
UNIT 1 THE CONCEPT OF NUTRITION

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1.1 INTRODUCTION

Food plays a crucial role in our lives. It sustains and nourishes us. It is the "life-giver". Eating the proper kinds of food in the right amounts is essential to keep us healthy. In this Unit, we shall talk about food and some of its components. We will also analyse why food is essential for our survival, as well as get introduced to the term *nutrition*.

Nutrition is the term used for the scientific study of food and how it is utilized by the body. This study enables us to answer such vital questions as—how much and what should one eat to keep healthy? How much and what, for example, should an infant consume? Similarly, how much and what foods should be consumed by a preschooler or a pregnant woman? Further, what happens when a person eats too much or too little?

Let us now embark on the study of nutrition.

Objectives

After studying this Unit, you should be able to :

- define the terms "food", "nutrient" and "nutrition"
- list the functions of food
- describe in simple terms how food is handled by the body
- discuss the socio-cultural, psychological and economic aspects of food and eating
- discuss the relationship between food, health and disease

1.2 FOOD AND ITS FUNCTIONS

What is food? The term *food* refers to *anything which nourishes the body*. It includes solids, semi-solids as well as liquids which can be consumed and which help to sustain the body and keep it healthy.

We all know that food is a basic necessity. Have you ever wondered why? Food is essential because it contains substances which perform important functions in our

body. These essential substances contributed by our food are called *nutrients*. If these nutrients are not present in our food in sufficient amounts, the result is ill health and in some cases, even death. Food does not contain only nutrients. It also contains many substances which are non-nutrients. For example, the colouring and flavouring substances in food do not perform any important function in our body, and hence, are non-nutrients.

Food is, therefore, a complex mixture of different nutrients and non-nutrients.

FUNCTIONS OF FOOD

You are now familiar with the fact that food contains several nutrients. In fact, there are over forty essential nutrients which are supplied by the food we eat. These nutrients can be classified into the following major categories (based on certain similar features) : proteins, carbohydrates, fats, vitamins, minerals and water. Water is important as a nutrient as well as a food. You will learn more about this aspect in Unit 4, Block 2 of this Course.

Each of the nutrient categories has a specific physiological role to play. Here the term "physiological role" refers to the role of nutrients and therefore of food in maintaining certain specific body functions. Food also has social and psychological functions in addition to physiological ones.

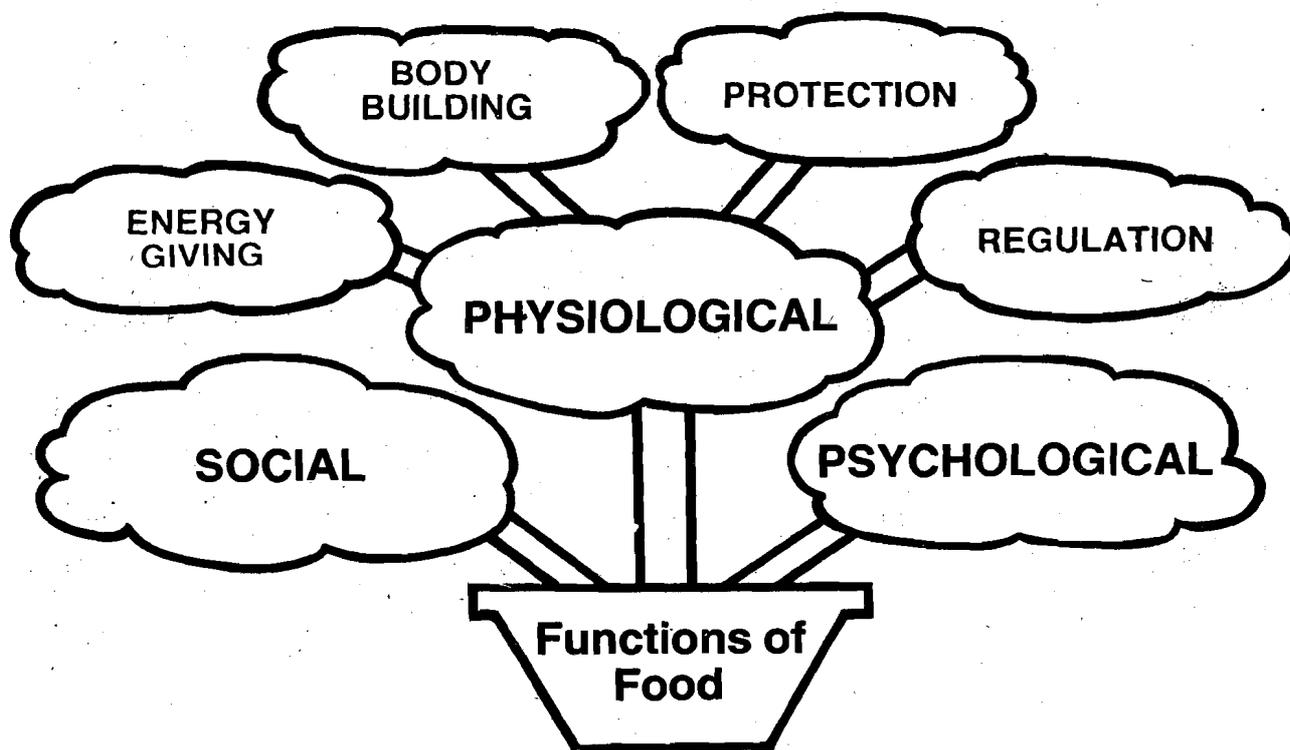


Fig. 1.1 : Functions of food

Let us now take a look at the functions of food, individually, in some detail.

- **Physiological Functions**

The physiological functions performed by food are the *energy-giving, body-building, protective and regulatory functions*.

We need *energy* every moment of our lives for performing various activities such as sitting, standing, walking, running, performing household work and other tasks. Several activities take place within the body as well e.g. beating of the heart, contraction of the intestines and expansion and contraction of the lungs, even though we are not always aware of them. These too require expenditure of **energy**. The energy-giving function of food is basically performed by two nutrient categories —*carbohydrates and fats*.

Food is also needed for *growth and repair*. You are already familiar with the term "growth". It refers to an increase in size of the various parts of the body. How does this growth come about? As you know, our body is made up of millions of units called cells. When growth takes place, new cells are added to the existing ones. The existing ones also increase in size. At the same time, cells do get worn out and die. These cells have to be replaced. This process is called repair. For both growth and repair, proteins are necessary. We can understand the role of proteins in growth and development if we just think of the tremendous increase in height and weight that occurs from infancy to adulthood.

The other major physiological functions performed by food are the protective and regulatory functions. Let us talk about the meaning of the term "protective" first. Here *protective* refers to the role of food in preventing infection by ensuring proper functioning of the body systems responsible for fighting infections. Even if a person does develop an infection or any other type of illness, food and the nutrients it contains facilitate rapid recovery. A person eating a poor diet would take much longer to recover. He would get ill more easily as well.

The *regulatory* function refers to the role of food in controlling body processes. As you are aware, several processes take place in the body such as beating of heart, maintenance of body temperature and contraction of muscles. Each of these processes is controlled. Our body temperature, for example, is maintained at 98.4°F or 37°C. Similarly, the rate at which the heart beats is also maintained. You are also probably aware that several chemical reactions take place in the body. With the help of these chemical reactions, complex substances are broken down into their simpler components. Similarly, simpler substances are used to build more complex substances. You will understand this better when you go through Units 4 and 5 of the next Block. The rate at which these reactions proceed is carefully controlled according to the need of the body.

Vitamins and minerals contribute substantially to both protective and regulatory functions. So do proteins and water.

● Social Functions

Food has a significant social meaning. Sharing food with any other person implies social acceptance. Earlier only persons enjoying equal status in society ate together. A person would never share a meal with someone inferior to him in social terms. Of course, we observe considerable change in this respect now, particularly in cities and towns. In a restaurant, for example, any person can eat with the others irrespective of his social background if he has the money to pay for the food.

Food is an integral part of festivity anywhere in the world. You must have surely noticed that joyous occasions such as the birth of a child or a marriage are celebrated by giving feasts and serving delicacies. Festivals such as Diwali, Dussehra, Pongal, Onam, Lohri, Holi, Christmas and Id are celebrated by having special and prescribed menus. In all these cases, food serves the function of bringing people together.

Food also has a specific significance and meaning in the religious context. Certain food items such as fruits, sweets and coconuts are offered to the deity in temples. Often sweets are prepared at temples and gurdwaras and distributed to devotees as a benediction or *prasad*. Further, people of a given religious community share a common eating pattern. This is because their religious texts and practices strongly recommend some foods while rejecting others. Food thus becomes an integral part of the social and religious life of people.

● Psychological Functions

We all have emotional needs such as the need for security, love and attention. Food is one way through which these needs are satisfied. When a mother prepares her child's favourite dish, the child recognizes the fact that her mother loves her enough to remember her likes and dislikes. She appreciates the attention she is given. As you are aware, when people share food it serves as a token of friendship and acceptance. A child quickly accepts foods eaten by her friends and by people she admires or wants to identify with. She may even accept food she first found distasteful if she observes her friends enjoying it. Sharing the same food as her peer group and those she considers important in her social sphere gives her a degree of confidence in herself and reassures her of their acceptance of her.

Food is also closely related to our emotions. It often serves as a reward. When a mother wishes to reward her child for doing well in a test, she may buy her a sweet or an ice cream. In this manner, that particular food item evokes pleasant feelings in the mind of the child. On the other hand, certain foods become associated with sickness. One such preparation is khichri (a rice-dal porridge), made in several parts of India. This type of food is generally eaten when a person suffers from fever or diarrhoea and may, therefore, not be associated with pleasant feelings.

Check Your Progress Exercise 1

1) List the three functions of food.

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2) Fill in the blanks:

- a) The body-building function of food is related to the presence of
- b) Energy-giving foods are rich in carbohydrates and/or
- c) Vitamins and minerals have and functions.

3) Read the following statements carefully and comment on how these relate to the physiological, social and psychological functions of food.

Pankaj is celebrating his birthday. His friends have come to his house for the birthday party. His mother has prepared several delicious dishes, particularly those which Pankaj likes.

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1.3 MEANING OF NUTRITION

Nutrition is a scientific discipline with food as the major focus of interest. It deals with several other related aspects as well, as you would observe from the following definitions.

Simply stated, nutrition is the study of what happens to food once it enters the mouth and thereafter. However, a more detailed definition would be : "*Nutrition is the science of foods, the nutrients and other substances therein; their action, interaction and balance in relationship to health and disease; the processes by which the organism ingests, digests, absorbs, transports and utilizes nutrients and disposes off their end products. In addition, nutrition must be concerned with the social, economic, cultural and psychological implications of food and eating.*" Let us now consider each of these aspects in some detail.

1.3.1 Nutrients : Action, Interaction and Balance

Food, as you know, contains nutrients as well as substances which are non-nutrients. The body needs each nutrient in specific amounts. Carbohydrates, fats, proteins and water are needed in relatively larger amounts and are, therefore, called the *macronutrients*. Vitamins and minerals are needed by the body in smaller amounts and are called the *micronutrients*. But they are all equally essential for our health. Each nutrient plays a significant role in the body. The mineral, calcium, for example, helps build strong bones and teeth. This is the *action* of calcium. Similarly, other nutrients have their own specific functions. To come back to the example just given, bones and teeth also contain another mineral, phosphorus. Both calcium and phosphorus must be supplied to the body in the required amounts and proportions to ensure the normal growth of bones and teeth. This means that the normal growth of bones and teeth and the maintenance of their normal structure and function requires an *interaction* between these two nutrients.

The concept of *balance* can also be explained by taking the example of calcium and phosphorus. If the diet contains too much phosphorus, it prevents the body from taking in enough of calcium. This creates an imbalance between calcium and phosphorus and affects the bones and teeth. This imbalance can be corrected by consuming foods that supply the two nutrients in the correct proportions.

In the larger context, the term balance means that the nutrients needed by the body should be provided in the right amounts and proportions. This is essential for good health.



Figure 1.2 : Balance of nutrients—the right balance fosters health

You will learn more about the action, interaction and balance of nutrients in Units 4, 5, 6 and 7 of Block 2 of this Course.

1.3.2 Handling of Food and Nutrients by the Body

How does the body handle food ? We take in food through our mouth where it is chewed and then swallowed. It then passes down the oesophagus into the stomach and thereafter into a long, coiled, tube-like structure called the intestine. All this while, the nature of food is being changed and it is being converted into utilizable forms. This process is called *digestion*.

Once digestion is completed the nutrients, now available to the body in a form in which it can use them, move from the intestine into the blood. This process is known as *absorption*. The blood then transports these nutrients to all the cells of the body where they are *utilized* for different functions. You will learn more about digestion, absorption and utilization of food in Unit 4 of Block 2 of this Course.

1.3.3 Socio-Cultural, Psychological and Economic Aspects of Nutrition

These factors determine the acceptability of a particular dietary pattern and the foods included. We might suggest a nutritious diet for a person but it might not be acceptable to him because of socio-cultural reasons. This is the reason why a person's social and cultural background and reactions to particular food items have to be carefully considered. Further, economic considerations determine whether foods are available and affordable. Let us now look at each of these aspects in greater detail.

● Social and cultural aspects of eating

Food has a special meaning in the social and cultural context, as you know. Our ancient Vedic tradition emphasizes food as the life-giver. It further attributes specific qualities to specific foods. It is said that *sattvic* foods, for example increase intellectual capacity and creativity, energy and cheerfulness. Milk and milk products are regarded as the prominent *sattvic* foods. The *rajasic* foods (foods that stimulate passion) are stated to include fish, eggs and meat while pork and beef are put in the category of *tamsic* foods, which make us lethargic and dull. *Tamsic* foods include stale, reheated, tasteless and impure foods. Contrast this view of food and eating with our modern views! Not all of us believe that certain foods or categories of foods (when part of usual diet) can influence our behaviour to any significant extent. At restaurants or homes people frequently eat reheated food which in the Vedic tradition has the lowest status.

You must have now realized why nutrition concerns itself not only with the body's handling of nutrients and other food components, but also with food acceptance. We cannot expect members of a community to immediately accept a food just because it is rich in nutrients. We have to consider the food from their point of view. Is it a food rejected by their culture ? Is it a food considered to be a "prestige" food (here we are referring to foods which are accorded a high status because they are expensive or because they are consumed by people of higher status in society) in that community? Are all population groups belonging to that community allowed to consume the food item or is it forbidden in the case of some, for example pregnant women? This shows us how important it is to keep a person's socio-cultural background in mind whenever we talk of improving or modifying food-related practices.

● The psychology of eating

Psychological factors have a significant impact on what we eat. Consider the following examples :

EXAMPLE A : *Ahmed, a five year old boy, loves to watch television. He sees numerous advertisements for foods like instant noodles, soft drinks, toffees and*

chocolates every single day. His mother frequently gets annoyed because he wants her to purchase the foods he sees on television even though she tries to convince him that they are not good for health.

EXAMPLE B : Saroj, when she was still a preschooler, was convinced by her mischievous elder brother that bitter gour:d (karela) was actually a rat that had been fried. Actually, the way Saroj's mother prepared the vegetable, there was some resemblance ! This created such a long lasting aversion in her mind, that even as an adult, when she knew that this was not correct, she could not bring herself to eat it.

EXAMPLE C : Sarla has just given birth to a baby boy. She readily consumes til laddoos, panjiri and ghee as she believes that these stimulate the flow of breast milk. (Til laddoos are sweet balls made of jaggery and sesame i.e. til seeds; panjiri is made of whole wheat flour, sugar, nuts and fat.)

Have you gone through the three examples carefully ? You must have noticed the importance of people's attitudes in determining what they eat. Many factors influence our choice of foods such as advertisements and the attitudes of other people around us. Our reactions to these influences often determine the type of foods we select and the quantities we eat. One example is the child who seeks to overcome a feeling of insecurity or inferiority by eating more. Another child may seek to overcome the same feelings by eating less. Thus our individual reactions to food and to the people around us can have a significant psychological influence on our eating pattern.

● **The economics of food**

Food costs money. The amount of money we can spend on food is a major factor that determines what we eat and how much we eat. In other words, by and large, our diet includes only those foods which we find available and affordable. This aspect is very important in practical terms. There is no point recommending expensive foods to a person who can barely afford low cost foods. In such a situation, one would obviously need to look for cheaper substitutes that are equally nutritious. However, there may be situations where a person cannot afford even those. It is therefore essential that food be within the reach of people and equitably distributed to all sections of the population. The availability of food and its proper distribution are of great importance. In India, for example, even though agricultural production has consistently increased, food is not available to all. Even today, there are many who do not get enough food. This is one of the larger economic issues of concern to everyone. Our ultimate aim should be to ensure the good health of all individuals. Towards this end, we need to ask and try to find answers to questions such as the following with the help of experts from different backgrounds :

- How do we meet the food needs of people who do not have the money to purchase adequate amounts ? Should we give them food as payment for work done by them or should we help them out by giving extra food at cheaper rates or free of cost ?
- How much food must we produce in order to meet the needs of people ?
- How can we ensure that food reaches all sections of people ? Is our network of ration shops and the public distribution of food adequate ?
- What types of food should be grown? Do we need to increase production of pulses and oilseeds, for example?

These issues are difficult to resolve. It would take time and the coordinated effort of planners, farmers, suppliers and consumers of food products to tackle them.

Check Your Progress Exercise 2

- 1) List any four aspects of the study of nutrition.

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2) Fill in the blanks :

- a) Nutrient balance can only be achieved by supplying all nutrients in the correct and proportions.
- b) is the process whereby nutrients move from the intestine to the bloodstream.
- c) The acceptance of particular foods by a person would depend on social, cultural, and economic factors.

1.4 INTERRELATIONSHIP BETWEEN NUTRITION AND HEALTH

Nutrition is closely interlinked with health. In fact, good nutrition is essential for good health. Eating the right kinds of foods in the required amounts is very important for an individual to develop normally and to remain healthy throughout life. When the diet is inadequate, there are chances that the individual's health would suffer; the likelihood that some organ of her body may start malfunctioning or that she may acquire some disease. A glaring example is the fact that thousands of young children in our country go blind every year because their diet does not provide them with sufficient vitamin A. You will read about the functions of various nutrients in the body and therefore the harmful effects of not eating the foods providing these nutrients in the right amounts in detail in Blocks 2 and 5 of this Course.

Health, as you would read in detail in the next Unit, refers to not only the physical well-being of a person, but also the mental and social well-being. Given the fact that the various aspects of health are inter related, poor nutrition may also influence the mental and social well-being of the person.

Nutrition is one of the major factors influencing the health of an individual. Since food is the source of nutrients, consuming the right types of foods in the right amounts becomes important. If the diet is poor, ill health will result due to the deficiency or excess of one or more nutrients. It must be emphasized, however, that though good food is one of the crucial factors in ensuring health, it is not the only one. Good nutrition is necessary, but not sufficient for optimal health. The food eaten must not only be nutritious but it must be clean and free from harmful germs. If this is not so, the person eating the food would fall ill even if the food is nutritious. The person's environment is equally important. If the individual acquires some infection, her health would suffer even if her diet is adequate.

GOOD NUTRITION IS A PREREQUISITE FOR GOOD HEALTH.

Before going any further, you need to recapitulate the meaning of the term "malnutrition". Do you remember reading about it in DECE-1 ? *Malnutrition is an impairment of health resulting from a deficiency, excess or imbalance of nutrients.* In other words, malnutrition refers to both undernutrition and overnutrition. Undernutrition means a deficiency or lack of one or more nutrients and overnutrition means excess of one or more nutrients. As mentioned earlier, both undernutrition and overnutrition result in ill health.

Nutritional anaemias are a prominent example of undernutrition in our country. In India, these are very common in women and children, more so in pregnant women and preschool children. Anaemia is a condition where haemoglobin levels in blood fall below the normal levels. You probably know that haemoglobin is a pigment present in the blood which gives red colour to the blood and is important for carrying oxygen to all the cells in the body. The person who suffers from anaemia

feels general weakness. The capacity to do physical work decreases considerably. Fatigue, giddiness, breathlessness on exertion, sleeplessness and loss of appetite are among the common symptoms. Anaemia can be due to the deficiency of the following nutrients in the body—iron, folic acid and vitamin B₁₂. You will read more about it in Unit 16 of Block 5 of this Course.

A disease that we easily relate to overnutrition is extreme overweight or obesity. When a person takes in more energy than she is able to spend on her daily activities, she accumulates fat in the body and her weight increases. If the weight increases substantially, the person becomes obese. Most of us do not tend to consider it as a serious disorder. We usually consider it bad from the point of view of body appearance only. At best we think of it as harmful in terms of reduced work capacity or inability to participate actively in sports or other such activities. The fact is that the health implications of obesity are far more serious than this. Obese individuals are more at risk of developing heart diseases and diabetes mellitus. The hazards of surgery, pregnancy and childbirth are greater in obese individuals. Obesity can also lead to various respiratory (breathing) problems due to stress on the respiratory system. So beware when you see your child become increasingly plump!

We need to remember that a given individual may show signs of deficiency and excess at the same time; for example, an obese person sometimes has an inadequate intake of some nutrients despite an excessive calorie intake.

Check Your Progress Exercise 3

- 1) "Good health cannot be achieved without good food." Comment on this statement in 2-3 sentences.

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- 2) List three different aspects of the interrelationship between nutrition and health.

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1.5 NUTRITIONAL STATUS

Nutritional status is the health of an individual as it is affected by the intake and utilization of nutrients. A good nutritional status implies a sufficiency of nutrients — neither deficiency nor excess — which, as you have just read, is necessary for good health. On the other hand, a poor nutritional status implies an excess and/or deficiency of one or more nutrients in the body. You must have noted from the definition that your nutritional status is influenced not only by your intake of nutrients (that is, the amounts of nutrients you consume through your diet), but also by the extent to which these nutrients are absorbed and utilized by your body. This would become clear to you as you read the next Section on the interrelationship between malnutrition and infection.

In view of the close interrelationship between nutrition and health, determining the nutritional status of individuals, communities, and the entire population becomes very important.

Let's now come to how to find out the nutritional status of a person. Well, to determine the nutritional status, all you have to do is to put together information about :

- what kind of diet is being consumed;
- what types of illnesses, if any, the person has suffered/ is suffering from, including any observable signs of ill health such as discoloured skin or bleeding;
- what is the level of nutrients and other substances in the blood and urine (as determined by blood and urine tests).

Let us consider an example. Suppose you notice that a child's gums are spongy and bleeding. This, as you would read in Unit 17 of Block 5 of this Course, is an important clinical sign of scurvy. Scurvy is a disorder caused by the deficiency of vitamin C. If a person does not consume enough of vitamin C, its levels in the blood drop. So, to confirm the diagnosis, you get the child's blood tested as well as take a look at her diet to see if foods rich in vitamin C are included. Confirmation of diagnosis is then followed by treatment, for otherwise, in this case, the condition could get serious. Untreated, the deficiency can lead to death due to internal bleeding !

There could be a difference in the sequence of events mentioned above. You may observe that a child's diet lacks foods that are good sources of vitamin C. On that basis, if a blood test is done, and the levels of vitamin C in the blood turn out to be low, then you would know that the child is suffering from a subclinical form of vitamin C deficiency. Remedial measures can then be taken.

1.6 INTERACTION BETWEEN MALNUTRITION AND INFECTION

You must have noticed that weak children fall ill more easily. Children who suffer from malnutrition are more prone to infections. Conversely infections, for instance measles, diarrhoea and whooping cough, can lead to malnutrition.

The relationship between malnutrition and infection can be described as a vicious cycle (Figure 1.3).



Fig.1.3 : Vicious cycle of Malnutrition and Infection

Malnutrition can increase the risk of infections and infections can, in turn, lead to malnutrition. How this happens would become clear to you on reading Sub-sections 1.6.1 and 1.6.2. In addition to this interrelationship between malnutrition and infection is the phenomenon of *synergism*. Now what does "synergism" mean? We know that malnutrition has a harmful effect on the health of the individual, and so does infection. But when these two disease conditions occur in the person at the same time, then the resultant damage that is caused to the person's health is more than the sum of the harmful effects that each disease would have caused if it had occurred alone. When malnutrition and infection exist in the individual simultaneously, they increase the severity of each other. To understand this better, let us consider an example. Suppose there is a child suffering from both protein energy malnutrition and diarrhoea. Protein energy malnutrition (PEM) is a disease condition arising from a deficiency of protein and energy in the body, and is commonly associated with infections. You will read about PEM in detail in Unit 15 of Block 5 of this Course. Diarrhoea is characterized by frequent passing of watery stools. There may be abdominal pain, weakness, fever and vomiting as well. Diarrhoea has been dealt with in detail in

Unit 23 of Block 7 of this Course. Both PEM and diarrhoea are very common among young children (0-6 years) in our country. When these two conditions co-exist, each gets exaggerated and the overall health status of the child worsens. There is increased severity and/or increased duration of the diseases which may result in greater complications and become fatal. The same would not have been the case if only one of these diseases were present. In other words, the co-existence of infections and malnutrition in the same child is producing an effect that is beyond the summed effect expected from the two diseases acting alone. This is called synergism.

The interrelationship and the synergistic effect of malnutrition and infection often lead to a high rate of illness and death among children in our country. This is more so in the case of the poor. In such cases, the cumulative harmful effects of malnutrition and infection are often severe and long lasting. For example, let's see what generally happens to a rural child from a low socio-economic group, starting from birth to adulthood in India. The child at birth weighs much less than 2.5 kg. As you know, infants who weigh less than two-and-a-half kilograms are "low birth weight" babies. As you would find out from Unit 9 of Block 3 of this Course, the health implications of low birth weight can be serious. Coming back to the example, the poor rural child, born with low birth weight is subsequently solely breast fed for longer periods. Due to the delayed supplementary feeding i.e. delayed introduction of additional foods, malnutrition usually sets in. In view of the poor environment and lack of hygiene, the child is constantly exposed to infections like diarrhoea and respiratory infections. There is reduction in food intake by the child because of loss of appetite due to these infections. As a result, nutritional deficiencies increase. The cycle of dietary deficit and infections leads to a progressively lower health status. Ultimately, the child with poor nutrition and health, if she survives, grows into a malnourished adult with poor health. It is to improve this tragic scenario that nutrition and health programmes are being run in our country, particularly for the tribal, rural and urban poor. You will read about these programmes in detail in Block 6 of this Course.

1.6.1 Effect of Malnutrition on Infection

Let us take a look at the ways in which malnutrition makes an individual more prone to infections.

a) **Reduction in antibody production :** A normal child who is adequately fed and well nourished is at a lower risk of acquiring infections. The child can fight infections better. This is due to the ability of the healthy and well nourished child to produce disease-fighting substances in the body called antibodies. As a result, such a child does not succumb to infections easily, and even if she does, recovers faster. However, if the child is malnourished, particularly if she suffers from severe PEM or Vitamin A deficiency, there is a reduction in the production of antibodies. As a result, her disease fighting capability is considerably lowered, making her more prone to infections.

b) **Effect on the integrity of skin and mucous membranes :** In well-nourished individuals, the skin, mucous membranes and other tissues prevent the infectious agents from entering the body. These tissues act as barriers to infection. However, in the case of an individual suffering from malnutrition, for instance PEM, this protective mechanism is severely affected. The secretion of mucous may be reduced, mucous membranes become readily permeable and a favourable environment for the growth of infectious agents gets created. This is why a malnourished child can catch infections easily.

Research has shown that human intestines harbour micro-organisms even when an individual is healthy and normal. In healthy normal individuals these organisms do not produce any disease. But, in PEM, because of the above mentioned changes that come about, these micro-organisms may produce diarrhoea which, in turn, leads to a worsening of the nutritional status. Thus the vicious cycle of malnutrition and infection, about which you have just read, begins.

c) **Malnutrition and worm infestation** : During digestion, the ingested food is pushed down the digestive tract with the help of movements of muscles in the walls of the digestive tract. You will read more about this in Unit 4, Block 2 of this Course. Proper movements of digestive tract muscles are important for normal digestion. In individuals suffering from malnutrition, these movements may slow down, due to which the food moves more slowly down the digestive tract. The result is that there is more time available to the worms (if any) which the person may have ingested along with the food then or earlier, to multiply. As a result, worm infestations like round worm disease become severe. In addition, the duration and severity of gastrointestinal infections may be more in malnourished individuals.

You have so far learnt how malnutrition can lead to or aggravate infections. We have also discussed that the relationship between malnutrition and infection is in the form of a vicious cycle. Now let us look at how infections can influence the nutritional status.

1.6.2 Effect of Infection on Nutritional Status

Nutritional status, you know, is the condition of health of an individual as influenced by the utilization of nutrients. How does infection influence the utilization of nutrients? What effect does it have on the nutrient intake? These are the aspects discussed in this sub-section. We begin with the effect of infection on food intake.

a) **Reduced food intake** : When a child is suffering from infections like diarrhoeal or respiratory infections, one of the first changes noted by the mother is loss of appetite. Quite often, the child may not like or tolerate food. As a result of this, the child consumes less food, that is, her dietary intake reduces. Furthermore, the antibiotics used in the treatment of infection may also reduce the child's appetite leading to reduced food intake.

One of the common practices in our country when a child is suffering from an infection or disease is restriction of food. For example, in the case of diarrhoea, solid foods and milk are restricted. Such a practice is harmful to the child, since what is required is in fact a good diet that will help the body recover from the damages done by the infection. The harmful effects of reduction of food intake are even worse when the child is already undernourished due to dietary deficiency over a period of time; which is generally true of children belonging to low socio-economic groups. The further reduction in the intake of nutrients leads to a lowering of the nutritional status.

b) **Effect on absorption of nutrients** : The intake of nutrients does not guarantee their availability to the body. It is only when the nutrients are absorbed into the bloodstream (following the digestion of food) that they can be utilized by the body. You will read more about this in Units 4,5,6 and 7 in the next Block. Any decrease in the absorption of nutrients can lead to the deficiency of the particular nutrient. It is observed that in the case of infections like diarrhoea, measles and respiratory disease, there is reduction in the absorption of nutrients. Only 60-70 per cent of the nutrients consumed are available to the body. Even worm diseases like round worm disease usually reduce the absorption of nutrients, thus leading to ill-health.

c) **Loss of proteins** : In some of the infections and fevers, a few nutrients, particularly proteins, are excreted i.e. lost from the body. This naturally increases the requirement of proteins during infections and fevers.

The overall effect of infections on the nutritional status of the child is therefore substantial. In the case of children belonging to poor families, who usually are already on a deficient diet, the effects of infections can therefore be disastrous.

Let us now study the effect of two common childhood infections, namely diarrhoea and measles, on the nutritional status.

MEASLES AND NUTRITIONAL STATUS

Measles is an acute viral infection characterized by fever and skin rash, which generally occurs in children around one year of age. In measles, the absorption of nutrients in the body is considerably reduced. Measles can also cause blindness by increasing vitamin A deficiency in a child living on inadequate diet. Matters are worsened by the practice of withholding diet to the child during measles, which is particularly common in rural India.

Measles leaves the child completely weak and emaciated. The child suffers not only from the effects of measles but is exposed to a number of complications which invariably follow an attack of measles. Measles decreases the disease-fighting ability of a child thus making her easily susceptible to more infections, the common ones being diarrhoea and severe respiratory disease. The net result of all these factors is usually severe and there are long lasting adverse effects on the nutritional and health status of the child.

DIARRHOEA AND NUTRITIONAL STATUS

As you have read, diarrhoea is a symptom characterized by the sudden onset of frequent stools of watery consistency. This may be accompanied by abdominal pain, weakness and sometimes fever and vomiting. You know that diarrhoea is very common among children. As in the case of any other illness, diarrhoea can reduce the appetite of the child considerably. As a result, the child does not eat properly. In addition, mothers usually think that the diet of the child with diarrhoea should be restricted because of the belief that the number of loose motions may increase if the child is fed. So what are the consequences? Obviously, there is reduced food intake. This adversely affects the child's nutritional status. The absorption of nutrients is also affected since the food does not stay in the digestive tract long enough. Further, in diarrhoea fluids are lost from the body. Along with the fluids, important minerals such as sodium and potassium (usually known as electrolytes) are also lost. This loss of fluids and electrolytes during diarrhoea leads to dehydration. It is this dehydration which is responsible for the high death rate among children with diarrhoea. In the villages and slum areas in the cities, the children generally suffer from frequent and repeated attacks of diarrhoea, which lead to significant weight loss and poor nutritional status.

Check Your Progress Exercise 4

1) How is the nutritional status of an individual assessed?

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2) What is synergism?

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3) How does malnutrition make a person more prone to infection?

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4) In what ways does infection influence the nutritional status?

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1.7 SUMMING UP

Food refers to "anything which nourishes the body". Food, we learnt, has many specific functions. It provides energy, helps build the body, protects it against disease and regulates body processes. In addition, it helps to bring people together. It is also a means whereby emotions and feelings are expressed.

Nutrition encompasses the study of food and how it is handled by the body. It also explores the influence of social, psychological and economic factors on our eating patterns. Various aspects of the study of nutrition have been enumerated in this Unit. In addition we have talked about the fact that nutrition and health are intimately linked. Good health cannot be achieved without eating the proper kinds of foods in the amounts needed. Nutritional status is the health of an individual as it is affected by the intake and utilization of nutrients.

Malnutrition and infection are closely related. Malnutrition can lead to infections by reducing the disease-fighting capacity of the child. Infections, on the other hand, can lead to malnutrition because of reduced nutrient intake due to loss of appetite, dietary restriction, reduced absorption etc. Thus malnutrition and infection form a vicious cycle. Malnutrition and infections often coexist in Indian children. The combined effect of both these conditions on the health of the children is devastating.

1.8 GLOSSARY

- Antibiotics** : Medicines used to treat infections/chemical substances that help in fighting infections in the body
- Benediction** : Blessing
- Cell** : The smallest unit of an organism that is able to function independently
- Clinical Sign** : An adverse change in the body that is externally noticeable

Deficiency	: A condition of the body resulting from an inadequate dietary intake of one or more nutrients
Delicacies	: Special dishes made for certain occasions
Diet	: Food items (dishes) you eat during the course of a day
Eating Pattern	: The number of meals and the types of foods served
Growth	: Changes such as increase in size and number of cells
Implication	: Meaning, significance
Infirmity	: Physical or mental weakness
Diabetes mellitus	: Disease in which sugar and starch are not properly absorbed in the body
Menu	: List of dishes included in a particular meal
Nourish	: To make well and strong
Obesity	: Extreme overweight
Subclinical condition	: A disease condition which occurs before clinical signs/symptoms of a disease occur. These forms of the disease can be identified through special investigations or tests.
Tissue	: A number of similar cells in the body together form a tissue

1.9 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress Exercise 1

- 1) physiological, social, psychological
- 2) (a) proteins (b) fats (c) protective, regulatory
- 3) Answer on the basis of what you have learnt about the functions of food.

Check Your Progress Exercise 2

- 1) Any four of the following :
 - a) food and nutrients b) processes of ingestion, digestion, absorption, transport and utilization of nutrients and disposal of end products c) social implications of eating d) economic implications of eating e) psychological implications of eating
- 2) a) amounts b) absorption c) psychological

Check Your Progress Exercise 3

- 1) Good health cannot be achieved without good food. This statement is true. Nutrition is one of the major factors influencing the health of an individual. Since food is the source of nutrients, selecting and consuming the right types of food in the right amounts becomes important. If the diet is poor, ill-health will result because of deficiency or excess of one or more nutrients.
- 2) Causation of diseases by deficiency or excess of nutrients; effect of nutrients in preventing disease and promoting quick recovery; good nutrition as a necessary, but not sufficient condition for good health.

Check Your Progress Exercise 4

- 1) An individual's nutritional status is assessed on the basis of i) his/her diet; ii) the types of illnesses (if any) that he/she has suffered/is suffering from, including observable signs of ill-health and iii) the level of nutrients and other substances in his/her blood and urine (as determined by tests).
- 2) The interaction between two disease conditions resulting in exaggeration of each in terms of severity and duration, producing a summed effect that is more than the sum of the expected effects of the diseases had they occurred one at a time.
- 3) In malnutrition, there is a reduction in the production of antibodies in the body, the integrity of skin and mucous membranes is adversely affected and an environment conducive to worm infestations and gastrointestinal infections gets created. These factors contribute to greater susceptibility to infections.
- 4) Through loss of appetite, intolerance to food, restriction of diet by caregivers, reduced absorption of nutrients and loss of nutrients.