UNIT 9  NUTRITION AND HEALTH

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9.2 Objectives
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9.1 INTRODUCTION

You have already been introduced to the concepts of organizational aspect of the living world and also its transactional techniques.

In this unit, the aspects of health and nutrition, like components of food, deficiency diseases, food adulteration, factors affecting health, organic diseases, and water, food and air-borne diseases will be discussed in an interactive manner. For effective presentation, the unit has been divided into five topics. Each topic has been dealt with under 4 various heads - major teaching points, effective teaching-learning process, methodology, and finally check your progress (in text questions) self-assessment. In teaching-learning process, attempts have been made to explain how a topic could be introduced, concepts to be developed by using a variety of teaching-aids and concepts to be assessed.

9.2 OBJECTIVES

At the end of this unit, teacher trainees would be able to:

- familiarize themselves with the content of the unit Nutrition and Health,
- analyze the content of the unit and identify major teaching concepts for each topic from the unit,
- suggest effective teaching-learning strategies for teaching the topics of nutrition and health,
- develop the ability to select the teaching-learning aids and also use them properly in the teaching-learning process,
- develop the various skills such as use of the blackboard, citing examples, probing questions for teaching the topics of nutrition and health, and
- prepare objectives-based tests to assess the achievement of the learner.
9.3 NUTRITION

We eat a variety of food. Basically, we need food to carry out all vital life processes. The major components of our food are carbohydrates, proteins, fats, vitamins and minerals. These components provide energy, help in growth and development and repair of the damaged parts of the body. They also develop resistance to diseases. A balanced diet contains all the nutrients and it varies according to the need of the body. The deficiency of these nutrients in food causes deficiency diseases. Malnutrition is the main cause of these diseases.

Excessive intake of nutrients also leads to the abnormal functioning of the body. Obesity and hypervitaminosis are examples of over nutrition. Since living organisms constantly interact with the environment which can cause disequilibrium. Disequilibrium in the environment may lead to diseases in living beings. In addition, to extrinsic factors, diseases may also caused due to intrinsic reasons or factors. Organic or metabolic diseases are caused due to intrinsic factors. Now, we will see each area in detail with their teaching methodologies.

9.3.1 Components of Food (balanced diet) and Sources

Main Teaching Points

- The major components of our food are: Carbohydrates, proteins, fats, vitamins and minerals.
- Water and roughage are not nutrients, but are important constituents of our food.
- Plants and animal sources are the major sources of food and nutrients.
- All nutrients are necessary for the better functioning of our body.
- The balanced diet varies according to age, state of health, occupation, etc.

Teaching-Learning Process

We know that all living beings require food for their survival. Plants make their own food, while animals either depend on plants or on other animals. We take a variety of things in our food, such as pulses, cereals, fruits and vegetables which are derived from plants and other like milk, eggs, and meat from animals.

Water and roughage are also important components of our food. Usually, all items contain all nutrients but in varying proportions. For example, rice and chapatti are a rich source of carbohydrates. Similarly, pulses also have carbohydrates but contain more proteins. Fruits and vegetables are a rich source of vitamins and minerals. Each nutrients has its own function. If you work hard and you feel tired, then you take a spoon of glucose which gives you instant energy and you feel fresh. Do you know what does a spoon of glucose contain? What the major functions of these components?

Each nutrient has its own functions to play in the body. Carbohydrates and fats are major sources of energy for the body. Proteins help in the growth and repair of the body cells. Vitamins and minerals are essential for the vital reactions of cells and tissues and regulation of the body’s functioning. Water is necessary in the diet to carry out all life processes. Similarly, roughage is also very essential and helps in proper digestion and bowel movement. But what are the various sources of these components? Table 9.1 depicts the various sources of each component.
### Table 9.1

| Carbohydrates | **Starchy foods** | Wheat, rice, maize, potato, sago, Peas, beans, fruits, honey, Jaggery, common sugar etc. |
| **Proteins** | Plants sources | Groundnuts, beans, whole cereals, pulses |
| Animal sources | Lean meat, milk, fish, paneer, Eggs, cheese, etc. |
| **Fats** | Plant sources | Cooking oil, (Groundnut, soyabean, nuts, coconut etc.) |
| Animal sources | Butter, ghee, milk, egg (yolk), animal fat from meat |
| Vitamins | A (Retinol) | Green leafy vegetables, carrots, mangoes, fish, liver oil, liver |
| B₁ (Thiamine) | Milk, green leafy vegetable, Soyabean, seafood, whole Cereals |
| B₂ (Riboflavin) | Milk, green leafy vegetable, peas, Beans, meat, eggs |
| B₄ (Niacin) | Groundnut, Green leafy vegetables, Potato |
| B₁₂ | Meat, liver, milk |
| C (Ascorbic acid) | All citrus fruits such as lemon, orange etc. |
| D (Calciferol) | Fish, liver oil, milk, sunlight (exposure) |
| E (Tocopherol) | Green leafy vegetables, tomatoes |
| K | Green leafy vegetables, tomatoes, eggs, Yolk etc. (also synthesized in Body) |

**The Protein is made up of amino acid molecules. In addition to carbon, hydrogen and oxygen, sulphur and nitrogen are also present in protein. Which helps in many of life's functions.**

***Fats are usually insoluble in water and are called lipids. Butter, ghee etc. are saturated fatty acids and solidify at room temperature. Unsaturated fatty acids (vegetables) have a low melting point. This is the reason why butter and ghee solidify in winter as compared to vegetable oils.***

**Minerals**

| Calcium | - Milk, butter, leafy vegetables |
| Phosphorus | - Cereals, pulses, milk |
| Iron | - Cereals, pulses, zeera, heeng, leafy vegetables |
| Iodine | - Fish, salt |
| Sodium & Potassium | - Salt |
Teaching Learning of Concepts in Science

<table>
<thead>
<tr>
<th>Magnesium</th>
<th>Green leafy vegetables, cereals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulphur</td>
<td>Cereals, methi, kala namak</td>
</tr>
<tr>
<td>Copper, Zinc &amp; Cobalt</td>
<td>Cereals, pulses, meat, leafy vegetables</td>
</tr>
<tr>
<td>Water</td>
<td>Present almost in all foodstuffs, water sources</td>
</tr>
<tr>
<td>Roughage</td>
<td>Fibrous vegetables, leafy fruits, porridge (dalia), Cellulose-containing products etc.</td>
</tr>
</tbody>
</table>

It is evident from the table that starchy food like wheat, rice, and maize are rich in carbohydrates. Carbohydrates are the cheapest and prime source of energy. Beans, whole cereals, pulses, soyabean, milk, eggs, cheese and lean meat are an important source of protein. Similarly, we get fat both from plants and animals. All fruits and vegetables are a major source of water, vitamins and minerals. Fibrous food are rich source of roughage. Water regulates the temperature of our body and constitutes a major part of protoplasm.

Now, can you tell what is a balanced diet? Should all the people have the same diet or should the diet vary according to age and nature of work? A diet is balanced if it contains all the nutrients in adequate quantities for the normal growth and development of the body. It varies according to age, nature of work etc. For example, children require more calories in food as compared to adults. Similarly, pregnant and nursing mother require more calories of food as compared to other women. A man who does more physical work requires more energy than a person whose task is sedentary.

Methods and Material Used

For teaching the components of food, the lecture method can be used. To make the concept more clear, charts can be shown (components of food and their major sources).

We consume three kinds of carbohydrates. Cellulose is a carbohydrate which we get from plants. It is useful in providing roughage to the body. Starch is another type of carbohydrate. The third type of carbohydrate is sugar, which we get from fruits. Common sugar (sucrose) is made from sugarcane.

Check Your Progress

Notes: a) Write your answers in the space given below.
      b) Compare your answers with those given at the end of the unit.

1) Name the major components of our food.

2) Explain what is a “balanced diet”?

3) Write the major functions of carbohydrates and proteins.

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...........................................................................................................................
...........................................................................................................................
...........................................................................................................................

4) What are the major sources of Vitamins A, C, D and K.
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...........................................................................................................................
...........................................................................................................................
...........................................................................................................................

9.3.2 Deficiency Diseases

Main Teaching Points

- Lack of nutrients in the diet causes deficiency diseases.
- Deficiency of carbohydrates, proteins and fats leads to Protein-Energy Malnutrition (PEM).
- Anaemia, goiter, rickets and osteomalacia are common mineral deficiency diseases.
- Some of the important diseases caused by the deficiency of vitamins are: night blindness, beri-beri, pellagra, scurvy, rickets etc.

Teaching-Learning Process

We know that all the nutrients are essential for our body. If we do not take all the nutrients in our diet what will happen? Do we feel weak? Now, we will study the effect of the deficiency of various nutrients.

Let us address this problem

Suppose there are three children, Ram, Rohit and Ramesh. Ram takes all nutrients in his diet. Rohit takes a few nutrients but not in adequate quantities. Ramesh takes all the nutrients but in excess of the body’s requirement.

What will be the difference in their health? Which child will be suffering from disease, and why?

Rohit will be suffering from some deficiency disease because he is not taking all the nutrients in an adequate amount. Hence, a disease which arises due to the lack of carbohydrates, or fats, or proteins, or minerals or vitamins in the diet, is called a deficiency disease. Anaemia, beri-beri, rickets and Protein-Energy Malnutrition are some examples of these diseases.

Ramesh is also not healthy though he is taking excess of all the nutrients in his diet. This may also lead to problem, such as obesity and hypervitaminosis. The chief cause of obesity is taking more food than the body requirement. Similarly, hypervitaminosis occurs when we take vitamins in excess of our needs.
Protein, carbohydrate and fat deficiency leads to protein-energy deficiency diseases. This is the most common nutritional disorder which affects children in our country in the age group of 1 to 5 years. Vitamin and mineral deficiencies are also very common. Look at the chart in which two diseases and their symptoms are shown. You have to give the name of the nutrients/nutrient whose deficiency in the body causes these diseases (some symptoms are given as hints).

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Disease</th>
<th>Symptoms</th>
<th>Name of Nutrients</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Kwashiorkor</td>
<td>Oedema of the body, skin becomes dark, no wasting of muscles, usually occurs in children from 1-5 years of age.</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Marasmus</td>
<td>No oedema, no change of colour of skin, wasting muscles, occurs in children upto 1 year of age.</td>
<td></td>
</tr>
</tbody>
</table>

The disease shown in Table 9.2(a) is caused by the deficiency of protein while the disease mentioned in Table 9.2(b) is caused due to the deficiency of protein, carbohydrates and fats. About 1% of pre-school children in our country suffer from Kwashiorkor. Likewise, marasmus is also striking children below the age group of one.

The main cause of marasmus is the deficiency of carbohydrates, protein and fats (malnutrition disease). This is very common disease among the poor people. This disease can be controlled by giving adequate amounts of all the above nutrients.

The deficiency of vitamin A leads to night blindness in which persons cannot see in dim light. Beri-beri is caused by the deficiency of vitamin B₁. Pellagra is common in those people who are mainly maize eaters (reduces niacin absorption). The deficiency of vitamin C and vitamin D causes scurvy and rickets respectively.

<table>
<thead>
<tr>
<th>Disease</th>
<th>Symptoms</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Night Blindness</td>
<td>Poor vision, bad eyes</td>
<td>Vitamin A</td>
</tr>
<tr>
<td>Beri-beri</td>
<td>Extreme weakness</td>
<td>Vitamin B₁</td>
</tr>
<tr>
<td>Bad skin</td>
<td>Retarded growth</td>
<td>Vitamin B₂</td>
</tr>
<tr>
<td></td>
<td>Cracking of the skin of the mouth and bad skin</td>
<td></td>
</tr>
<tr>
<td>Pellagra</td>
<td>Soreness of the mouth Eczema and diarrhoea</td>
<td>Vitamin B₄</td>
</tr>
<tr>
<td>Scurvy</td>
<td>Swollen gums, loose teeth</td>
<td>Vitamin C</td>
</tr>
<tr>
<td>Rickets</td>
<td>Soft bone and spine and bow legs.</td>
<td>Vitamin D</td>
</tr>
</tbody>
</table>

Do you know what makes our teeth, nails and bones strong and why some exposure to sunlight is essential for healthy living?

Yes, you are right. It is Calcium and phosphorus. These two minerals make our bones and teeth strong. The deficiency of these minerals causes rickets in children and Osteomalacia.
in adults. Due to rickets, the bones become twisted or bent (show picture). This disease can be prevented by giving cod liver oil and proper exposure to sunlight. In Osteomalacia, bones become soft and fragile. This disease occurs due to the deficiency of calcium, phosphorus, and vitamin D in food. It is common in women, especially when they are in pregnancy and during the lactation period. Milk and liver are rich sources of calcium and phosphorus. Their intake in adequate quantities improves the patient’s health.

Mineral deficiency can also lead to deficiency diseases. The diseases caused by mineral deficiency are shown in Table 9.4.

<table>
<thead>
<tr>
<th>Name of Disease</th>
<th>Symptoms</th>
<th>Main cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaemia</td>
<td>Pale look, tiredness, loss of appetite, weight loss etc.</td>
<td>Iron</td>
</tr>
<tr>
<td>Goitre</td>
<td>Increase in weight, low metabolism, swollen neck, water retention</td>
<td>Iodine</td>
</tr>
<tr>
<td>Nervous disorder, malformation of bones, rickets (child) osteomalacia (adults)</td>
<td>Softening of bones, twisted bones</td>
<td>Calcium, Phosphorus, Vitamin D.</td>
</tr>
</tbody>
</table>

Anaemia can be identified when the person looks pale, tires easily, feels exhausted and loses weight. Iron deficiency results in hemoglobin deficiency in the blood. This disease can be cured by taking an adequate amount of iron in the diet. Another disease called goitre is caused due to deficiency of iodine in the diet. In goiter, the neck seems swollen, the body weight increases, and disorders of the nervous system leads to imbalance in the body.

This disease is very common in hilly areas but what makes this different? This is because in soil contains less iodine and due to which the food becomes deficient in iodine. Now, you must have understood why in coastal areas people rarely have iodine deficiency. Taking iodized salt can help in normal thyroid functioning and prevent goiter.

Methods and Material used

For teaching deficiency diseases, the deductive approach can be used. Initially, the deficiency disease concept is developed through the problem-solving approach. Students generalize the reasons of deficiency diseases through this approach. Pictures of different diseases, charts depicting their names of diseases and their symptoms can also be used as instructional material.

Check Your Progress

Notes:  
a) Write your answers in the space given below.  
b) Compare your answers with those given at the end of the unit.

5) Name the diseases caused by the deficiency of the following nutrients:
   i) Protein .................................................................
   ii) Vitamin A .............................................................
   iii) Energy-giving nutrients ...........................................
   iv) Vitamin C .............................................................
   v) Vitamin B₂ ............................................................
   vi) Vitamin B₁₂ ..........................................................
6) Distinguish between Kwashiorkor and marasmus.

7) Write the main symptoms of the following diseases:

Anaemia, goitre, rickets.

9.3.3 Food Adulteration

Main Teaching Points

- The deliberate contamination of food material with low quality stuff is called food adulteration.

- The common adulterants (which make food adulterated) are metanil, lead chromate, brick powder, sand, papaya seeds etc.

- Most adulterants can be identified through simple tests.

- The FPO, Agmark and I.S.I. are the national standards for edible foodstuffs.

- Food adulteration may cause serious health hazards.

Teaching-Learning Process

You know that food products are available in different forms such as powdered or coarse. For example, chillies and turmeric are available in dried (raw) as well as powder form. Why do we prefer to buy these products in the unpowdered form? Have you noticed what things are mixed with wheat, pulses, rice when we buy them? There could be stones pieces of glass etc. This deliberate contamination of food materials with low quality, non-edible or toxic substances is called food adulteration. The substance which lowers the quality of food material is called an adulterant. Adulterants, when mixed with food products, increase the weight of the product. Do you know what things are mixed with different food products? Do they mix the same adulterants in all products?

An adulterant varies according to the colour and form of the product. Look at the chart (Table 9.5) showing different adulterants mixed with various kind of consumable food.

<table>
<thead>
<tr>
<th>Food Products</th>
<th>Adulterants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dal Arhar</td>
<td>Kesri dal Metanil yellow.</td>
</tr>
<tr>
<td>Mustard seeds</td>
<td>Argemon seeds.</td>
</tr>
<tr>
<td>Black pepper</td>
<td>Dried seeds of papaya.</td>
</tr>
<tr>
<td>Ingredient</td>
<td>Adulterants</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>Zeera</td>
<td>Straw, stones, Mud and wild seeds.</td>
</tr>
<tr>
<td>Heeng</td>
<td>Sand, grit, atta, gum</td>
</tr>
<tr>
<td>Haldi powder</td>
<td>Metanil yellow, lead chromate.</td>
</tr>
<tr>
<td>Chilli powder</td>
<td>Brick powder, colour</td>
</tr>
<tr>
<td>Dhania powder</td>
<td>Powder of cow and horse dung.</td>
</tr>
<tr>
<td>Besan</td>
<td>Powdered kesri dal, starch.</td>
</tr>
<tr>
<td>Milk</td>
<td>Water, starch.</td>
</tr>
<tr>
<td>Edible oil</td>
<td>Mineral oil, argemone oil.</td>
</tr>
<tr>
<td>Honey</td>
<td>Sugar, Jaggery.</td>
</tr>
<tr>
<td>Ice cream</td>
<td>Saccharin, or dulcin as a sweetening agent, starch, blotting paper.</td>
</tr>
</tbody>
</table>

If the products are unpowdered or coarse like wheat, pulses, etc. we can detect or pick out the adulterants easily. How can we detect adulteration when the product is in powered forms? This can be done by different tests used to detect adulteration. Let us do this activity in a group.

**Demonstration - Detection of haldi adulteration**

Take 2 gm. of haldi powder in a crucible. Heat till it becomes white ash. See the colour of the ash. Cool the ash and dissolve it in 5 ml. of dilute $\text{H}_2\text{SO}_4$. Filter it and see whether it has got dissolved or not. Add a few drops of 0.2% diphenyl carbanide. A pink colour in the solution confirms the presence of lead chromate in haldi.

Like haldi, lead chromate also has a yellow colour. Lead chromate being heavy, add a lot of weight to haldi powder. This agent is very harmful as it can cause mental retardation, brain damage in children and also causes abortion in womb. Another very harmful adulterant is kesari dal. This dal is very similar to arhar dal. Kesari dal when mixed with arhar poses serious health hazards. It causes a disease called **lathyris**. The disease causes lesions on the spinal segments followed by paralysis.

In edible oil, argemone oil is mixed because it is much cheaper. To test it, add concentrated $\text{HNO}_3$ to the sample (adulterated oil) and shake carefully. Observe the colour of the acid layer. A red to reddish brown colour indicates the presence of argemone oil. You can notice that there are different tests for different adulterants. Collect different samples of products and test them in the presence of your teacher and prepare a project and report. Collect samples from different sources.

Many times you will notice the symbols of F.P.O., Agmark and I.S.I. on the packets or containers that you buy from the market. Do you know their full name and why products are marked like this? F.P.O. stands for Food Products Order. Agmark stands for Agricultural Marketing and I.S.I. means India Standards Institution. If the products are marked with F.P.I., I.S.I. or Agmark, it indicates the purity and quality of food. Now, it will be clear why we should buy only those food products which carry these marks?

**Methods and Material Used**

For teaching food adulteration, an inquiry approach should be followed along with demonstrations. The concept of adulteration/adulterants can be developed through discussion also.
Check Your Progress

Notes: a) Write your answers in the space given below.
   b) Compare your answers with those given at the end of the unit.

8) Name the adulterants which can be found in the following foodstuffs:
   i) Edible oil: ............................................................
   ii) Zeera: ............................................................
   iii) Haldi: ............................................................
   iv) Honey: ............................................................
   v) Arhar dal: ............................................................

9) How are adulterants different from preservatives? Explain with examples.
   ...........................................................................................................................
   ...........................................................................................................................
   ...........................................................................................................................
   ...........................................................................................................................

10) Write the full form of F.P.O., I.S.I. and Agmark.
   ...........................................................................................................................
   ...........................................................................................................................
   ...........................................................................................................................
   ...........................................................................................................................

9.4 HEALTH

9.4.1 Water, Air and Food-borne Diseases

Main Points

- Water, air and food-bone diseases are mainly caused by micro-organisms, which enter through these vehicles.
- Cholera, typhoid, gastro-enteritis, etc., are some water-borne diseases.
- Air-borne diseases are transmitted through spores or dust.
- Disease agents sometimes spoil the food (making toxic) or enter the human body through food and cause diseases.
- Proper and timely treatment is possible of these diseases.

Teaching-Learning Process

You have learnt about deficiency diseases. Deficiency diseases are caused by external agents, e.g., lack of nutrients in the diet. But there are organic diseases also, which can caused by intrinsic reason i.e. hormonal imbalances, allergies, genetic etc. Therefore, we can say deficiency diseases are different from organic diseases.

We all have heard about infectious diseases. Can you give reasons how organisms enter the body and cause infectious diseases?
Micro-organisms enter the human body through air, water and food. These modes, which help in transmitting the diseases, are called the vehicle and the factor, which causes the disease, is called the agent. Infectious agents may have multiplied or developed in the vehicle before being transmitted. Contaminated water and food, when consumed by a healthy person, enters the human body and makes the man sick. Similarly, through talking, coughing, sneezing etc., diseases agents are expelled from the diseased person's body and when a healthy person inhales the air, these agents enters his body and cause that particular disease. Some micro-organisms (agents), which causes diseases in human beings, are shown in Table 9.6.

### Table 9.6

<table>
<thead>
<tr>
<th>Infectious agent</th>
<th>Mode of Transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacteria</td>
<td>Water and food</td>
</tr>
<tr>
<td>Viruses</td>
<td>Air</td>
</tr>
<tr>
<td>Fungi</td>
<td>Food</td>
</tr>
<tr>
<td>Protozoans</td>
<td>Water</td>
</tr>
<tr>
<td>Helminthic</td>
<td>Water</td>
</tr>
</tbody>
</table>

Now, it would be clear that infectious agents those which are the cause of infectious diseases. They are transmitted through water, air, food etc.

Water-borne diseases are those which are transmitted through contaminated drinking water. These diseases and their infective agents are shown in Table 9.7.

### Table 9.7

<table>
<thead>
<tr>
<th>Infective agents</th>
<th>Name of the disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viral</td>
<td>Viral hepatitis, poliomyelitis</td>
</tr>
<tr>
<td>Bacterial</td>
<td>Typhoid, cholera, dysentery etc.</td>
</tr>
<tr>
<td>Protozoal</td>
<td>Amoebiasis, giardiasis</td>
</tr>
<tr>
<td>Helminthic</td>
<td>Roundworm, threadworm, whipworm etc.</td>
</tr>
</tbody>
</table>

These micro-organisms multiply in water and contaminated water helps in spreading these diseases. Causing agents like roundworm, etc., enter the alimentary canal as eggs or larvae and adhere to the canal and suck blood.

Can you identify the possible causes which make food turn harmful? We have already learnt that adulterant is one of them. Do you know how bacteria or viruses make our food harmful? What are the different factors of food-borne diseases?

Food-borne diseases may be caused by a large number of factors. Bacteria and fungi produce toxins in the food and cause food poisoning. Food poisoning is also cause by pesticides sticking to food (fruits, vegetables). Cooking utensils like brass, copper, etc., also react with food material and can cause food poisoning. Important information about food-borne disease is can be found in Table 9.8.
Food-borne toxicants

1. Naturally occurring toxins in some foods.
   a) Beta, oxalyl amino alanine causing Lathyrism
   b) Toxins produced by certain bacteria causing
      i) Botulism
      ii) Staphylococcus poisoning

2. Toxins produced by some fungi:
   a) Aflatoxin, b) Ergot, c) Fusarium toxins

3. Food-borne chemical poisoning
   Heavy metal mercury - Fish
   Cadmium - Shell fish
   Lead - Canned food

Food-borne infections may also be caused by bacteria, viruses or parasites. Cooked food can get contaminated during storage, handling and transportation at any point from the producer to the consumer. Food such as milk, meat, fish, egg, fruits and vegetables act as good media for multiplication of disease agents. Common food-borne diseases, caused by disease agents (bacteria, viruses, parasites) are shown here:

II. Food-borne infections:
   a) Bacterial - Typhoid, cholera, salmonellosis.
   b) Viral - Viral hepatitis, gastro-enteritis, jaundice.
   c) Protozoic and Helminthic - Ascariasis, amoebiasis

Air-borne disease are transmitted through droplets, nuclei or dust. The infectious agents are spread during taking, coughing or sneezing and released into the air. When healthy person inhales the air, the diseases agent enters the body through the inhaled air. Common air-borne diseases are:

- Influenza - Viral
- Chicken-pox - Viral
- Pneumonia - Viral/bacterial
- Tuberculosis - Bacterial

Methodology Used

For teaching the topic water, air and food-borne diseases, the lecture-cum-demonstration method should be used. Some inquiring question can also be asked to make the lecture interesting. Charts on infectious diseases and their causing agents can be prepared and shown.
Check Your Progress

Notes: a) Write your answers in the space given below.
     b) Compare your answers with those given at the end of the unit.

11) Give example each of water, air and food-borne diseases with their causing agents.

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12) Classify the following into water, food and air-borne disease: Polio, cholera, typhoid, viral hepatitis, amoebiasis, influenza.

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.........................................................................................................................

13) The disease agent of typhoid is:
   a) Bacteria
   b) Protozoan
   c) Virus
   d) All of the above

14) What are the major causes of infectious diseases? How are they different from deficiency diseases?

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9.4.2 Organic and Metabolic Diseases

Main Teaching Points

- Some internal human factor may lead to organic or metabolic diseases.
- Malfunctioning of body organs or systems may lead to some fatal diseases.
- Genetic diseases like haemophilia, sickle cell anaemia are transferred from generation to generation.
- Defects in hormonal production or in the action of various glands lead to diseases like dwarfism, gigantism or cretinism.
- Malfunctioning of the immune system of human body may cause allergic reactions.
You know that an inadequate diet is an external factor which affects our health. We can say that those disease which are caused by factors which come from outside the human body, are extrinsic factors. What are intrinsic factors which affect health?

There are some causes which are found in individuals that may lead to diseases. These factors may or may not be specific. The major factors are:

- Malfunctioning of the body or organ system.
- Genetic disorders.
- Hormonal disorder.
- Malfunctioning of the immune system.

Diseases caused by these factors are called organic or metabolic-diseases. Some examples of these diseases are: osteoporosis, (bone defect), cataract and myopia (eye defect), haemophilia (defect in the clothing of blood), allergies (defects in the immune system of the body) etc.

The improper functioning of various body parts or organs like the heart, the kidney, bones, eye lenses etc., leads to a number of diseases. There are many reasons for the improper functioning of these organs. These are:

- Hereditary factors - They pass from parents to off-spring.
- Congenital - These defects are present right from the birth.
- Slow or sudden malfunctioning of the organs.
- Uncontrolled growth of body cells - some diseases are caused by the uncontrolled growth of cells in the body. The abnormal growth of the cells may lead to tumors. These tumors may be benign or malignant. Malignant tumors are cancerous in nature. They multiply in various parts of the body.

Some diseases caused by the malfunctioning of body organs are (explain from the charts of a working model shown here):

<table>
<thead>
<tr>
<th>Name of the organ</th>
<th>Cause</th>
<th>Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart</td>
<td>Improper functioning</td>
<td>Cardiac failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heart-related diseases</td>
</tr>
<tr>
<td>Kidney</td>
<td>Improper functioning</td>
<td>Kidney failure or ailment of this organ</td>
</tr>
<tr>
<td>Bone</td>
<td>Malfunctioning of bone</td>
<td>Osteoporosis</td>
</tr>
<tr>
<td>Eye</td>
<td>Improper functioning</td>
<td>Myopia cataract</td>
</tr>
</tbody>
</table>

It is clear from the above table that heart-related diseases, osteoporosis, cataract, etc. are some of the major diseases which are caused by the malfunctioning of the organs. The actual cause of these disease is not clear.

Table 9.10 gives the names of some hormonal diseases or hormonal disorders and their symptoms. Hormones are proteins secreted by different glands of the body which control many of our body processes and helps in healthy development. The deficiency or excess of hormones by these glands may lead to diseases. These are called hormonal diseases. Important hormonal diseases with their main symptoms are:
Table 9.10

<table>
<thead>
<tr>
<th>Name of the Disease</th>
<th>Hormonal imbalance of</th>
<th>Hormone action</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gigantism</td>
<td>Pituitary gland</td>
<td>Over secretion</td>
<td>Excessive growth of bone, resulting the person becoming too tall.</td>
</tr>
<tr>
<td>Dwarfism</td>
<td>Pituitary gland</td>
<td>Under secretion</td>
<td>Diminished growth of bones, person becomes too short.</td>
</tr>
<tr>
<td>Cretinism</td>
<td>Thyroid gland</td>
<td>Under secretion</td>
<td>Feeble mindedness (Occurs in children).</td>
</tr>
<tr>
<td>Diabetes</td>
<td>Pancreas</td>
<td>Deficiency in insulin</td>
<td>Body cannot utilize sugar, level of sugar in the blood increases, person too weak.</td>
</tr>
</tbody>
</table>

Apart from these hormonal diseases, there are some diseases which are also caused by some other internal factors. These are genetic diseases or genetically transmitted diseases. Haemophilia is a genetic disease in which the blood does not clot easily. Sickle cell anaemia is also a genetic disease, in this disease red blood corpuscles become sickle-shaped due to a defective type of haemoglobin and hence their oxygen-carrying capacity is greatly reduced.

![Normal R.B. Cells](image1)

![Sickle-shaped cell of haemoglobin](image2)

Fig. 9.1

This disease is prevalent among people living in some parts of Africa. In India, it also occurs in the tribal areas of M.P., Bihar and some parts of Maharashtra.

You must have noticed that when few people are exposed to pollen grains or any other such particles, they start sneezing and have difficulty in breathing. Similarly, when some people eat a protein-rich diet, they develop rashes on the body. What are these reactions?

The sensitivity of a person to certain substances like dust, pollen, grains, certain foods like eggs, serum and certain drugs is called allergy. It should be noted that these substances may be harmless to other people. Hence, the unfavourable response of the body to certain substances is called an allergic reaction. Most such reactions can be avoided by taking precautions or by keeping away from them. The important disease caused by allergy is asthma. The cause of allergies is not yet clear.

Methods and Material Used

The topic of organic or metabolic diseases can be taught through the lecture-cum-discussion approach. Some questions can be raised to improve the discussion. Concepts are taught through the lecture method. Some charts related to the topic can be shown for clarity.
Check Your Progress

Notes: a) Write your answers in the space given below.
     b) Compare your answers with those given at the end of the unit.

15) Write any three major causes of organic diseases.

...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................

16) Identify which of the following diseases are organic diseases.
    Malaria, osteoporosis, influenza, diarrhoea, scurvy, AIDS, myopia, cataract, diabetes.

...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................

17) Osteoporosis is a disease of:
    a) Teeth  b) Bone  c) Nerves  d) Blood vessels

18) Name any two hormonal diseases.

...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................

9.5 LET US SUM UP

It has been mentioned that nutrition is a very important factor for health. Nutritious food provides all the nutrients which keep our body healthy. Inadequacy of nutrients in the diet may lead to deficiency diseases. A large number of people in our country suffer for malnutrition because they cannot afford to buy proper food. Adulterated food also affects our health. Adulterants which are mixed in our food material are injurious and toxic and sometimes may lead to death. F.P.O., I.S.I., and Agmark certificates check the purity of food materials. In addition, to extrinsic factors, intrinsic factors. Such as hormonal imbalances, genetic disorders etc., also cause disease.

9.6 UNIT-END EXERCISES

1. What are the various functions of nutrients? Explain with examples.

2. List major sources of vitamins and minerals.
3. How does roughage help in digestion?

4. What are deficiency diseases? Give five examples of these diseases?

5. What are the major diseases caused by mineral deficiency? Give one symptom of each disease.

6. Explain the term “food adulteration”? Name any four adulterants which are commonly used.

7. How can we detect lead chromate from haldi?

8. What are organic diseases? Give any two examples.

9. How are hormonal diseases different from genetic disorder? Explain.

10. What are food-borne diseases? How do these diseases differ from air-borne infections?

9.7 ANSWERS TO CHECK YOUR PROGRESS

1. Major components of food are - carbohydrates, proteins, fats, vitamins and minerals.

2. Balanced diet contains all the nutrients in the desired or required amount. It varies according to age and nature of work.


   Proteins - Body-building, repairing the wear and tear of parts of the body.

   C - All citrus fruits
   D - Milk, sunlight, fish
   K - Leafy vegetable, tomatoes, egg yolk.

5. i) Proteins - Kwashiorkor
   ii) Vitamin A - Night-blindness
   iii) Energy-giving Nutrients - Marasmus
   iv) Vitamin C - Scurvy
   v) Vitamin B₂ - Pellagra
   vi) Vitamin B₁₂ - Bad skin

6. Kwashiorkor - Marasmus
   1. Oedema of the body - No oedema
   2. Skin becomes dark in colour - No change of skin colour
   3. No wasting of muscles - Wasting of muscles
   4. Usually occurs in 1-5 years old children - Usually upto 1 year of age.

7. Disease - Symptoms
   Anaemia - Looks pale, feels tired, loss of appetite, loss of weight.
   (Oedema of the body)
Teaching Learning of Concepts in Science

8. Food Material Adulterant

<table>
<thead>
<tr>
<th>Material</th>
<th>Adulterant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edible oil</td>
<td>Argemone oil</td>
</tr>
<tr>
<td>Zeera</td>
<td>Wild seed, straw, mud, stones</td>
</tr>
<tr>
<td>Haldi</td>
<td>Lead chromate, yellow colour</td>
</tr>
<tr>
<td>Honey</td>
<td>Saccharin</td>
</tr>
<tr>
<td>Arhar dal</td>
<td>Kesri dal, metanil yellow colour</td>
</tr>
</tbody>
</table>

9. Adulterants are low quality, cheap and toxic substances. These lower the quality of the food material, while preservatives (mainly chemical) are used to save food products for a longer period of time. They are used in a very small quantity and do not affect health too much.

10. F.P.O - Food Products of India
     I.S.I.- Indian Standard Institution
     Agmark - Agricultural Marketing.

11. i) Water-borne disease Disease agent

   Viral hepatitis - Virus

   ii) Air-borne disease

   Chicken-pox - Virus

   iii) Food-borne disease

   Typhoid - Bacteria.

12. Polio - Air-borne
     Cholera - Food-borne
     Typhoid - Food-borne
     Viral Hepatitis - Water-borne
     Amoebiasis - Food-borne
     Influenza - Air-borne

13. a)

14. The major cause of infectious disease are micro-organisms.

   The deficiency disease is caused by lack of nutrients in the diet e.g., carbohydrates, fats, proteins, vitamins and minerals.

15. i) Genetic disorder.

   ii) Hormonal imbalance.

   iii) Malfunctioning of body organs or organ systems.
16. Osteoporosis - Organic disease
   Myopia - do-
   Cataract - do-
   Diabetes - do-

17. b)

18. i) Dwarfism
    ii) Cretinism

9.8 SUGGESTED READINGS

Science Textbook for Class X, NCERT Publication.

