poorly affects an individual's mental performance, social development, coordination language development, motor development, educational achievement, increase illness from infection.
2. The key recipients of National Anaemia Control Programme include females of reproductive age, pregnant females, infants, young children and adolescents.
3. In 2013, the Ministry of Health and Family Welfare (MoHFW) has launched National Iron Plus Initiative (NIPI) with a motive to combat the widespread public health challenge of iron deficiency anaemia.
4. Iodine deficiency is the main cause of Goitre. Iodine is an essential nutrient in the diet and insufficiency or absence of the same in the body may lead to an enlarged thyroid gland disorder which is known as Goitre.
5. The Government of India has commenced the National Goiter Control Programme (NGCP) in 1962 with an aim to cover the wide range of problems associated with iodine deficiency disorders like goiter, impaired brain functions, damage nerves, heart diseases and heart-related disorders, miscarriages and stillbirth. However, in 1992 it was renamed as the National Iodine Deficiency Disorder Control Programme (NIDDCP).

10.5 SUMMARY

- The government has launched the National Nutritional Anaemia Control Programme (NNACP) with an aim to reduce the number of incidences of anaemia in females of reproductive age, pregnant females, infants, young children and adolescents.
- The Ministry of Health and Family Welfare in India organized a National Consultation on Control of Nutritional Anaemia in October 1997 to review the epidemiology of nutritional anaemia and the existing policy on nutritional anaemia control.

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- The Adolescent Division of the Ministry of Health and Family Welfare (MoHFW), Government of India has developed the National Iron Plus Initiative with an aim to combat the widespread public health challenge of iron deficiency anaemia among population.
- The government has developed National Guidelines for Control of Iron Deficiency Anaemia to eliminate anaemia as a major public well-being issue among pregnant females, infants and adolescents (4-6).
- Iodine Deficiency Disorders (IDD) is the inadequacy of iodine levels required by an average human in the food/diet. It affects a variety of people across the age, gender and socioeconomic spectrum. During pregnancy, iodine deficiency directly decreases the availability of iodine to the foetus.
- National Goiter Control Programme (NGCP) has been launched by the government in 1962 with an aim to cover the wide range of problems associated with iodine deficiency disorders like goiter, impaired brain functions, damage nerves, heart diseases and heart-related disorders, miscarriages and stillbirth. In 1992, the programme was renamed with National Iodine Deficiency Disorders Control Programme (NIDDCP).
- The Central Nutrition and Iodine Deficiency Disorders cell at the Directorate General of Health Services (DGHS) is responsible to put into practice NIDDCP in the country.
- To combat the problem of iodine deficiency disorder worldwide WHO has called in massive preventive measures supported by bilateral agreements between government and agencies like International Council for Control of IDD (ICCIDD). This initiative will slow down the prominence of iodine deficiency.

10.6 KEY WORDS

- **Epidemiology:** It refers to the study and analysis of the distribution and determinants of health and disease conditions in defined populations.
- **Prophylaxis:** It refers to the treatment given or action taken to prevent disease
- **Stillbirth:** It refers to the birth of a baby who has already died inside the womb of mother
- **Hypothyroidism:** It refers to the state of a body when the thyroid gland does not produce enough thyroid hormones to meet the needs of the body
- **Spasticity:** It refers to the condition in which certain muscles are continuously contracted.

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- **Mental Retardation:** It refers to a developmental disability that first appears in children under the age of 18.

10.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What are the three strategies of government to control anaemia?
2. Mention the key policies of MoHFW for the prevention and control of anaemia.
3. Why has the government initiated National Guidelines for Control of Iron Deficiency Anaemia?
4. What are the important objectives of National IDD Control Programme?

Long Answer Questions

1. Elaborate the need and objectives of National Guidelines for Control of Iron Deficiency Anaemia.
2. List the disorders caused due to iodine deficiency in the body.
3. Elaborate all the significant measures taken by IDD.
4. Analyse the achievements of NIDDCP.

10.8 FURTHER READINGS

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UNIT 11 NUTRITION SUPPLEMENTATION PROGRAMMES

Structure

11.0 INTRODUCTION

In our country it is seen that most of the women and children face the problem of ill-health because they are prone to malnutrition. To find a solution to this problem many programmes have been introduced. In this unit we will study about the food supplementation programmes. There are many supplementation programmes which run on small and large scale by the government. To understand these programmes firstly we should find out the description about the theory of supplementation. It is a mostly seen that there is a wide gap between the recommended intakes and the amount of energy and protein actually supplied by the diet. Now the question arises that how do we fill this gap? The answer, obviously, is to give a nutritious food supplement rich in energy and protein. To meet the Recommended Dietary Intakes (RDIs) for energy and protein our effort is to add extra food to the home diet of a person.

The basic concept of food supplementation is this but the method is short-term because we are providing extra food to population groups without necessarily giving them the means to earn more. But we should educate people so that they develop a sense of independence and should be less dependent on others for their food needs.

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Initially, the supplementary feeding programmes were catered only to children. But gradually, pregnant and lactating mothers were also involved. This helped the mothers through a safe birth and the babies also had improved weight at the time of birth.

Mostly it is seen that the majority of people are poor and they have to live in very bad conditions. They stay in unhygienic conditions and this gives rise to more infection. Therefore it is important that the people should not only be given additional supplements to fulfill the need of their nutrient deficiency but they should also be given proper education so that they take care of their living conditions. All these programmes will be effective only when there will be improvement in the living conditions of the mass population. Education will play a very important role in bringing awareness in the people.

11.1 OBJECTIVES

After going through this unit, you will be able to:

- Analyse various nutrition supplementation programmes in India
- Examine the objectives and services of Integrated Child Development Services (ICDS)
- Describe the scope and objectives of Mid-Day Meal (MDM) programme
- Discuss the implementation and aims of Special Nutrition Programme (SNP) and Balwadi Nutrition Programme (BNP)

11.2 FOOD SUPPLEMENTATION PROGRAMME

Presently main nutrition supplementation programmes in India are:

1. Integrated Child Development Services Scheme (ICDS);
2. Mid-day Meal Programmes (MDM);
3. Special Nutrition Programme (SNP);
4. Wheat Based Nutrition Programme (WNP);
5. Applied Nutrition Programme (ANP);
6. Balwadi Nutrition Programme (BNP);
7. National Nutritional Anaemia Prophylaxis Programme (NNAPP);
8. National Programme for Prevention of Blindness due to Vitamin A Deficiency; and
9. National Goiter Control Programme (NGCP).

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Giving a food supplement alone is not sufficient because poor people are victims of infectious deseases as they live in unhealthy conditions. There is a relationship of malnutrition and infection. Therefore it becomes important to improve the living conditions of individuals so as to have the effects of food supplements. All this is only possible when people will be educated.

11.2.1 Integrated Child Development Services (ICDS)

The Integrated Child Development Service (ICDS) was started by the Government of India by taking into consideration the three important services i.e., health, nutrition and education. Earlier, all these factors were not considered in any of the programmes related to supplementation. The integration of all these three services was done for the first time in Integrated child development services. This programme is one of the world's largest community based Integrated Child Development Services (ICDS) scheme. The mother and child were considered as one biological unit in this programme and education was provided to both mother and child. This programme was starded in 1974-75.

Objectives of Integrated Child Development Programme:

1. To develop the child psychologically, socially, and physically
2. To improve the health of the children in the age group of 0-6 as well as the adolescents
3. To improve the nutritional status of the children
4. To educate the mother so that she can take proper care of the health of her child
5. To decrease the number of school drop outs due to malnutrition
6. To effectively run the programme with the coordination of various departments

Services provided by integrated child development service (ICDS):

The services provided by the ICDS are as follows:

- Additional nutrition
- Health check up
- Vaccination
- Growth and development
- Education on health and nutrition to women
- Pre-schooling to children

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The services are provided through the anganwadi centers. These Anganwadi centers are schools where the nursery education is given to the children. These 'Anganwadi' (AWC) are situated in the villages, slums or tribal areas. The worker is appointed to take care of the anganwadi center. Mostly a female worker is deputed for this work. The people can easily reach these centers. The female appointed is a trained worker and she works as the key community level official. The female working at AWC is taken from the local community. She undergoes a training of 3 months in child development, immunization, personal hygiene, environmental sanitation, breastfeeding antenatal care, treatment of minor ailments and recognition of 'at risk' children is given to her. An honorarium as an incentive is given to her. She gives awareness about health which helps achieve better maternal and child health, enhances awareness regarding family planning services, treatment of morbidity and reduction of mortality. There are many services provided by AWC like immunization, health awareness camps, first aid, distribution of nutritional supplements, and education to mothers regarding child care etc.

(A) Supplementary Nutrition: One of the major services provided by ICDS is nutrition to the poor and needy people of the community. This is done through survey method. The expecting mothers and the nutritional deficient children are identified through the survey of the society. Then the food items are prepared at the AWC containing cereals, pulses, oil and sugar and this food is provided to them. The mothers are given education regarding raising their children. Anganwadi mostly focuses on bridging the gap between nutritional deficiencies by providing the deficient calories to children below 6 years.

The surveys have proved that the preschool children in India eat food which supplies 800-900 calories while they requires 1240 calories per day. This means the gap is around 300 calories per day. Apart from this Vitamin A, Folic acid, and iodized salt are supplied to take care of individual deficiencies.

(B) Health check-up: Anganwadi centers also provide the health check up service to the children, adolescent girls and pregnant and lactating mothers at regular intervals. The local health personnel such as Lady Health Visitor (LHV) and Auxiliary Nurse Midwife **(ANM)** are arranged to take care of health problems. After the diagnosis the medicines are provided in a medical kit. If the children and women need special treatment after investigation they are referred to the Doctors at the Primary Health Centre and sub-centres or district hospital.

(C) Vaccination: All the children in the project area are vaccinated against infectious diseases. Even tetanus is given to all the pregnant women.

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Fig. 11.1 *Immunization of Infants*

Fig. 11.2 *Immunizing pregnant women against tetanus*

(D) Growth Monitoring: The ICDS programme takes care of the growth of a person. For this, an eye is kept on the physical growth of a child

in terms of his/her height and weight. The monitoring of the weight of the children is done to see their progress.

This monitoring is done with the help of special growth charts.

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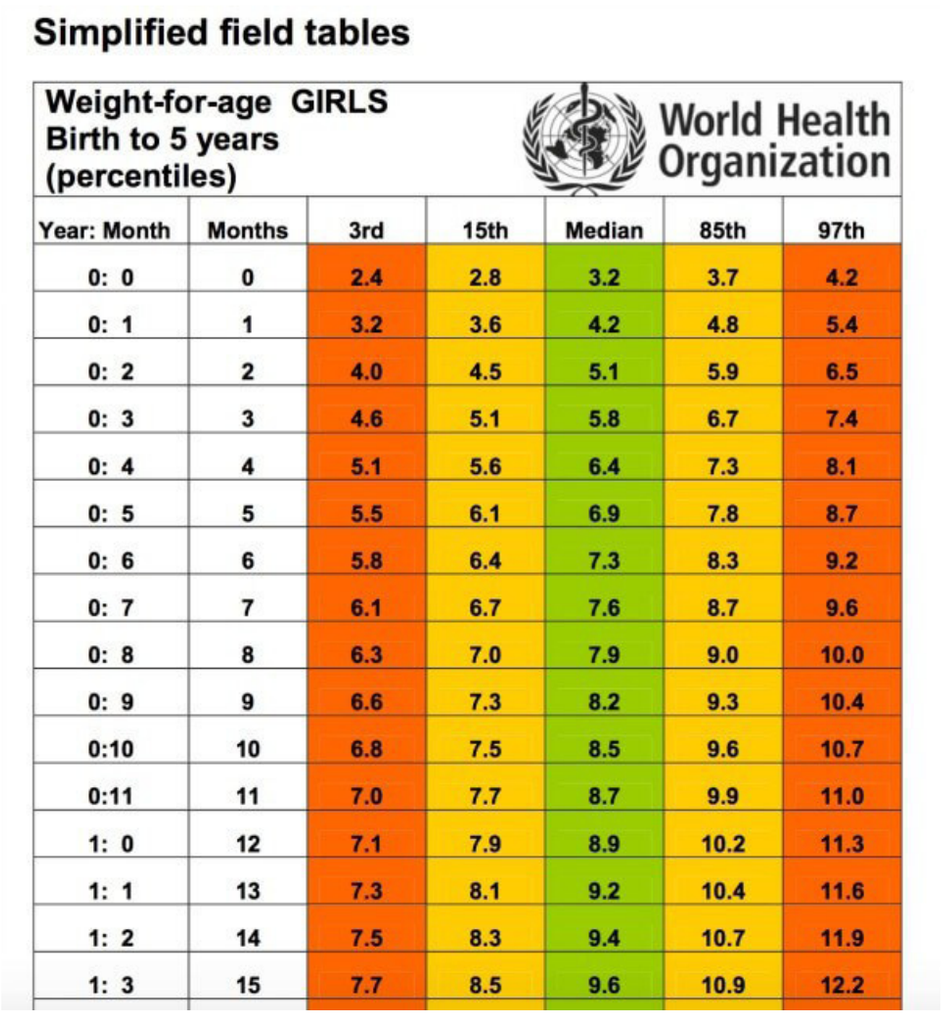

Simplified field tables

Weight-for-age GIRLS
Birth to 5 years
(percentiles)

World Health Organization

Year: Month	Months	3rd	15th	Median	85th	97th
0: 0	0	2.4	2.8	3.2	3.7	4.2
0: 1	1	3.2	3.6	4.2	4.8	5.4
0: 2	2	4.0	4.5	5.1	5.9	6.5
0: 3	3	4.6	5.1	5.8	6.7	7.4
0: 4	4	5.1	5.6	6.4	7.3	8.1
0: 5	5	5.5	6.1	6.9	7.8	8.7
0: 6	6	5.8	6.4	7.3	8.3	9.2
0: 7	7	6.1	6.7	7.6	8.7	9.6
0: 8	8	6.3	7.0	7.9	9.0	10.0
0: 9	9	6.6	7.3	8.2	9.3	10.4
0:10	10	6.8	7.5	8.5	9.6	10.7
0:11	11	7.0	7.7	8.7	9.9	11.0
1: 0	12	7.1	7.9	8.9	10.2	11.3
1: 1	13	7.3	8.1	9.2	10.4	11.6
1: 2	14	7.5	8.3	9.4	10.7	11.9
1: 3	15	7.7	8.5	9.6	10.9	12.2

Fig. 11.3 *Weight-for- Age Growth Chart for Girls (WHO)*

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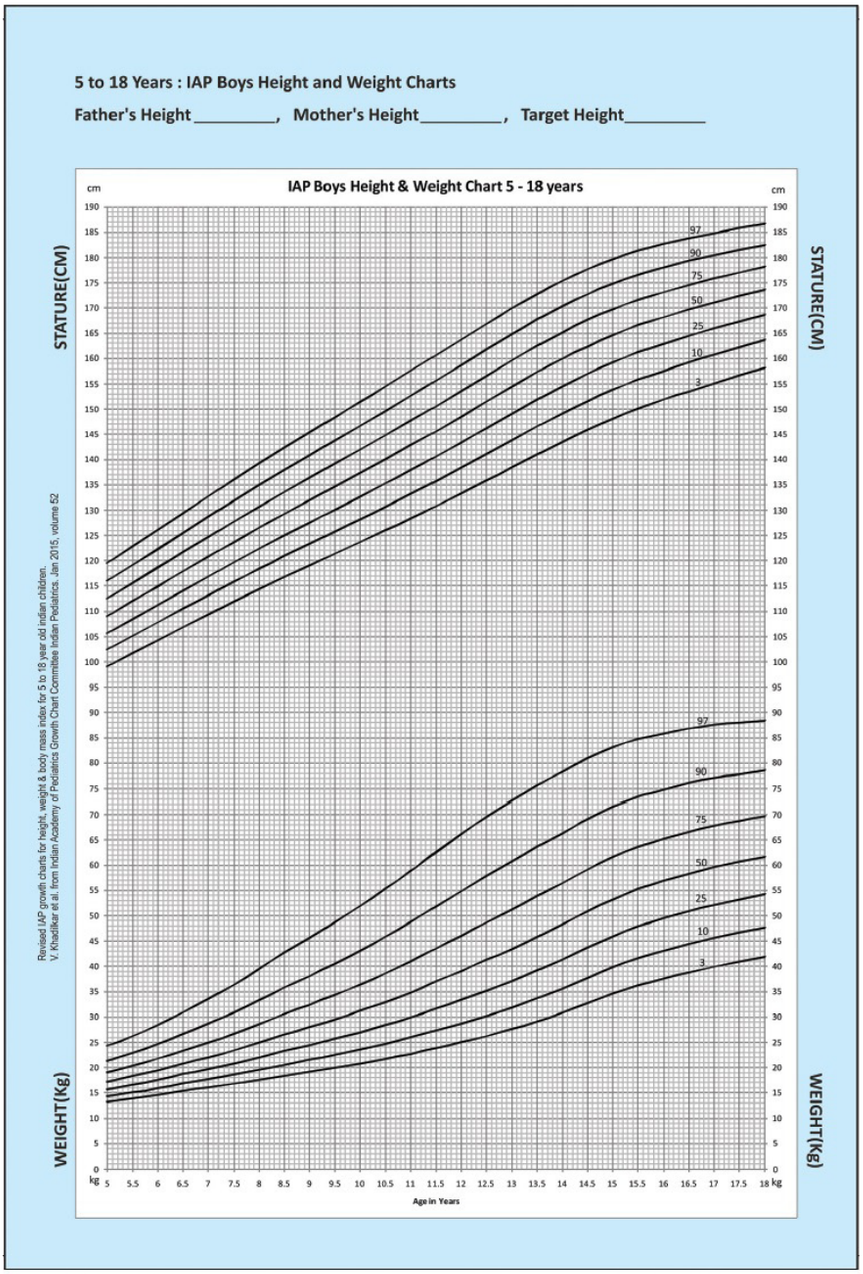

Fig. 11.4 *Height and Weight Chart for Boys (5-10 years)*

(E) Education on health and nutrition to mothers: The mothers are educated about the growth of their children. They are also educated about health and hygiene.

(F) Pre schooling of children: Non-formal education is provided to children of 3-5 years. They are provided with pre schooling facility. No rigid curriculum is followed and only the curiosity of the child is satisfied. Play way method is used to teach the children. They are taught through toys and games. Teaching aids are used to teach them and these aids are prepared using available resources in the community.

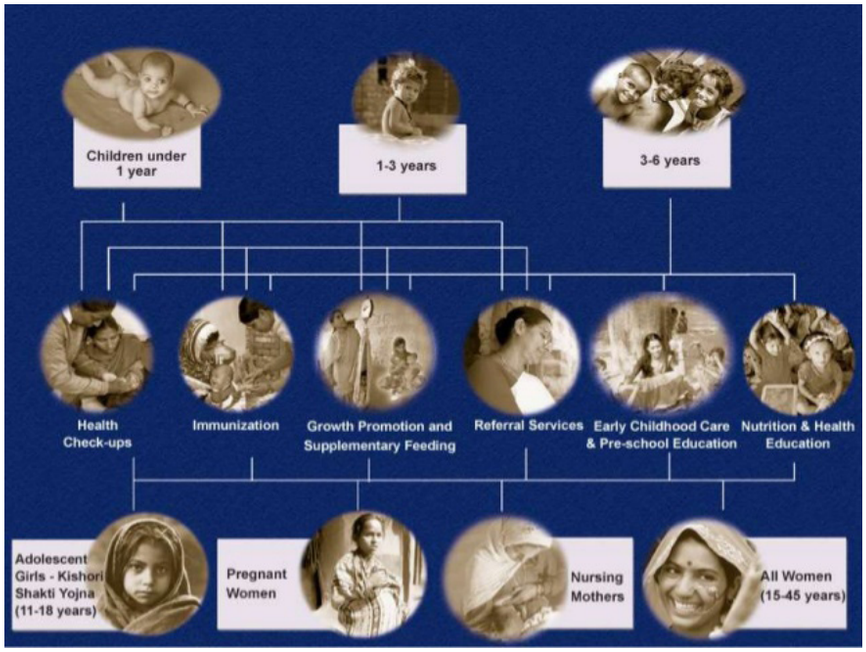

Fig. 11.5 *Beneficiaries and Services of ICDS*

To improve the quality of life ICDS Programme has had an effective impact on the health and nutrition of the beneficiaries. The services provided by ICDS have increased the nutritional status, immunization rate and changes in the cognitive development of pre-school children. To achieve the objectives of ICDS the community participation is very essential.

11.2.2 Mid Day Meal Programme (MDM)

To enhance the enrolment retention and attendance of children in primary school, National Programme of Nutritional Support was started commonly known as Mid-day Meal (MDM). This programme serves freshly-cooked lunch to children in government and government-aided schools in India. On 28 November 2001, the Supreme Court of India passed a mandate stating, 'We direct the State Governments/Union Territories to implement the Mid-Day Meal Scheme by providing every child in every Government and Government assisted Primary School with a prepared mid-day meal.'

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Mid-Day Meal Scheme aims to:

- avoid classroom hunger
- to increase nutritional status
- increase school enrolment
- increase school attendance

This scheme was started on 15th August 1995. Under this scheme every child in every government and government aided primary school was to be served with a prepared Mid Day Meal. It was seen that the children from the poor families came to school either partly hungry and some even came empty stomach. This was an obstacle in their education as they could not concentrate on their studies with empty stomach and could not get benefit of education. Even it was observed that the diet the children got from home was inadequate and did not supply proper nutrition to the children. This leads to a direct effect on the growth and development of the children. This programme is focused on nutrition , education and health.

Scope and Objectives of Mid Day Meal

The programme was carried out at Balwadi for the children under 4 years and at primary schools for children of 5 to 9 yrs.

The main objectives of the programme are as follows:

- To provide nutritional meals to the children and to promote child's health, growth and development thereby improving the nutritional status of children
- To enhance the school attendance by inspiring and motivating children to attend school regularly
- To enhance the social behaviour of the children and narrow the differences between various castes
- To enhance the good health and food habits of children.

Components of Mid-day meal programme

The major component of this programme is food supplement. The raw food material supplied by international agencies includes corn soya meal (CSM), soya, wheat soya blend, SFB & salad oil.

The raw ingredients are cooked into 'Upma' or 'Khichri' or some other forms. They are also incorporated into ready to eat foods along with flavouring agents & condiments. Even milk powder in some places forms part of the supplies.

The meal provides roughly 450-500 kcal and 20-30 gm protein per child per day, which is expected to meet one-third of the energy and half of the recommended dietary intake (RDI) for protein.

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Target Groups of Mid Day Meal Programme

Children between 6 and 11 years who attend primary schools are the main beneficiaries of this programme.

Implementation of Mid Day Meal Programme

The Mid day meal programme takes place in the school premises. The food is cooked and distributed by the school teachers. The record of the programme is maintained in the register. The teacher maintains the stock register, attendance register and other relevant details related to the programme. The Education Department operates this programme. Government provides assistance for running the programme. There is a budget for meeting the requirement of cost of spices, fuel, and other ingredients.

Along with the supply of mid day meal the same target group is also provided with medical assistance.

Health checkup camps are organized by the Medical Officer of the local Primary Health Centre (PHC) to maintain the health status of the children and maintain records of height, weight and clinical (health). The paediatricians, ophthalmologist, and dentist pay regular visits to schools and conduct health check-ups of children. The children who require special treatment are reffered to hospitals.

Several national and international agencies namely UN International Children's Emergency Fund (UNICEF), World Food Programme (WFP), Cooperative for Assistance Relief Everywhere (CARE) give their support to the programmes like ICDS and MDM. The MDM programme is being run successfully in many states of India.

11.2.3 Special Nutrition Programme (SNP)

The programme was launched in the country in 1970-71. It provides supplementary feeding of about 300 kilo calories of energy and 10 grams of protein to preschool children and about 500 calories and 25 grams of protein to expectant and nursing mothers for six days a week. This programme was operated under Minimum Need Programme (MNP). The programme was taken up in rural areas inhibited predominantly by lower socio-economic groups in tribal and urban slums. Fund for nutrition component of ICD programme is taken from the SNP budget.

Special Nutrition Programme was introduced in 1970 to improve the nutritional status of specific target groups.

The target groups are:

- children under 6 years
- pregnant and lactating mothers

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The programme is operated in the following locations:

- urban slums
- tribal areas
- backward rural areas

Supplementary nutrition is provided for 300 days every year

- Children under 6 years – 300kcal, 10-12g protein
- Pregnant and lactating women – 500kcal, 25g protein

Initially, the programme was under the control of Central Government. But, the responsibility was later shifted to the state government under the Minimum Needs Programme. Now, the special nutrition programme is integrated with the ICDS (Integrated Child Development Services).

Implementation of Special Nutrition Programme:

- The scheme proposed periodical check-up for beneficiary children.
- Feeding of Children
- Immunization of beneficiaries.
- Assessment of weight and haemoglobin content of blood from time to time.

37 lakh beneficiaries in urban tribal and backward rural areas were covered under this programme by the end of 1973-74 and the number was exceeded to 70 lakh by 1986.

Special Nutrition Programme has now been combined with ICDS wherever possible.

11.2.4 Balwadi Nutrition Programme (BNP)

The government of India started the Balwadi Nutrition Programme (BNP) in 1970-71. Balwadis and day-care centres are responsible for operating this programme. There are about five thousand Balwadis implementing the programme. It is a non-expanding and non-plan activity of the Government of India. At present, about 2.29 lakh beneficiaries are being covered under the scheme.

(Source : Indian Paediatrics 1992, 29: 1601-1613)

Objectives of Balwadi Nutrition Programme (BNP):

- To provide about one-third of the calorie and half of the protein requirements of the pre-school child as a measure to improve nutritional and health status.

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Beneficiaries of Balwadi Nutrition Programme (BNP):

- Pre-school children between the age of 3 to 6 years.
- Priority is given to children belonging to low income group.

Implementation of Balwadi Nutrition Programme (BNP):

- Each child is given a supplementary nutrition consisting 300 kilocalories of energy and 10 g of protein for 770 days a year.
- Balwadis also organize activities for the social and emotional development of the children
- The aim of Balwadi programme is to focus on formal education of children.
- More stress is given on regular attendance.
- Motivation is provided to children to participate in the class.

Special features of Balwadi:

1. The village community manages the centre and provides a room and land for it.
2. Free mid day meals are not provided in the balwadis.
3. Instead parents are asked to send tiffin with their children which is then shared at meal time.
4. This is with keeping with our policy of minimum money inputs and supports the concept of self sufficiency in the village.
5. The sharing of food amongst the children helps break down caste barriers.
6. The teacher is appointed by the village community.
7. Environment related activities are given priority.
8. Kids are taught many nursery rhymes to develop their vocabulary.
9. They learn shapes and colours through songs, pictures and toys.
10. Children learn the alphabet and are introduced to numbers.
11. Children learn about culture by celebrating various festivals.

India is facing a major health problem of malnutrition. The government is putting in lot of efforts to reduce the problem of undernutrition by taking the following three important measures:

- Government is trying to increase food production,
- It is also trying to increase purchasing capacity and
- Starting nutrition programmes

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Check Your Progress

1. What are the services provided by ICDS?
2. List the services provided by AWCs.
3. What is Mid-Day Meal?
4. Name the agencies that support programmes like ICDS and MDM.
5. Who are the target beneficiaries of Special Nutrition Programme (SNP)?

11.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The services provided by the integrated Child Development Services (ICDS) include additional nutrition to the poor and needy people of the community, vaccination, regular health check-up, growth and development, education of health and nutrition to women, pre-schooling to children. These services are provided through the Anganwadi Centers (AWC).
2. Anganwadi Centers provide various services such as immunization, health awareness camps, first aid, distribution of nutritional supplements, and education to mothers regarding child care etc.
3. Mid-Day Meal is a school meal programme initiated by the Government of India with an aim to increase nutritional status of the school-age children nationwide and also to enhance the enrolment retention and attendance of children in primary schools.
4. Several national and international agencies have extended their support to the nutrition programmes like ICDS and MDM, namely United Nations International Children's Emergency Fund (UNICEF), World Food Programme (WFP), Cooperative for Assistance Relief Everywhere (CARE).
5. The target beneficiaries of Special Nutrition Programme (SNP) comprise of children under 6 years of age and pregnant and lactating women. The programme was launched in 1970 to improve the nutritional status of specific target groups.

11.4 SUMMARY

- Food Supplementation programmes are large programmes which are designed to include a substantial number of beneficiaries with the

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support of government and national and international agencies. Such programmes are mainly designed to distribute food among children between the ages of six months and six years so as to improve their nutritional status and also to put a check on the deterioration in their health and nutrition.

- The Integrated Child Development Service (ICDS) was started by the Government of India in 1974-75 by taking the three important services, namely health, nutrition and education into consideration. This programme is one of the world's largest community-based ICDS scheme. The mother and child were considered as one biological unit in this programme and education was provide to both mother and child.
- The services under ICDS are provided through the Anganwadi centers (AWC). These centers are schools where the nursery education is given to the children. These centers are situated in the villages, slums or tribal areas.
- Supplementary nutrition, health check-up, vaccination, growth monitoring, education on health and nutrition to mothers, pre-schooling of children are a few services covered under ICDS programme.
- The services provided by ICDS have increased the nutritional status, immunization rate and changes in the cognitive development of pre-school children. To achieve the objectives of ICDS the community participation is very essential.
- Under Mid-Day Meal programme, freshly-cooked lunch is served to children in government and government-aided schools in India. The scheme was started on 15 August 1995. The scheme is aimed to avoid classroom hunger, increase nutritional status, increase school enrolment, and to increase school attendance.
- The major component of MDM is food supplement. The raw food material supplied by international agencies which includes corn soya meal (CSM), soya, wheat soya blend, SFB & salad oil. Children between 6 and 11 years who attend primary schools are the main beneficiaries of this programme.
- Health check-up camps are organized by the Medical Officer of the local Primary Health Centre (PHC) to maintain the health status of the children and maintain records of height, weight and clinical (health) under the Mid-Day Meal programme.
- Special Nutrition Programme (SNP) was introduced in 1970 with the goal to provide supplementary feeding of about 300 kilocalories of energy and 10 grams of protein to preschool children and about 500

calories and 25 grams of protein to expectant and nursing mothers for six days a week.

- The Government of India started the Balwadi Nutrition Programme (BNP) in 1970-71. The objective of the programme is to provide about one-third of the calorie and half of the protein requirements of the pre-school child as measure to improve nutritional and health status. Pre-school children between the age of 3 to 5 years are the target beneficiaries of the programme.

11.5 KEY WORDS

- **Antenatal care:** It refers to the care a woman receives from health professionals during pregnancy.
- **Honorarium:** It refers to a payment given for professional services that are rendered nominally without charge.
- **Paediatrician:** It refers to a medical practitioner specializing in children and their diseases.
- **Ophthalmologist:** It refers to a specialist in the branch of medicine concerned with the study and treatment of disorders and diseases of the eye.

11.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Name a few nutrition supplementation programmes prevalent in India.
2. What is supplementary nutrition programme?
3. Write a short note on the components of mid-day meal programme.
4. What are the special features of Balwadi Nutrition Programme (BNP)?

Long Answer Questions

1. Discuss the objectives of Integrated Child Development Service.
2. Analyse the objectives of Mid-Day Meal programme.
3. Describe the implementation of Special Nutrition Programme (SNP).
4. Discuss, in detail, the objectives, beneficiaries and implementation of BNP.

11.7 FURTHER READINGS

NOTES

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BLOCK - IV

HEALTH PROGRAMMES

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UNIT 12 NATIONAL HEALTH PROGRAMMES-I

Structure

12.0 INTRODUCTION

The government has initiated various health programmes related to communicable diseases. The healthcare schemes have improved the lives of lots of people and allowed them to lead a disease-free and better lives. The role of these government-run health schemes and their successful execution has been discussed in this unit.

Immunization is the process of injecting weakened diseases causing microbes into the body of a patent causing an immune response which counteracts microbes from doing any damage. The unit talks about different vaccinations essentially required for the children and also about the various schemes like National Immunization Programme, Universal Immunization Programme, National Family Welfare Programme and the functions and services related to the same have been discussed in detail in this unit.

12.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss major health programmes initiated by the government
- Describe the major activities of National Immunization Programme (NIP)

- Analyse the government health policies
- Explain the objectives and functions of National Family Welfare Programme
- Recognize the importance of research and evaluation in family planning

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12.2 MAJOR HEALTH PROGRAMMES

During the past 50 years numerous government interventions in public health and well-being have led to the people having better lives, the access to healthcare has improved and lots of people in the rural and impoverished places have the means to get basic healthcare. These steps have led to increased life expectancy at birth from 31 years in 1950 (Times of india) to almost 68 in 2016(world bank), reduced infant mortality to 37.81per 1000 in 2015. All this has been due to the government efforts aimed to improve our standards of living, but still these numbers are way below what western half of our planet enjoys. In Europe it is 79 years for males and 84 for females whereas in the USA it is 78.69 in 2016. We might be behind the west for now but our government knows that and has been ramping up measures and a number of health programmes these programmes are collectively called the National Health Programmes.

A few of the National Health Programmes are as follows:

- Irnmunisation Programme
- Family Welfare Programme
- Programme for Prevention of Nutritional Blindness due to Vitamin A
- Deficiency
- 8 Nutritional Anaemia Control Programme
- 8 Iodine Deficiency Disorders Control Programme
- Filaria Control Programme
- Programme for Control of Blindness
- Aids Control Programme
- Mental Health Programme
- Diabetes Control Programme
- Tuberculosis Control Programme
- Malaria Eradication Programme
- Child Survival and Safe Motherhood Programme

All of these programmes are funded by the government. Several of them even done in partnership with WHO and UNICEF. Even some

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programmes partner foreign governments like recently UK. This with advances in technology and our government's efforts has led to few very successful programs like the National Immunisation Programme which helped eradicate smallpox. We will talk about this programme in greater detail in the following section.

12.2.1 National Immunization Programme

During the 70s, smallpox was an epidemic broke in India and killed over 15,000 people between January and May 1974 with most deaths in states of Bihar, West Bengal, Orissa making it the worst smallpox epidemic in 20th century. It was the NHS' National Immunization Programme which eradicated this deadly disease. This propelled this program into a global spotlight. This program was later expanded in 1978 to cover all children below age of five to be immunized with DPT, OPV, BCG and typhoid–paratyphoid fever vaccines. Immunizing pregnant females with TT was introduced in 1983.In 1985 it was renamed to Universal Immunization Program (UIP) and a new mandate was given to it.

- To improve the coverage of vaccine as fast as possible
- To raise the standards of vaccine and delivery methods
- To establish a efficient supply chain to the health facility
- To establish a district wise evaluation and monitoring of performance
- Reach total independence and sufficiency in vaccination production

In 1986, UIP was classified as one of the 'National technological mission'. A special Immunization strengthening project was planned to run for 3 years from 2000, which incorporated three crucial parts (polio obliteration, betterment of regular immunization, and development of strategic frames for improving the immunization cover).

Universal Immunization Programme

- Immunization is the most basic intervention which if administered at early stages can save lives of countless children from life threatening diseases, Our immunization programme is the largest in the world and very heavily promoted.
- Immunization programme was introduced in 1978 as an expanded immunization programme.
- Then soon after it gained key attention and got advanced to a Universal Immunization Programme in 1992 and ever since they have been a crucial part of NRCHP.
- Since 2005 this is one of the key programmes and helped a lot of underprivileged people under NRHM

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- It is implemented in phases all across the country at district levels to fight diseases and eradicate them, deadly diseases like Diphtheria, Tetanus, Polio, Hepatitus B, Pertussis and a lot more, saving countless lives.

A National Immunization Programme(NIP) is an organization under Ministry of Health with the aim to prevent diseases, disability, and death from preventable diseases in children and adults. A NIP is a programme operating within the framework of overall governmental health policy. It is very important to have programme like this and every government around the world attempts to form a framework like this. It prevents the major cause of mortality or disability in children.

The children become ill and if somehow survive are left with a daunting challenge to face a world with a severe disability which could and should have been prevented and otherwise the child just dies. In underprivileged areas like rural areas, tetanus still remains as a huge cause for infant mortality. A huge pile of cases of typhoid, diphtheria, tetanus etc are reported annually. In our country more than 1.3 million children are killed each year because of these diseases which by the way are 100 per cent preventable by immunization and an even higher number of children more than 5 million remain disabled. This is a very high rate for a country to be called a developed one. We need to ramp up this programme so that we can prevent so many untimely deaths by timely immunizing the children.

Infrastructure: UIP was started by our government to reduce the morbidity and mortality rate in all the beneficiaries by covering all the possible number of children and pregnant females. Our country having such a high population and quite a lot of rural areas makes this a monumental task to achieve. For this programme to be a success, a lot of expertise and infrastructure is required. Our government has allocated the existing primary healthcare centres in rural areas and also trained special multipurpose workers, health guides and dais to facilitate these centres. The District health authorities have been tasked with providing vaccine and other equipments.

Activities: Immunisation is the process of injecting weakened diseases causing microbes into the body of a patient causing an immune response which prevents the deadly microbes from doing any damage. This process requires a lot of preparation on the parts of health centres from the procurement of the vaccine to storage and timely distribution before the vaccine is spoiled. All these task fall into hands of UIP workers. Apart from this they also need to keep a functional record of information about delivery schedule, number of eligible children vaccinated. Developing this system and giving feedback for any further improvements is one of their key functions.

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Strategy of operations: This programme is one of basic service facilitated through primary health care in our country; therefore it has been completely integrated into the services provided by our primary health centres. There is no separate cadre of staff for this specific task instead pre-existing health care workers have this as one of their main functions. Immunization is a fairly long-term programme; hence these functions are carried out even in the absence of any imminent threat of disease in the area. Through this the highest levels of immunization coverage is achieved and maintained for the years to come.

Vaccinations are given by organizing daily, weekly, biweekly, or even monthly sittings on the basis of the number of people in need. All the vaccines are made available at each and every centre so that it is convenient for the parents otherwise they might have to go to different locations for all the required doses. Doing campaigns to spread awareness about the schedule is of utmost importance and all the efforts are made to hold them regularly with maximum turnout of the people.

The government had set a goal of 85 per cent coverage of children by the year 2000 and it feels really good to say is that in 2017 upto 91 per cent (UNICEF 2017 report)of the children were covered from once deadly diseases and have been immunized with BCG, DPT1, DPT2 and coverage has dramatically increased for vaccines like Pol3, MCV1, HepB3, Hib3. The last wild case of polio was recorded in January 2011 and WHO has declared India polio free in 2014. All this has been made possible due to the constant efforts of NHS and more specifically it's Universal Immunization Programme.

Once there was very poor coverage due to lack of accessibility, lack of community participation and awareness, an inadequate recording system and inadequate equipment, with time and all the technology that was leveraged we slowly raised awareness and to the point where we are today. Computer databases for better storage and retrieval of data, better equipment, highly and motivated trained staff has made all the difference in the lives of numerous people. Now it is just the last mile that we need to run together as a country to get 100 per cent coverage and save countless more from these deadly diseases.

12.2.2 National Family Welfare Programme

India as of now has a population of more than 1.34 billion, the second most populated country in the world, just behind China. However, it is on track to become the most populated country by 2024. It has a landmass of just 2.4 per cent of the world and supporting a population of nearly 17.5 per cent of the world.

This population growth has been growing almost unchecked for all these decades turning a lot of problems in our country objectively worse. We have limited natural resources going around and there just is not enough

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for everyone and at the pace where we grow at record paces it is only going to make these resources even scarcer. There are a lot of mouths to feed, lots of people to cloth, lots of people to educate, lots of people to employ, lots of people to get a shelter and as basic principle of economics states if supply remains close to the same and demand grows everything comes with a greater cost.

Our children have to struggle harder to get quality primary and secondary education, our teenagers have to study extremely hard to get good colleges, our youth has to fight a lot harder for a quality jobs just because of a growing demand for all these things. Our government in the end has to make these ends meet with only a small portion of tax paying population sustaining such a large population. The infrastructure projects, welfare programs can cover only a small portion of the lacking population and can only give respite to small part of it.

Not to mention all the social issues we face as cities become denser and people lack resources crime rates increase, regulation need to improve to keep up with it putting a restriction on several freedoms of the people lots of rules that were not necessary before but have become an essential and granted parts of our lives.

To address this growing concern Government started a National Family Welfare Program in 1953. India became the first nation to start a state-wide programme. This became a 100% centrally sponsored program, focusing on spacing functionaries without having effect on the sterilization pie. During 1972, abortion was allowed to terminate an unwanted pregnancy under MTP Act. In 1977, The form of Family welfare we know today was created from Family planning programme which was functional pre era of family welfare programme.

India's strategy for family welfare is:

- Voluntary Adaptations of family welfare based on the benefits of it.
- Making people understand its need in today's times. Hence encouraging smaller families.
- Focus on male participation by educating them about reproductive health and good practices.
- Rights' based approach to family planning without enforcing any harsh laws.

This programme was implemented in the existing infrastructure of health care systems and started to give services to the masses.

Objective: When 'London Summit on Family Planning' took place in 2012 it brought up this issue globally. It was a stride forward in the right direction

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expanding the scope of services and knowledge to 120 million poor girls and females. As a response to this the Government of India redefined its approach by making an umbrella of RMNCH+A program. This shift of focus went beyond the stabilization of population to a bigger view of enhancing the health of both mother and child in India.

Functions: India is at the forefront of the global Family Planning 2020 action plan which was created in 2012. Our government's RMNCH+A (Reproductive, Maternal, Newborn and Child Health and Adolescents) programme were contextualized and formed to meet certain demands. The programme was proposed to allow laser like precision for achieving the following commitments made towards Family Planning 2020 which will be enacted through decentralized action at different levels of state and district and even lower at the village level.

- Family planning becomes one of the most important parts of universal health coverage.
- Giving in over 2 billion USD for family planning initiatives.
- Increasing the coverage of female contraceptives and maintaining it for the 100 million already covered.
- Improving the access to unmet need of family planning and information about it.
- Introducing even more choices therefore improving the scenario.
- Growing the access to contraceptives by the help of health workers
- Raising awareness about birth spacing and therefore ensuring that families are well prepared for the same.
- Improving the sterilizing services.
- Improving current services and protocols for FP and create new standards.
- Ensuring that the people and adolescents who seek services get them through public healthcare centers.
- Making sure that the poorest of the poor get access to the service thereby having equity in the system.
- Creating better system by striking deals with non government organization and let them help in improving the services.
- Raising the awareness globally thereby having a positive impact on family planning

There are a lot of functional products and active assistance provided by the family welfare programmes to fulfill the above-mentioned objectives and get the desired results, these services are as follows:

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- **Making contraceptives easily accessible:** Contraceptives have been made easily procurable to eligible couples. The choice of which the method of contraception to be used is upto the couple itself. The public sector provides emergency contraception such as ezy pills, injectable contraception, combined oral contraceptive, condoms etc. all these services are provided at sub centres till the higher levels.
- **Allowing Abortion:** Medical Termination of Pregnancy Act in 1971 allows females to choose to terminate the pregnancy. This enactment led to the reduction of mortality rate due to illegal abortion.MTP gives the choice to mothers to accept a small family and avoid any unexpected circumstances.
- **Child and Maternal care:** It is one of the most basic components of family welfare. This program raises awareness and makes the means available to expectant mothers to keep themselves and their babies healthy. This creates a sense of calm in the minds of the parents as it provides security to the health of the new born helping it lead a happy life.
- **Raise Awareness:** Educating and making people aware of the benefits of a smaller family. All the technology we have access to can be leveraged to form an informed society where people through their conscious choices make it so that they can adopt smaller family size, delay marriages to the right time, have space between having 2 kids.

Research and Training: We need well-informed personnel and trained doctors and workers to fulfill our objectives as soon as possible. For this purpose 5 year plans are made and targets get laid down by the government. Undertaking research and evaluation in family planning can tell us which methods work and which don't, help us identify areas which require more effort and finally increase the likelihood of all the objectives being met.

Check Your Progress

1. State the aim of National Health Programmes.
2. What is the aim behind the constitution of National Immunization Programme (NIP)?
3. When was India declared polio free?
4. When the government did plan to achieve full immunisation?

12.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

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1. Government plays an instrumental role in public health and well-being. During the past 50 years, the government has improved the lives of many rural and impoverished citizens by providing them with basic healthcare schemes. The main objective of National Health Programmes is to achieve the highest possible level of good health and well-being, through promotive health and developmental policies.
2. A national Immunization Programme (NIP) is an organization that works under Ministry of health with an aim to prevent diseases, disability and death from preventable diseases in children and adults. The programme operates within the framework of overall government health policy.
3. With the constant efforts of NHS-led Universal Immunization Programme, Polio has been eradicated in India since 27 March 2014. The World Health Organization (WHO) has formally declared India polio-free. The last case of polio was recorded from West Bengal in January 2011.
4. The government has planned to achieve a goal of 85 per cent coverage of children by the year 2000. But, according to UNICEF 2017 report, 91 per cent of children were already covered by the year 2017.

12.4 SUMMARY

- During the past 50 years numerous government interventions in public health and well-being have led to the people having better lives, the access to healthcare has improved and lots of people in the rural and impoverished places have the means to get basic healthcare.
- Various National Health Programmes in India are conducted in partnership with WHO and UNICEF. This with advances in technology and our government's efforts has led to few very successful programs like the National Immunisation Programme which helped eradicate smallpox.
- During the 70s smallpox was an epidemic broke in India and killed over 15000 people between January and May 1974 with most deaths in states of Bihar, West Bengal, and Orissa making it the worst smallpox epidemic in 20th century. It was the NHS' National Immunization Programme which eradicated this deadly disease.

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- Immunization programme was introduced in 1978 as an expanded immunization programme. Then soon after it gained key attention and got advanced to a Universal Immunization Programme in 1992 and ever since they have been a crucial part of NRCHP.
- A National immunization programme (NIP) is an organization under Ministry of Health with the aim to prevent diseases, disability, and death from preventable diseases in children and adults.
- UIP was started by our government to reduce the morbidity and mortality rate in all the beneficiaries by covering all the children and pregnant females possible. During 1972 abortion was allowed to terminate an unwanted pregnancy under MTP Act.
- India is at the forefront of the global Family Planning 2020 action plan which was created in 2012. Our governments RMNCH+A (Reproductive, Maternal, Newborn and Child Health and Adolescents) programme were contextualized and formed to meet certain demands.
- Family planning becomes the one of the most important part of universal health coverage. Undertaking research and evaluation in family planning can tell us which methods work and which don't, help us identify areas which require more effort and finally increase the likelihood of all the objectives being met.

12.5 KEY WORDS

- **Eradication:** It refers to the complete destruction of something.
- **Morbidity rate:** It refers to the frequency or proportion with which a disease appears in a population.
- **Mortality rate:** It refers to a measure number of deaths during a particular period of time among a particular population.
- **Sterilization:** It is the process of making something free from bacteria or other living microorganisms.
- **Decentralized**: It is used to describe organizations or their activities which are not controlled from one central place, but happen in many different places.

12.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. What is immunization and its importance?
2. List the major objectives of Universal Immunization Program (UIP).

3. Write a short note on National Family Welfare Programme.
4. Briefly discuss government's RMNCH+A programme.

Long-Answer Questions

1. List the names of a few National Health Programmes.
2. Analyse the Universal Immunization Program (UIP) in detail.
3. Describe India's strategy for family welfare.
4. Discuss various functional products provided by the family welfare programmes.

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12.7 FURTHER READINGS

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UNIT 13 NATIONAL HEALTH PROGRAMMES-II

Structure

13.1 INTRODUCTION

Health promotion programmes play a key role in the development of a country as it has to deal with the common life of communities and with the major determinants of bad health and diseases. The government should be considerate towards these programmes as it makes a major contribution to the economic progress of the country, owing to the fact that a healthy population can live longer and is more productive which in turn will boost the country's economy.

We have already discussed two such national programmes in the previous unit related to immunization and family welfare. In this unit, you will study about the inception, objectives and achievements of National Programme for Control of Blindness (NPCB). Also, the unit will provide a deep insight into the operations of National Mental Health Programme (NMHP). In addition to this, you will also be able to learn about Child Survival and Safe Motherhood Programme (CSSM) in this unit.

13.1 OBJECTIVES

After going through this unit, you will be able to:

- Describe the goals and achievements of NPCB
- Analyse the objectives of National Mental Health Programmes (NMHP)
- Discuss the objectives, achievements and success of Child Survival and Safe Motherhood Programme (CSSM)

13.2 NATIONAL PROGRAMME FOR CONTROL OF BLINDNESS

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In 1976, India became the first country to start a nationwide programme for controlling blindness. Most of the blindness is preventable or curable and about 80 per cent people suffering through this may not have to suffer and go through the hardships at all. Blindness drives the people into the poor socio-economic strata and in turn preventing them from accessing the eye care services which worsen the problem. The National Programme for Control of Blindness (NPCB) originally was a cataract centered programme but then it was transformed in a wholesome programme with multiple objectives like Diabetic Retinopathy, Glaucoma, Ocular trauma and a lot of other diseases and their treatments.

There are more than 12 million blind people in India and by a few estimates from WHO this number is poised to double to 24 million by 2020. Cataract is the most common form of blindness causing upto 62.6 per cent to lose their eye sight either partially or totally followed by Refractive errors(19 per cent) which if left uncorrected can cause severe visual impairment and even blindness.

Objectives of NPCB:

The main aim of this programme is to drastically reduce the number of blind people in our country and NPCB works to achieve the same. The major objectives under the programme include:

- To identify and treat blind people and reduce the backlog of blindness
- To develop in a very comprehensive eye care facility every district.
- To improve the human resources we have for the delivery of eye care
- To enhance the service delivered to the blind population
- To gain more voluntary organization's participation from private practitioners and eye care clinics
- To raise awareness about eye care
- To have the best possible treatment available in the region for the people who can be saved and cured of their miseries
- To create a network of feedback for interplay and coordination between all the different agencies for prevention, treatment and rehab.

The impact of the NPCB programme has been far and wide. To have achieved such kind of impact there were a lot of health workers who were primed for positive attitude, high knowledge, awareness levels, and ability to deliver quality service and deep coverage in the place of need.

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It is because of this highly dedicated workforce that even after there being so much on the platter there were so many people who could get rid of all there problems and started leading a normal life. In the XIth five year plan a total of 250 eye surgeons, 425 ophthalmic assistants,150 eye donation counselors had been chosen to fulfill the need of the local people. Community workers like anganwadi and ASHA were tasked with spreading awareness and social mobilization.

Or government has generously supported the NPCB and with the help of WHO, World bank, DANDINA, and international NGOs and there technical knowhow have brought in quite a lot of achievements.

Achievements of NPCB:

- According to recent data there has been an increase in the number of successful cataract surgery with Intraocular implants. This increased knowhow over the conventional methods has raised success to a higher high than ever.
- The number of surgeries with Intraocular Lens (IOL) has increased from <9 to 93 per cent in 2006-07.
- The IOL push by the government has really taken over as upto 95 per cent surgeries were IOL implants in 2009-10. Covering almost 92.5 per cent of the target set which had been identified in the previous surveys.
- More than 307 eye operation theaters and eye care clinics and wards were created at the district level.
- The supply for the equipment for diagnosis and treatment of common ocular disorders has been increased
- In 2009-10 over 109189 teachers were provided with training, over 3 million children were screened for ocular disorders, wherein 1 million were detected with errors. Over 5,00,000 were provided with free glasses under this programme

13.3 NATIONAL MENTAL HEALTH PROGRAMME

There has been growing number of mental health cases and a very low supply to meet this growing demand. The supply of the qualified professional like psychiatrist has been far outmatched and superseded by all the people in need of help. Mental health has always been an unmentionable problem in the culture of our country making it even harder to reach to the people who face these problems. So even if we somehow manage to meet up with the current demand for these professionals there is still this stigma which will stop the people from getting the proper treatment required.

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To meet this far outstripped demand for mental health, Government of India implemented a National mental health program in 1982, then in 1996 the mental health programme was expanded to districts and district mental health programmes emerged. In more recent times it was rethought and two schemes were included i.e. modernization of state mental health facilities and upgradation of Psychiatric wards of Medical colleges/hospitals. Later on Manpower development scheme was also added to the programme.

Objectives of NMHP:

- To make mental health care more accessible and increase its availability to all the people who require it
- To increase the application of mental health knowledge in general healthcare and un-stigmatize the taboo around mental health.
- To increase the communities participation in mental health service and raise awareness about it in the general public.
- To improve the human capital in this area and mental health and sub specialities.

To improve the condition of mental health and the care given to its patients, the program is divided into a few components:

I. Service Provision

This enables people to access basic health care at the community level with the help of centers like a 10 bedded inpatient center.

II. Outreach Element

In this component the clinics are setup with Community Health Centers (CHCs) by the district MHP team. They are in the community to prevent suicides due to stress providing counseling services and life skill education and counseling at school level.

III. Training the Personnel

It is of utmost importance to have a great supply of human capital with skills good enough to handle the influx of the entire mental trauma of numerous people with professionalism at district and sub district level.

IV. Spreading Awareness

This part is of NMHP is responsible for the rapid increase in the amount of people who have been able to get mental help through professionals. Awareness camps are setup for removing any kind of stigma in getting help through the involvement of local PRIs, teachers, leaders, etc

V. Increasing Community Participation

Improving linkages with self help groups, NGOs working in the field and even making enforcement officers aware of the legal provisions under Mental Health act.

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VI. Hiring of Professionals

Hiring of psychiatrist, social workers, community nurse, case registry assistant and other personnel on a contractual basis.

Achievements of NMHP:

- Initial workshops held for sensitization and training of mental health professionals went a long way in setting the tune for all the people who participated in these programmes
- Teachers were given training in psychiatry to access and identify the students who need basic support and help
- Support material on mental health in form of manuals, health records with inputs from Central Institute of Psychiatry (CIP) and The Postgraduate Institute of Medical Education and Research (PGIMER) were distributed to raise awareness
- Modernization of state run mental hospitals
- Teaching of life skills and other important skills like critical thinking
- Expansion of urban mental health care
- Increased sponsored research and training in the country
- Psychotropic drugs including anti depressants and anti psychotics made accessible to the people in need

13.4 CHILD SURVIVAL AND SAFE MOTHERHOOD PROGRAMME

Till the year 1977, the major activity in the government in terms of health for public was family planning which eventually was morphed into Family welfare programme which had maternal and child health as a very important part of the same. The CSSM programme was developed to cater to the needs of both the child and the mother post child birth. This programme was introduced in over 100 districts in states like Bihar, Uttar Pradesh, Madhya Pradesh and Rajasthan. This programme was aimed to utilize the existing infrastructure of primary health care service and to provide every mother and her child with health facilities and secure their health and future.

Objectives of CSSM:

The most obvious objective of CSSM is to reduce maternal and infant mortality and even the child mortality rates. This can be achieved through increasing the access to already available services and increasing the awareness of females so that they believe in the modern medicine instead of traditional unreliable remedies, increasing the rapport of health workers

thereby inducing the trust needed for the mothers to rely on them. Given below are some specific objectives of CSSM.

- Improve access to health care to mothers and children
- Have all the deliveries done institutionally
- Extend the scope of full immunization
- Accelerate on the fall of infant mortality rate of 50 per cent in 2009 (from 2006) and rapidly keep it reducing
- Similarly decrease the already falling maternal mortality rate (fell by 32 points to 212)
- Increase awareness about health and good practices

This all can only be achieved if government diverts enough resources to these causes. Increasing the expenditure to healthcare from 1.0 per cent of GDP to more than 2.5 per cent.

Achievements of CSSM:

- Ever since the introduction of CSSM in 1991, infant mortality rate has fallen to 35 in 100 live births in 2016 from previously 80 in 1995
- India had a under 5 mortality rate of 41.2 in 1995 which has now fallen to the global average of 39 but it is still off the target of 10
- Elimination of polio (with the help of UIP)
- Elimination of infant tetanus (again with the help of UIP)
- Reduction in the number of measles cases and deaths due to measles
- Prevention of Diarrhoea cases and deaths
- Reduction in cases of death due to acute respiratory infections

Check Your Progress

1. How does blindness affect a person?
2. What are the main cause of blindness in India?
3. What is National Mental Health Programme?
4. What was the primary objective of CSSM?

13.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Besides limiting a person's ability to perform everyday tasks, blindness can drive people into the poor socio-economic strata and in turn

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preventing them from accessing the eye care services which worsen the problem.

2. There are numerous reasons that can lead to blindness. However, the leading causes of chronic blindness consist of cataract, glaucoma, refractive errors, ocular trauma, diabetic retinopathy, and childhood blindness.
3. In 1982, the government has launched the National Mental Health Programme (NMHP) with a motive to reduce the growing number of mental health cases in the country. In addition to this, the programme was also focussed to meet the shortage of mental health hospitals in the country.
4. The Child Survival and Safe Motherhood (CSSM) Programme was developed to cater the needs of both the child and the mother post child birth. The primary objective of this programme is to reduce maternal and infant mortality and even the child mortality rates.

13.6 SUMMARY

- In 1976, India became the first country to start a nationwide programme for controlling blindness. Blindness drives the people into the poor socio-economic strata and in turn preventing them from accessing the eye care services which worsens the problem.
- Cataract is the most common form of blindness causing upto 62.6% to lose their eye sight either partially or totally. However, the other causes of blindness include glaucoma, refractive errors, ocular trauma, diabetic retinopathy, and childhood blindness.
- The NPCB originally was a cataract-centered programme but them it was transformed in a wholesome programme. The main aim of this programme is to drastically reduce the number of blind people in our country.
- In the XIth five year plan a total of 250 eye surgeons, 425 ophthalmic assistants, 150 eye donation counselors had been chosen to fulfill the need of the local people.
- Mental health has always been always been an unmentionable problem in our country. The government has launched a National mental health programme in 1982 to meet up the demand for mental health professionals and hospitals. In 1996, the mental health programme was expanded to districts and district mental health programmes emerged.
- NMHP was aimed to make mental health care more accessible to all the people, to increase the participation of communities in mental health service, to improve the human capital in this area.

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- The CSSM programme was developed to cater to the needs of both the child and the mother post child birth. This programme was introduced in over 100 districts in states like Bihar, Uttar Pradesh, Madhya Pradesh and Rajasthan.
- The most obvious objective of CSSM is to reduce maternal and infant mortality and even the child mortality rates.

13.7 KEY WORDS

- **Cataract:** It refers to a mental condition in which the lens of the eye becomes progressively opaque, resulting in blurred vision.
- **Diabetic Retinopathy:** It refers to a complication of diabetes that affects the eyes.
- **Glaucoma:** It refers to the condition of increased pressure within the eyeball, causing gradual loss of sight.
- **Psychiatry:** It refers to the study and treatment of mental illness, emotional disturbances, and abnormal behaviour.
- **Psychotropic drug:** It refers to any drug that is capable of affecting the mind, emotions and behaviour.
- **Immunization:** It refers to the process of protecting a person or animal from an infectious disease by putting a substance into the body to make it produce antibodies.

13.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. What is National Blindness Control Programme?
2. List a few components of National Mental Health Programme.
3. Write a short note on the achievements of NMHP.
4. What steps should government take to reduce maternal and infant mortality rates?

Long-Answer Questions

1. Elaborate the achievements of National Programme for Control of Blindness.
2. Discuss the objectives of National Health Mental Programme.
3. Describe the major achievements of CSSM.

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13.9 FURTHER READINGS

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UNIT 14 ASSESSMENT OF NUTRITION AND GROWTH

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Structure

14.0 INTRODUCTION

In this unit you will learn how a diet is accessed for its nutritional content for different age groups children and adults. You will learn about two different ways of assessing the same namely anthropometric and diet survey methods for assessing the nutritional content of the food.

Nutritional assessment in its broadest sense is a system for collecting and interpreting information about the diet in a manner that we can make informed decisions about the nature and cause of nutrition-related health issues. Measuring the amount of nutrition a child or an adult receives is the best indicator of their physical well being but the question here is how that is supposed to be done. Perhaps we can define certain measurements which could benchmark the level of nutrition.

Measurement of body size is one of the indicators for measuring growth of a child. Assessment of the child's food intake provides valuable insight into the nutrition of the child and by extension any nutrition related health issue can be quantized through the given data.

In this unit, you will look deeply into the signs and indicators one looks into during assessment. What are the good measurements as to indicate a healthy body size? How to collect data on the food intake?

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14.1 OBJECTIVES

After going through this unit, you will be able to:

- Describe the methods used in assessment of nutritional status of a person
- Discuss anthropometric measurements and Dietary Diversity Score (DDS)
- Evaluate the importance of growth monitoring
- Explain the significance of maintaining a growth chart
- Analyse various practices of personal hygiene

14.2 METHODS OF ASSESSING NUTRITIONAL STATUS

Nutritional status is a complex interaction between internal and external environmental factors. It is used to determine the body status or health status of a person or a group tying it in to the state of sustenance of that person derived from the access to consumption of nutrients.

Internal factors: gender, age, metabolic rate, physical exercise etc.

External factors: access to quality food, food security, economic circumstances, social circumstance etc.

We all strive to attain ideal nutritional status, the one which manages to fulfill every nutritional requirements of the person. Diets should contain a balance of nutrients and the required number of calories so that it provides all the nourishment required, such type of diet is called a balanced diet. Nutrition, as mentioned in all the previous units, is one of the most important aspects of a healthy life. Hence, it is very important to asses this information and identify people who are at the risk or are already malnourished, then develop programs for them and meet their needs and once these programs are developed the assessment can give them a reality check so as to what works and what doesn't and develop them further into better once.

There are certain techniques to assess the nutrition. These techniques fall into two general categories: direct and indirect methods.

Direct methods consist:

- Anthropometric measurement
- Biochemical analysis
- Clinical method
- Diet survey

These can be mnemonized as ABCD.

Indirect methods consist:

- Ecological variables
- Economic factors
- Cultural and social habits
- Vital health statistics

14.2.1 Anthropometric Measurements

The word **anthropometry** comes from *Anthropo* i.e 'Human' and *metry* means 'measurement'. These are the measurements used to assess the change or growth in human body, measuring height, weight, arm circumference then referring these values to standards for ages like height for the age group or weight for the age group or against each other like weight for height (BMI).

This section presents a detailed study on these measurements. We need to have accurate age measurement and appropriate standards of comparison. The age is an important parameter and should be recorded accurately as with age the body structure changes and that changes the standard for different ages. Standards are those body measurements of healthy children who are socially and medically privileged then these values are used as standards. To declare a child undernourished, obese or fit.

This is a non intrusive method to measure the nourishment levels with various different parameters. There are methods to measure the parameters like height, weight, body circumference, waist-to-hip ratio, elbow amplitude, BMI and knee-heel length.

1. Length:

The length or height of a child, who is for 2 years or less, can be easily measured using a measuring board for child 2 years or less.

Procedure:

- To measure the height, the child is to lie flat on the board
- Both assistant and measurer need to be sitting down
- The assistant holds the child's head to make sure head is touching the base of the board
- The line of sight of the child should be perpendicular to the board
- The child's foot should be flat on the board
- Read the length of the child using the measuring tape attached to it
- Keep in mind the height is a cm or two longer
- Record the height

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The height of a a child who is older than 2 years, can be easily measured using a stadiometer or a portable anthropometer. Measurements are accurate to the nearest millimeter.

Procedure:

As before, you need an assistant and a measurer, both should be at the child's level.

- The child must have the heel, the calves, buttocks, shoulders and prominent area of head(occipital) against the board
- The child's should look dead ahead
- Hands to the side with measures left hand on the child's chin
- Shoulders should be leveled
- With the head piece firmly on the child's head the measurement should be recorded

2. Weight

The weight measurement of a child less than 2 years of age is done using a spring balance also called 'Salter scale'. For ages 2 and above beam balance is used. Keep the scale at zero pre weighing. If you wish to check whether your scale is measuring correctly than weigh a known weight in it and verify its accuracy. At times, improvisation is needed and act according to the situation as very young children are not the most obedient and this might require some maneuvering on your part.

Procedures

- Adjust the pointer to zero
- Take off any heavy clothing the child might be wearing
- Hold the child's legs through the hole
- Hang the child on salter scale
- Read the scale and remove the child safely

3. Head circumference

The measurement of head alongwith the forehead (*supra orbital ridge)* and prominent area of the back of your head (*occipital prominence*). It is measured in the nearest millimeter using flexible non stretchable tape. This is an indicator of chronic nutritional problems as the brain grows very rapidly during the first two years of life. So this measurement is especially useful for children below the age of two.

Procedure

It is measured simply by wrapping the band around the head posteriorly and noting down the measurement.

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14.2.2 Dietary Methods of Assessing Nutritional Status

Dietary methods of assessment is looking into the kind of food intake both past and current are under consideration, this intake data could be used to estimate the nutrition of the individual.

Later, this can classify the person into the different formed groups like under nourished, obese or fit.

The most commonly used tool in this form of assessment is Dietary diversity score. It is the measure of the number of food groups consumed over a reference period, usually 24 hours. The six groups under which food is classified are:

1. Bread, cereal, rice etc
2. Vegetables
3. Fruits
4. Dairy products like milk, yoghurt
5. Oils
6. Meat, poultry etc

Sometimes, water is also added to the base of the pyramid as it is a very essential component of our daily intake.

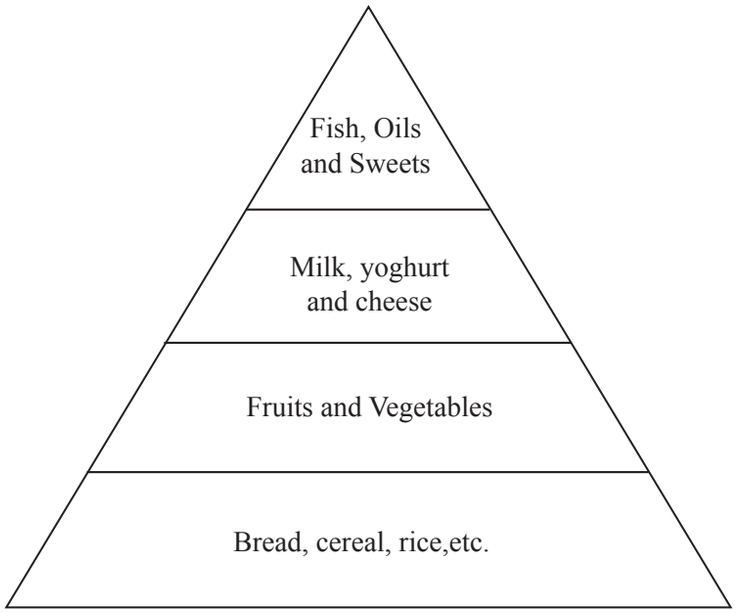

Fig 14.1 *Food guide pyramid*

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The food pyramid is a very important tool through which a person can regulate a diet to form a balance of nutrient composition. The base being the widest needs to be higher in content and as we move up the quantity of food needed is less.

If a person consumes any examples of the food type from each of the six groups in 24 hours, we can say that their dietary diversity score (DDS) is six. If the higher dietary score higher the diet then it is more balanced and diverse and the household is food secure.

As a part of the diet salts are also added which need to iodized as studied earlier.

Check Your Progress

1. Define balanced diet.
2. What are the most common anthropometric measurements?
3. How to measure the weight of a child less than 2 years and of 2 years or above?

14.3 GROWTH MONITORING

Growth can be monitored by keeping track of the data collected and turning them into various indicators.

A combination of two or more measurements gives an index and with the help of a few of those we can track and keep a tab on the growth and nourishment of a child. An index combined with specific cut off values helps determine whether a child is undernourished or overweight using anthropometric indicators to assess nutritional status, to evaluate the effects of interventions and using it to create better interventions.

A few of the widely used indicators are mentioned below:

- **Weight-for-age:** It is an index used to measure and keep track of the growth of children. Primarily, it is an indicator of a child being underweight or not. It carried out when community based nutrition activities take place every month.
- **Height-for-age:** It is an index which keeps track of stunting in children. Stunting is low height for age compared to standard child of the same age. It indicates chronic malnutrition in the child.
- **Weight-for-height:** It is an index which keeps track of wasting which is acute malnutrition in children. These children are vulnerable to infection and are more likely to die due to a disease.

- **Body mass index:** It is a very popular indicator used to calculate the mass a person should have for a particular height. It is calculated as weight in kilograms (kg)/height in metres $(m)^2$.
- **Birth weight:** It is the weight of child at birth and has very specific standard which can tell if the infant is healthy or unhealthy.

more than 2500 grams	normal weight
1500–2499 grams	low weight
less than 1500 grams	very low weight

The height and weight of children that we recorded earlier is used to form the growth of a child. We will study more about it in the next section.

Table 14.1 Indicators of underweight and malnutrition derived from the weight and height of children relative to their age.

Table 14.1 *Indicators of Underweight and Malnutrition through weight, height and age.*

Index	Cut-off value based on standard deviation (SD)/ percentage	What it indicates
Weight-for-age	Less than -2 and more than -3	Moderate underweight
Weight-for-age	Less than -3	Severe underweight
Height-for-age	Less than -2 and more than -3 (i.e. 70–79.99% of the norm)	Moderate acute malnutrition (MAM)
Height-for-age	Less than -3 (i.e. less than 70% of the norm) and/or bilateral pitting oedema	Severe acute malnutrition (SAM)

14.3.1 Growth Chart

Growth is at its peak when a child is growing and if in that period there is an inadequate supply of good nutritious food and good healthcare, then the child could be seriously faltered with undeveloped body and may not be able to lead a very healthy life.

To prevent this from happening regularly, growth of a child needs to be monitored so that if there is a chance of the child developing a deficiency of something then it can be detected as early as possible and the rectifying measures be taken as soon as possible.

Growth charts are very essential tool in doing so and are very frequently used. The guidance that a growth chart can provide can ensure continued and

unhindered growth of the child. A growth chart primarily records changes in weight over time of a baby. In a growth chart, weight is plotted against the age of the child to give us a graph of weight to age over a period of time.

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Given below are a few examples of a growth chart.

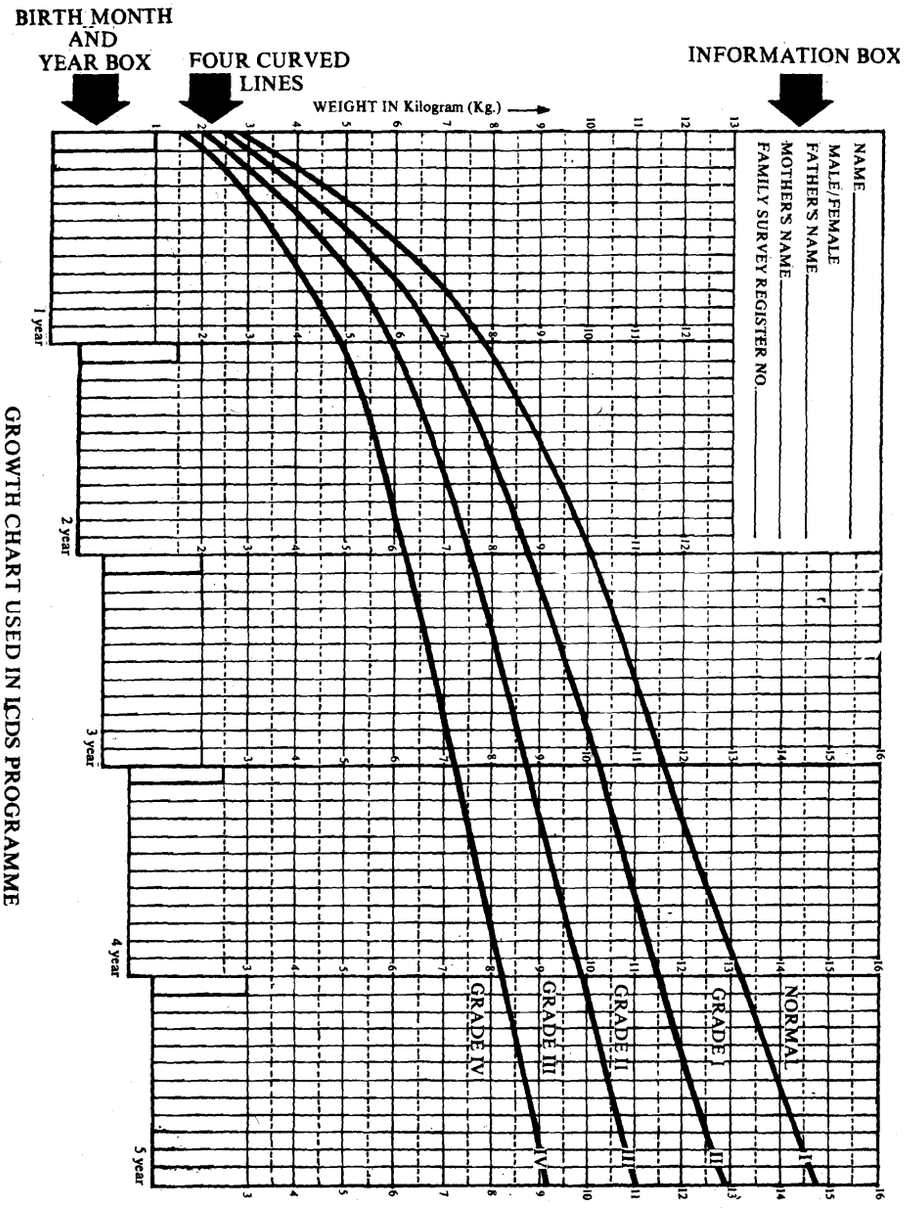

Fig. 14.2 *Sample Growth Chart Used in ICDs Programme*

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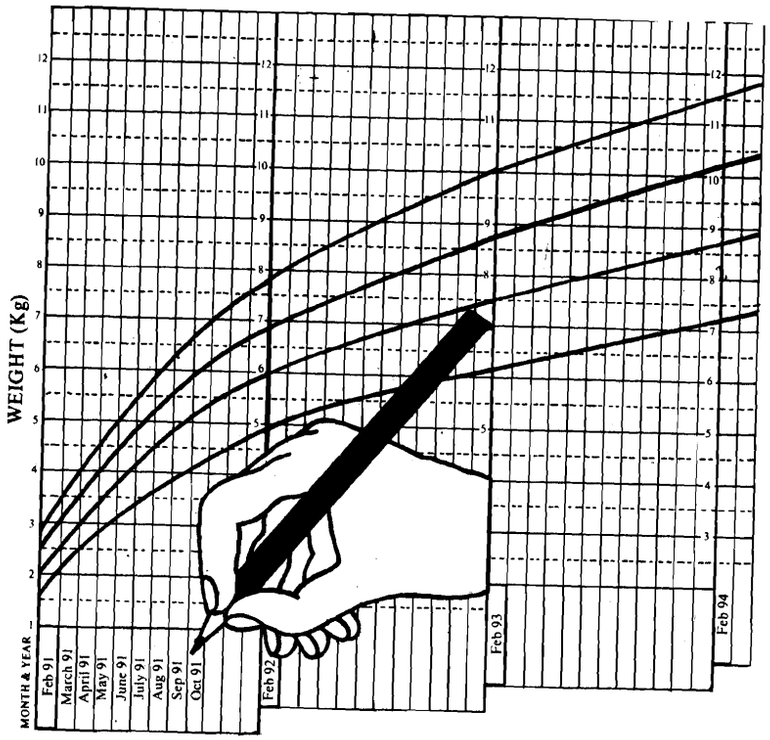

Fig. 14.3 Sample of Filling Monthly Column in Growth Chart

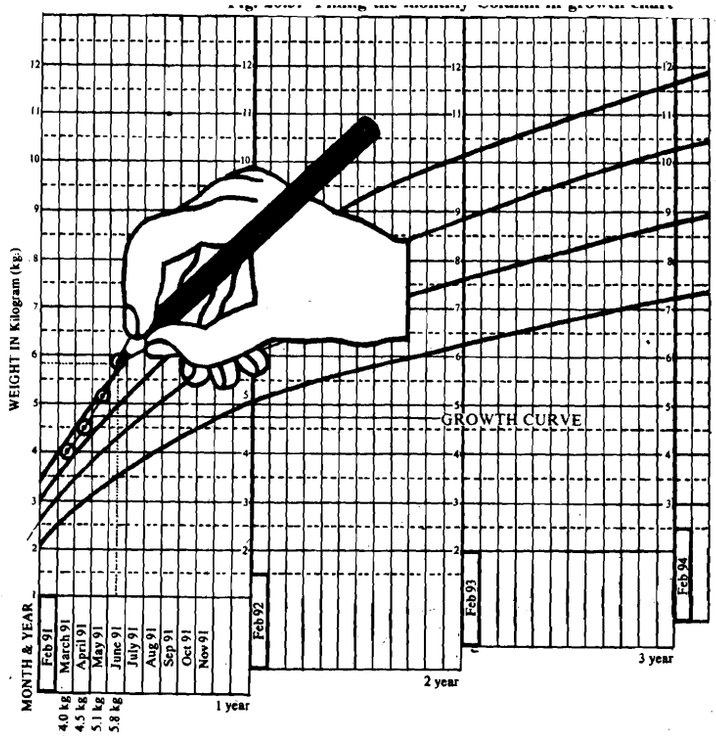

Fig. 14.4 Sample of Plotting Weight on the Growth Chart

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Steps in Growth Monitoring by using the Growth Chart

The five steps involved in growth monitoring are:

Step 1: Determining correct age of child.

It is a primary requirement of filling out weight against age. We should accurately know the age of a child to the month such that we can make informed predictions about the health of the child. After all we can't compare the child's weight to the standards of weight for age if we don't know the age. For that you need to have an accurate 5 year local calendar and then ask the parents if they can tell what is the month in which the child was born , if they can't tell then ask them which local festival or event was just pre or post the birth of the child

Step 2: Accurate weighing of each child.

Now the second factor in age weight curve is weight. This also needs to be accurately measured. The methods to measure child's weight have been already discussed. Using them carefully, measure the weight and record it to nearest 0.1 kg.

Step 3: Plotting the weight accurately on the growth chart.

Then comes the plotting of the graph part. Here, first note down the name and gender of the child and all the details asked in the information box, then make note of the month and the year in solid boxes. After making all these arrangements, choose the month for which you are plotting then mark the weight on the graph using those solid lines.

Step 4: Interpreting the direction *of* the growth curve of the child.

After plotting all the subsequent months you get a pattern and depending on the patterns of monthly growth of a child we get a directional growth curve it might be an upward curve, a flat one or a downward curve.

An uptrend of the growth curve is a sign of healthy growth.

A flattened growth curve is a sign of no weight gain, which is not good and requires attention.

A downward growth curve indicates loss of weight, which is a genuine matter of concern and promptly needs to be resolved by a remedial action.

Another aspect that needs interpretation is the nutritional grade the curve falls in. The growth curve despite of moving up could be a sign of malnutrition if the child it is not in the area labeled normal.

Step 5: Analysis and follow-up action.

The trend of the growth curve shows which direction the growth of the child is headed and for this system to give any results at all a good follow up is required. If the child is on a flat or a downtrend you need to analysis the reason for the same and rectify it as soon as possible before the faltering growth hampers the future of the child. Similarly, if the growth is on an uptrend, again do the same process of analysing the factors behind it and asking the mother to keep them up.

This data from all the growth charts can also be used as outstanding bases for selecting the beneficiaries of government feeding programs.

- Children without weight gain for 3 months are given supplementary food.
- Children whose growth curve fall in grade II are given one supplementary feeding.
- Children who fall in Grade III and IV are given double the quantity of supplementary food from anganwadi in addition to being sent to a Project Healthy Children (PHC).

14.4 PERSONAL HYGIENE AS AN ESSENTIAL FACTOR FOR HEALTH OF THE CHILDREN

We wake up in the morning, brush our teeth, take a bath, wash our hair and body, and put on clean clothes. These are so mundane and obvious things that we don't think about what we are doing because it is a routine taught to all of us from a very young age.

These are the things taken for granted but there is a whole other part of the world which doesn't have access to all the personal hygiene paraphernalia like toilets, clean water, soaps etc.

This creates a challenge in child's growth as poor hygiene leads to diseases like cholera, typhoid etc. Research illustrates an average 0.5cm augment in height in children under the age of five.

Effects of water, sanitation and other aspects of hygiene must be controlled. Parents should be taught good practices and should encourage personal hygiene in the children. Given below are a few aspects of hygiene

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that the parents must be made aware of and asked to follow the best practices in them

Toilet hygiene: The parents should be encouraged to have a toilet in their homes which the children and even they can use to keep the surroundings clean and stop the breeding of bacteria which are harmful to humans.

Rinsing hygiene: The child must be taught to take a bath daily using soap and clean every part of the body from armpits to legs and feet.

Nail hygiene: Kids tend to bite their nails and grow them long. The parents must teach them that doing the same is a really bad habit and should discourage them from doing so. Also the parents should make sure that toe nails are also cut regularly.

Dental hygiene: The children must be taught to brush twice daily and remove any bacteria on the tongue also. The children must be taught the right way of holding the brush and the right method of brushing the teeth.

Sickness hygiene: If a child is sick prevent the spread of the diseases to others. This can be done by encouraging the child to use their hands to cover their mouths when they sneeze and avoid spreading germs.

Hand hygiene: The child should be asked to clean his hands before eating meals and after touching places considered dirty. This would prevent a lot of diseases from reaching you.

Food hygiene: This is one of the most important aspects of personal hygiene as whatever we eat directly affects our body so parents should be encouraged to cook meals in clean environment and not to eat stale food. The children can also be taught the importance of eating good food. The food should be eaten in clean areas.

Home hygiene: The parents must keep the place they stay in clean so that there are no disease spreading germs around. The children should also be taught the importance of cleanliness and should be encouraged to keep the house and surroundings clean.

Check Your Progress

4. What are the uses of growth monitoring of a child?
5. Define Body mass index (BMI).
6. Define personal hygience and state its importance.

14.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

NOTES

1. A diet that contains an adequate amount of nutrients necessary for good health, is termed as a balanced diet i.e., a diet that contains proper proportions of carbohydrates, vitamins, proteins, fats, minerals and water.
2. The most common anthropometric measurements include height, weight, BMI, body circumference, waist-to-hip ratio, elbow amplitude and knee-heel length.
3. The weight measurement of a child less than 2 years is done using a spring balance also called 'Salter Scale'. While the weight of a child of 2 years or above is measured using beam balance.
4. Growth monitoring is a regular measurement of a child's size. A regular monitoring of a child's growth using anthropometric indicators helps determine whether a child is undernourished or overweight. It is also used to assess nutritional status in a child and to evaluate the effects of interventions.
5. Body mass index (BMI) is a measure of body fat based on height and weight. It is a very popular indicator which is calculated as weight in kilograms (kg)/ height in metres (m)2.
6. Personal hygiene refers to maintaining cleanliness of one's body for overall health and well-being. Practising good personal hygiene is very important for both health and social reasons. It involves keeping one's hands, head and body clean in order to stop the spread of germs and illness.

14.6 SUMMARY

- Nutritional status is a complex interaction between internal and external environmental factors. It is used to determine the body status or health status of a person or a group tying it in to the state of sustenance of that person derived from the access to consumption of nutrients.
- Diets should contain a balance of nutrients and the required number of calories so that it provides all the nourishment required, such type of diet is called a balanced diet.
- Anthropometric measurement, Biochemical analysis, Clinical method, and Diet survey are the four direct methods used for assessing nutritional status of a person. While the indirect methods used for

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assessing a person's nutritional status include ecological variables, economic factors, cultural and social habits, and vital health statistics.

- Anthropometric measurements are used to determine the change or growth in human body, measuring height, weight, arm circumference then referring these values to standards for ages like height for the age group or weight for the age group or against each other like weight for height (BMI).
- For a child older than 2 years old, height can be easily measured using a stadiometer or a portable anthropometer. Measurements are accurate to the nearest millimeter.
- The weight measurement of a child less than 2 years of age is done using a spring balance also called 'Salter scale'. For ages 2 and above beam balance is used.
- Head circumference is measured in the nearest millimeter using flexible non stretchable tape. This is an indicator of chronic nutritional problems as the brain grows very rapidly in during the first two years of life.
- Dietary methods of assessing nutritional status includes of looking into the kind of food intake both past and current are under consideration, this intake data could be used to estimate the nutrition of the individual. The most commonly used tool in this form of assessment is Dietary diversity score (DDS).
- The food pyramid is a very important tool through which a person can regulate a diet to from a balance of nutrient composition.
- Growth monitoring is a regular measurement of a child's size. A regular monitoring of a child's growth using anthropometric indicators helps determine whether a child is undernourished or overweight.
- A growth chart primarily records changes in weight over time of a baby. In a growth chart weight is plotted against the age of the child to give us a graph of weight to age over a period of time.
- Personal hygiene is an important part of a person's overall health and well-being. Important aspects of personal hygiene include toilet hygiene, rinsing hygiene, nail hygiene, dental hygiene, hand hygiene, sickness hygiene, food hygiene and home hygiene.

14.7 KEY WORDS

NOTES

- **Sustenance:** It refers to the food and drink regarded as a source of strength.
- **Metabolic rate:** It refers to the rate at which metabolism occurs in a living organism.
- **Undernourished:** It refers to the stage of an individual having food or other substances for good health and condition.
- **Stadiometer:** It refers to the device for measuring height that typically consists of a vertical ruler with a sliding horizontal rod.
- **Anthropometer:** It refers to an instrument used for making anthropometric measurement
- **Beam Balance:** It refers to a *balance* consisting of a lever with two equal arms and a pan suspended from each arm.
- **Faltered:** It refers to the state of losing strength
- **Paraphernalia:** It refers to miscellaneous articles, especially the equipment needed for a particular activity.

14.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. What is nutritional status assessment?
2. What do you understand by anthropometric measurements?
3. Write a short note on various indicators used for growth monitoring.
4. Briefly discuss a few aspects of personal hygiene that parents should teach their child.

Long-Answer Questions

1. Discuss the methods of assessing nutritional status of a person.
2. Elaborate the dietary methods of assessing nutritional status.
3. What are the five steps involved in growth monitoring?
4. Why is personal hygiene an essential factor for good health of the children?

14.9 FURTHER READINGS

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M.A. [Child Care & Education]
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CHILD HEALTH AND NUTRITION

I - Semester

ALAGAPPA UNIVERSITY

[Accredited with 'A+' Grade by NAAC (CGPA:3.64) in the Third Cycle and Graded as Category–I University by MHRD-UGC]

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