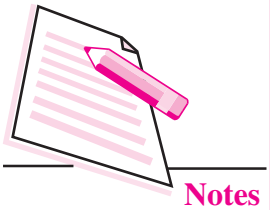


Notes

28

NUTRITION AND HEALTH

Food is the basic necessity of life. We all know that regular supply of food is essential for human beings in order to keep fit and to carry on all the life processes. We eat a large variety of food according to our taste, availability and body requirement. In this lesson we will learn about nutritional requirement of the body and the problems of health related to specific deficient nutrition.

OBJECTIVES

After completing this lesson you will be able to :

- *define the terms food, nutrition and disease;*
- *explain the biological significance of food;*
- *differentiate between micro- and macronutrients;*
- *list the sources and describe the functions of carbohydrates, fats, proteins, vitamins, minerals, water and roughage;*
- *explain the energy requirement of the body;*
- *emphasise the need of balanced diet especially for growing children, persons in different occupations and lactating mothers;*
- *list the common deficiency diseases PEM, minerals and vitamins; deficiency, obesity, hypervitaminosis, their symptoms and recommended food sources.*

28.1 WHAT IS FOOD

Food is any substance which performs the following functions in the body :

(i) yields enegy for life processes,

(ii) builds up new cells during growth,

(iii) repairs worn out (damaged) tissues,

(iv) aids in production of useful body compounds.

Biological Classification of Food

Food can be classified into three categories based on their functions (Table 28.1)

(i) Energy providing foods

(ii) Body building foods

(iii) Protective/regulatory foods

(i) **Energy providing foods** : These are rich in carbohydrates and fats and provide energy on biological oxidation in the body. Example : cereals, sugar, fats, oils, jaggery, coconut, and groundnuts.

(ii) **Body building foods :** These are rich in proteins and help in the formation of new tissues. Example : legumes, milk, egg, meat, fish, pulses, nuts and oilseeds.

(iii) **Protective/regulatory foods :** These are rich in minerals, vitamins, roughage and water. They help in regulaiton of internal metabolism in the body. Example : green leafy vegetables, fruits, amla, guava, citrus, oranges and water melon.

Table 28.1 The three food groups

Food group	Major nutrients	Food sources
Energy providing food	Carbohydrate and fats	• Cereals (rices, wheatm maize) • Sugar • Fats (oil and ghee) • Jaggery
Body building food	Proteins	• Milk • Legumes • Egg white • Meat (chicken, mutton, fish)
Protective food	Minerals and vitamins	• Green leafy vegetables • Roughage such as fruits, beans and other lagumes. • Amla, guava, citrus, orange, etc.

28.2 NUTRITION

Nutrition is the sum of the processes by which an organism takes in, metabolises and utilises food substance for its various biochemical activities.

Nutrients are the organic or inorganic substances which help in our survival and in maintaining proper health. A nutrient supplies energy to the body, builds and repairs body tissues and regulates the body metabolism.

On the basis of quantity required by the body, nutrients are classified into two categories :

(i) Macronutrients (ii) Micronutrients

Macronutrients (Nutrients required in a large amount) : Carbohydrates, fats, proteins and water contained in food comprise macronutrients.

Micronutrients (nutrients required in small amount) : Vitamins and minerals form only a small fraction of the total weight of the food.

One molecule of glucose yields 38 ATP molecules
1 ATP gives 34 kJ
∴ 1 mole of glucose yields $38 \times 34 = 1292$ kJ upon complete biological oxidation

Let us learn in some detail about these nutrients.

28.2.1 Carbohydrate

Carbohydrates are the chemical compounds made up of carbon, hydrogen and oxgyen. They release energy on biological oxidation with the help of cellular enzymes. They are the cheapest source of energy. Complete biological oxidation of one gram of carbohydrate yields about 18 kilo joules of energy. One kilo calorie of heat is required to raise the temperature of 1 litre of water through 1°C.

1 kilocalorie = 4.18 kJ

1 kilojoule = 1/4.18 × 1000 calories

Carbohydrates in the diet provide about 60-80% of total energy required by our body.

Types of carbohydrates

The three types of carbohydrates that we consume in our food are :

(i) sugars (ii) starch (iii) cellulose (Table 28.2)

Table 28.2 Carbohydrates required in our diet

Carbohydrates			
Sugar		**Starch**	**Cellulose**
Monosaccharides Glucose (found in molasses, honey and sweet fruits like grapes) Fructose (Found in honey and ripe fruits)	Disaccharides Sucrose (found in sugarcane and sugar beet) Maltose (found in sprouted cereals) Lactose (found in milk)	Storage form of carbohydrates (found in cereals, grains, seeds, roots, potato, rice, wheat, barley, maize, nuts etc.)	Found in cellulose of plants, seed coats, fruits, vegetables and cereals

Common sources of carbohydrates

- **Starch**

  Cereals (wheat, rice, maize), millets (bajra, jowar, barley), roots and tubers (sweet potato, tapioca, potato)

- **Sugar**

  Cane sugar, beet root, fruits (banana, mango, sapota or chiku), milk, honey, and cereals.

- **Cellulose**

  Cell walls of fruits, vegetables, and cereals

  During digestion both starch and sugars are absorbed as glucose. The surplus glucose is changed into glycogen which is stored in the liver for subsequent use. (For detail refer to lesson 13)

  Cellulose is a fibrous substance which is not digested by human body. However, it serves as roughage and facilitates bowel (stool) movement.

  A normal person needs about 400-500 grams of carbohydrates daily in the diet. A growing child, a lactating mother and a person doing hard physical work need more carbohydrates than an average person because of their greater energy requirements. The percentage of carbohydrates in different food items is given in table 28.3 below :

Table 28.3 Percentage of carbohydrates present in some common food items

Food	Percentage (per 100 g of food)
Sugar	99.4
Rice	78.2
Wheat flour	69.4
Potato	22.7
Banana	24.7
Mango (ripe)	11.8
Green gram	69.4
Red gram	57.6
Carrots	1.6
Cow's milk	4.4

Functions of carbohydrates

- Lactose sugar promotes growth of intestinal bacteria that facilitate the absorption of calcium.
- Excess carbohydrates are converted into glycogen and fat and serve as reserve sources of energy.
- Cellulose provides faecal bulk and helps in bowel movement.
- Glucose is the only source of energy for the central nervous system.

28.2.2 Fats

Fats are members of lipids. Like carbohydrates, fats are also made up of carbon, hydrogen and oxygen. However fats contain more carbon and hydrogen and less oxygen. Fats are the richest source of energy. Fats are insoluble in water but soluble in solvents like acetone, and benzene. Chemically fats are triglycerides.

One gram of fat on biological oxidation gives about 9.0 kcal (37 kilojoules) of energy.

Sources :

Animal sources : Ghee, butter, fish oil, meat, egg.

Plant sources : Vegetable oil from the seeds of coconut, mustard, sunflower, safflower, milk, nuts, soyabean, cheese.

Functions of fats

- fats are the richest sources of energy. On biological oxidation, one gram of fat provide 37 kJ of energy.
- Form structural components of cell cytoplasm and cell membrane.
- help in absorption of fat-soluble vitamins A, D, E and K
- act as precursor of various hormones.
- can be stored for subsequent use by the body.
- sub-cutaneous fats serve as insulators in the body thus protecting it from cold weather and pressure.
- stored fat provides padding to protect the vital organs of the body from shocks.
- help in the synthesis of vitamin D and steroid hormones in the body.

28.2.3 Proteins

Proteins are extremely large molecules composed of many amino acids. Proteins are complex organic compounds rich in carbon, hydrogen, oxygen, nitrogen and sometimes phosphorous and sulphur also.

Proteins are needed by the body for :

- growth and development
- repair and maintenance
- the synthesis of antibodies, enzymes, and hormones

They can also be used as a source of energy. 1 gram of protein yields about 4 kcal of energy. Building blocks of proteins are the amino acids. You have already learnt in lesson one that there are only about 22 different amino acids of which almost all proteins found in living organisms are made. Nutritionally, amino acids belong to two categories :

(a) **Essential amino acids :** These are the amino acids which can not be synthesised in the animal body and must be supplied with food e.g. leucine.

(b) **Non essential amino acids :** which can be synthesised in the body particularly from carbohydrates and need not be supplied in the diet. e.g. alanine.

Digestion of protein

Like fats, proteins can not be absorbed in the tissue until they are broken down into their amino acids. Digestion of proteins occurs in stomach and small intestine where acids and enzymes break up proteins into amino acids.

Sources :

Animal sources : Milk, egg, fish, bean, meat, and liver. contain adequate amount of essential amino acids.

Plant sources : Whole cereals (wheat and maize), pulses, nuts, grams, and legumes.

Intake of more than one plant protein in the same meal (dal-roti, sambar-idli) can produce a mixture containing all the essential amino acids.

Proteins are structural components of body. For example, protein **keratin** is present in hair and nails. Collagen present in the connective tissue is also an example of protein. Actin and myosin are examples of contractile proteins present in the muscles.

Functions of proteins

- Proteins are required for building and maintaining body tissues.
- Proteins are found in all the enzymes e.g. Trypsin, pepsin and rennin.
- Some proteins function as hormones, to regulate many body functions. For example, insulin is a hormone which regulates blood glucose level in the body.
- Proteins also act as antibodies and protect the body from antigen (foreign agent).
- Transport protein carries different substances from blood to the tissues in the body. Haemoglobin is a transport protein.

28.2.4 Vitamins

Vitamins are complex chemical substances required by the body in very small amounts. They do not yield energy but act as biocatalysts in the body. They are essential for good health and protect the body from various diseases. They are essential for the utilisation of other nutrients that we take in our diet.

Vitamins are grouped into two classes :

(a) Water soluble vitamins are vitamins B complex and C

(b) Fat soluble vitamins are vitamins A, D, E and K

Since vitamins cannot be made in our body except for vitamin D, they need to be supplied through food that contain them. Table 28.4 lists the vitamins and their sources as well as the daily requirements in the body, deficiency diseases and symptoms in 13-15 year old boys and girls.

Table 28.4 Vitamins : their functions, sources and deficiency diseases.

Vitamin	Daily requirement	Function	Best food sources	Deficiency diseases	Symptoms
		1. Water Soluble Vitamins			
Vitamin B_1 (Thiamine)	1.3 mg (boys) 1.2 mg (girls)	Carbohydrate metabolism; sharpens appetite; functioning of heart, nerve and muscles	Yeast; liver; milk; cheese; leafy vegetables; meat; whole grain cereals	Beri-beri	Pain in hands and feet. Swelling of body. Paralysis of limbs. Oedema.
Vitamin B_2 (Riboflavin)	1.6 mg (boys) 1.4 mg (girls)	Carbohydrate and protein metabolism; keeps skin healthy;	Milk; liver meat; eggs peas; yeast; whole grains; green leafy vegetables.	Riboflavinosis; photophobia	Retarded growth and mental disorder. Cracking of skin at corners of mouth. Lesions of eyes.
Vitamin B_3 (Niacin)	1.8 mg (boys) 1.5 mg (girls)	Coenzyme for protein, fat and carbohydrate metabolism. Keeps the skin healthy.	Fish; eggs; meat; legumes; whole grains; leafy vegetables; peanuts; bean; tomato; potato.	Pellagra	Dermatitis (bad skin), diarrhoea (loose motions) dementia (mental disorder).
Vitamin B_{12} (Cyanocobalamine)	0.2-100 mg	Blood formation, Nervous tissue metabolism, Nucleic acid synthesis.	Liver; fish; cheese; milk; eggs; meat.	Pernicious anaemia.	Paleness of skin; breath lessness; retarded growth.
Vitamin C (Ascorbic Acid)	40 mg	Resistance to infections; keeping teeth, gums and joints healthy; healing of cuts and wounds; maintenance of connective tissue.	Amla, cabbage; tomatoes, lemon; orange; mangoes; chillies, guava, pineapple; sprouted grams.	Scurvy	Bleeding gums; pain in joints; general weakness.
		2. Fat Soluble Vitamins			
Vitamin A (Retinol)	750 mg	Maintenance of vision and skin; Essential for synthesis of visual pigment	Milk, cheese, butter, eggs codliver oil, carrots mangoes papaya, yellow pumpkin spinach, sweet potato	Night blindness. Xerophthalmia or keratinol acid. Dry skin	Cannot see in dimlight, (night blindness); Retarded keratinization of epithelia

Vitamin D (Calaciferol)	200 IU	Keeps teeth and bones healthy, absorption of calcium and phosphorus	Milk; cheese; egg yolk; cod liver oil, fish; butter; expo sure to sunlight.	Rickets in children; (Fig. 28.1) Osteomalacia in adults	Failure of growing bones to calcify; bow legs pigeon chest; softening of bones Painful bones; spontaneous fracture.
Vitamin E (Tocopherol)	Trace	antioxidant; ageing vitamin	Grains vegetable oil, green leafy vegetables, nuts, liver	reproduction failure in males and females	Sterlity in males, miscar-riage, or death of embryos during pregnancy in females.
Vitamin K (Phylloqu-inone)	Trace amount	Clotting of blood	Green leafy vegetables; soyabean; tomatoes.	Faulty blood clotting; haemorrhage.	Delayed blood clotting.

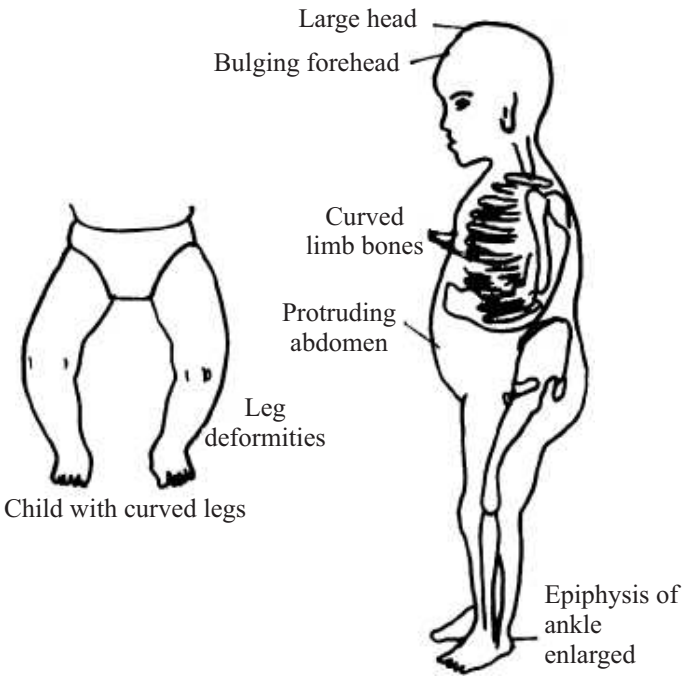


Fig. 28.1 Child with rickets

28.2.5 Minerals

Minerals are micronutrients required in varying amounts for proper functoning, normal growth and keeping good health of our body. They are inorganic elements, occuring in the form of their salts e.g. calcium, potassium, sodium, phosphorus, iron etc. They do not supply energy to our body but are essential for protection against diseases and also have role in body functions.

Minerals	
Required in larger amounts	**Required in trace amounts**
Calcium, Phosphorus Sodium Potassium, Sulphur Chloride, Magnesium.	Iron, Iodine, Zinc, Chromium Cobalt, Copper, Fluoride, Manganese, Molybdenum Selenium, and Boron

Functions

Minerals perform the following functions :

- Essential for development of bone and teeth e.g. calcium, phosphorus.
- Regulate the fluid balance and acid alkalinity of body fluids e.g. sodium, potassium, chloride.
- Iron is major component of haemoglobin, which helps in transport and release of oxygen.
- Iodine is required for the synthesis of thyroid hormone thyroxine, which regulates the rate of oxidation energy sources within cells.
- Zinc, coper and magnesium regulate a host of vital reactions in our body.

Table 28.5 Lists the minerals, their sources, function, deficiency diseases and symptoms

Table 28.5 Minerals required by and in our body, their sources and functions

Minerals	Functions	Food sources	Deficiency diseases	Symptoms
1. Calcium	Formation of bones and teeth, necessary for nerve, teeth and muscles	Milk and milk products; fish; meat; beans; green leafy vegetables; brocolli, tapioca; cereals.	Rickets; Oesteomalacia loss of teeth	Softening of bones; deformities; pain in bones; enamel.
2. Iron	Formation of haemoglobin; acts as carrier of oxygen.	Liver; green leafy vegetables; eggs, spinach; groundnuts; cereals; jaggery.	Anaemia.	Loss of weight; pale appearance; tiredness; loses of appetite.
3. Phosphorus	Formation of bones and teeth	Milk; cereals; green leafy vegetables; nuts, bajra meat.	Rickets and Oesteomalacia;	Softening of bones; bowlegs; pigeon chest.

4.	Iodine	Metabolic control of hormone thyroxine; controls growth and mental ability.	Iodized salt; sea food; fish; green leafy vegetable	Goitre (Fig. 28.2)	Enlargement of thyroid gland; retarding of physical and mental growth.
5.	Sodium and Potassium	Maintenance of normal water balance in the body; associated with conduction of nerve impulse.	Common salt; meat; poultry; fish; fruits; cereals; egg; spinach; pulses; potato; yoghurt.	High blood pressure; Oedema; Osmotic pressure disturbed.	Severe malnutrition; high blood pressure; fatigue; loss of appetite; vomiting.

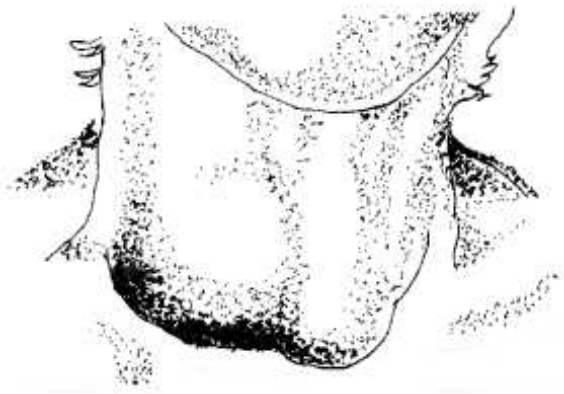


Fig. 28.2 Patient with goitre

28.2.6 Water

Water is an important constituent of our diet. 75% of an infant body and 60% of an adult body is nothing but water. Various functions of water are as follows.

- essential for the transport and digestion of food material.
- excretes wastes.
- maintains the body temperature.
- acts as solvent in various reactions in the body.

Sources of water

Water is replenished by :

- drinking of plain water or of tea, coffee, milk and fruit juices.
- eating fruits, vegetables and fish.
- some amount of water comes as a by-product of oxidation of glucose in the body.

28.2.7 Roughage

Roughage is the fibre present in some food items like fruits and vegetables. Though roughage is not a food, it forms an important part of our diet. Roughage consists mainly of cellulose.

Function

- It helps in bowel movement.
- It cleans our digetive tracts and protects the body from digestive ailments.
- It prevents constipation.
- It helps in retaining water in the body.
- It helps in maintaining optimum levels of blood sugar and cholesterol.

INTEXT QUESTIONS 28.1

1. Define nutrition and nutrients

   .....

2. Name the various nutrients of food.

   .....

3. Differentiate between macronutrients and micronutrients

   .....

4. Name the following :

   (i) two water soluble vitamins

   .....

   (ii) two sources of roughage

   .....

   (iii) two sources of proteins

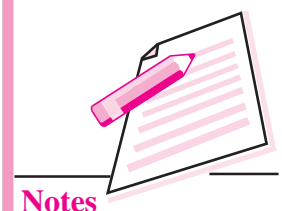
   .....

5. If equal amount of sugar and butter are consumed, which one will provide more energy?

   .....

28.3 ENERGY REQUIREMENTS OF THE BODY

Our body needs energy to carry on various activities of life. We get this energy by eating food.



The energy requirement of an individual depends on various factors like age, sex, amount of work done (occupation), special needs like pregnancy and lactation. The average daily requirements of our body for different age groups are given below.

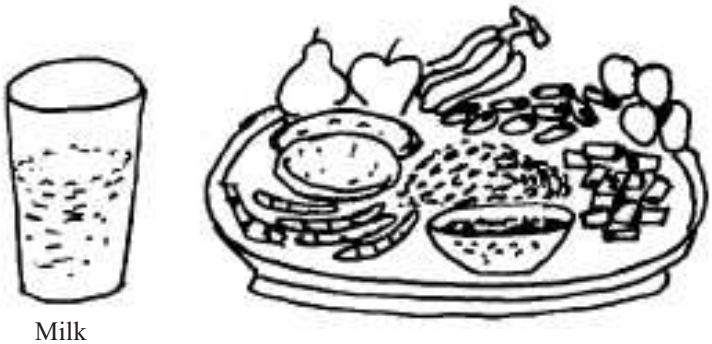
Table 28.6 Energy requirements of body

Group	Sex	Age/Profession	Required calories
Infants	-	0-12 months	100-120/kg body weight
Children	-	2-6 years	1200-1800
		7-12 years	1800-2000
Adolescent	Boys	13-15years	2500
	Girls	13-15 years	2200
Adult	Man	Sedentary work	2400
		Moderate physical work	2800
		Heavy physical work	4000
	Woman	Moderately active	2400
		Pregnancy (later half) during lactation (upto 1 year)	3300 3700

Growing children, persons engaged in hard physical work (labourers), pregnant women, lactating mothers, sportsman, persons recovering from illness and persons working in cold weather require more energy.

28.4 BALANCED DIET

You have studied that our balanced diet consists of all the nutrients in varying amounts. (Fig. 28.3)



Milk

Apple, chapati, green vegetables, eggs paneer, dal, rice, banana

Fig. 28.3 Sample of a balanced meal.

To maintain proper health, one needs the right type of food in right quantity. The need generally varies with age, sex, type of work and state of body, (See Table 28.6).

A balanced diet is one that contains all essential nutrients in suitable proportion and amount to provide necessary energy and keeps the body in a healthy state.

A balanced diet has the following qualities :

– it meets the nutrient requirement of the body,

– it consists of different types of food items,

– it provides adequate amount of energy,

The box given below shows recommended dietary requirements according to age, sex and different physical activities.

Recommended dietary requirements (in gram) according to age, sex and different physical activities

Food items	Adult man			Adult woman			Children		Boys	Girls
	Seden-tary	Moderate Work	Heavy Work	Sede-tary	Moderate Work	Heavy Work	1-3 years	4-6 years	10-12 years	10-12 years
Cereals,	460	520	670	410	440	570	175	270	420	380
Pulses	40	50	60	40	45	50	35	35	45	45
Leafy vegetables	40	40	40	100	100	50	40	50	50	50
Other vegetables	60	70	80	40	40	100	20	30	50	50
Roots and tubers	50	60	80	50	50	60	10	20	30	30
Milk	150	200	250	100	150	200	300	250	250	250
Oils and fats	40	45	65	20	25	40	15	25	40	35
Sugar and jaggery	30	35	55	20	20	40	30	40	45	45
Fruits	20	30	30	30	30	30	5	10	10	10

28.4.1 Balanced diet for special needs

Balanced diet varies with age, occupation, and state of health. Under special conditions more food is required by an individual. Let us learn about it.

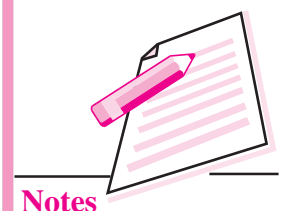
1. Nutritional needs for growing children

Growing children need more food in proportion to their body weight. They need –

(i) extra protein to make new tissues for growth,

(ii) more calcium and phosphorous for formation of bones and red blood cells,

(iii) vitamin A for development of healthy eyesight,



(iv) vitamin C for general health, and

(v) vitamin D for healthy bones.

2. Nutritional needs for persons in different occupations

Persons doing hard physical work like rickshaw pullers, labourers, carpenters, mill workers. require food which is rich in energy (carbohydrates and fats). Similarly, athletes also require diet of high energy value.

3. Nutritional needs during pregnancy and lactation

A pregnant women has to feed the developing embryo, therefore, she has special need for extra nutrients.

The pregnant women and lactating mothers should take,

(i) extra protein for tissue growth

(ii) more calcium and phosphorus to form bones of the baby

(iii) more iron for making sufficient blood of the baby

(iv) more carbohydrates for herself because extra energy is required to carry out all the building processes linked with embryo.

Similarly, nursing mothers (who breast feed their babies), also need a special diet to take care of their additional requirements of lactation (milk formation). So their diet should contain more proteins, calcium and vitamins.

4. Nutritional needs depending upon the state of health

The persons recovering from illness need more proteins, minerals and vitamins in their diet to repair the damage caused by the ailment. If there is loss of blood due to surgery or an accident the patient needs more of proteins and iron to make up for the loss of blood.

28.5 WHAT IS HEALTH AND DISEASE?

According to the World Health Organisation (WHO), health is defined as:

Health is a state of complete physical, mental, and social well being and not merely absence of disease or infirmity.

Disease :

Disease is a malfunctioning process related to a certain part of the whole body in which normal functions are disturbed or damaged. Disease literally means not at ease (dis = not)

Deficiency diseases :

The diseases which occur due to deficiency of one or more nutrients (proteins,carbohydrates, vitamins and minerals) in our diet are called **deficiency diseases**.

Malnutrition : The condition resulting from lack of nutrients in the diet is called malnutrition.

A large number of people in our country suffer from malnutrition. Malnutrition affects the health of the children adversely as it results in physical and mental retardation.

The deficiency diseases are of three types :

- Protein Energy Malnutrition (PEM)
- Mineral deficiency diseases.
- Vitamin deficiency diseases.

Let us learn in some detail about some of these diseases:

28.5.1 Protein energy malnutrition (PEM)

Generally the growing children suffer from protein energy malnutrition as the required amount of proteins needed for their growth and development is not available. A number of children in the age group of 1-5 years suffer from this disease. PEM is due to two reasons :

(a) Lack of proteins or carbohydrates or both in the diet.

(b) More intake of carbohydrates than proteins.

Protein energy malnutrition results in two diseases :

(i) Marasmus, and

(ii) Kwashiorkor

Marasmus

It is caused due to the deficiency of carbohydrates, fats and proteins. It usually affects infants below the age of one year (Fig. 28.4a)

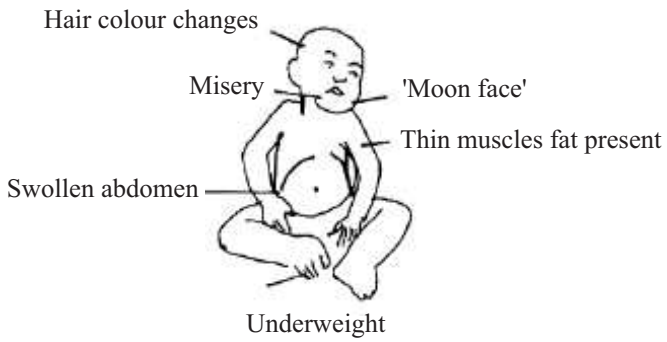


Fig. 28.4(a) A child suffering from marasmus

Symptoms

– wasting of muscles reduces the child to skin and bones.

– folded skin.

– sunken eyes, thin face, thinning of limbs and abdominal walls.

– retarded physical and mental growth.
– ribs become prominent (Pigeon chest).
– Oedema and skin pigmentation are absent.

Kwashiorkor

This disease develops when mothers stop feeding their babies with breast milk and the child is given traditional family food having low protein in it. (Fig. 28.4b)

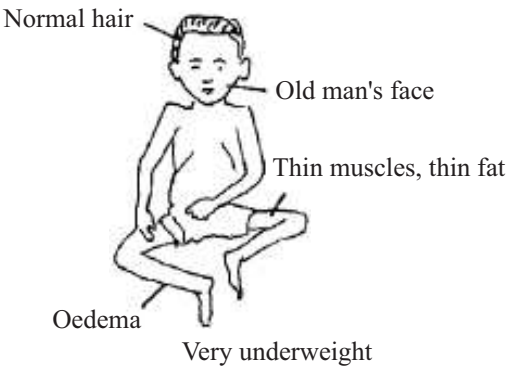


Fig. 28.4(b) A child suffering from kwashiorkor

Symptoms :

A child suffering from Kwashiorkor disease shows the following symptoms

– under weight
– has protruding bellly
– the skin is dark and scaly
– has enlarged liver
– has anaemia
– suffers from repeated diarrhoea
– stunted growth
– loss of appetite
– hair becomes reddish
– swelling of legs and feet due to retention of water by the cell (oedema)

Cure : The child suffering from kwashiorkor and marasmus can recover if adequate protein and carbohydrate rich food is given.

28.6 MINERAL DEFICIENCY DISEASES

Common deficiency diseases of iron, calcium and iodine are given below:

Anaemia (Iron deficiency) : Iron is important for the formaiton of the respiratory pigment **haemoglobin** present in blood. Deficiency of iron results in reduction of red blood cells. This reduces the oxygen carrying capacity of blood.

A person suffering from Anaemia becomes pale, tires easily, loses appetite and loses weight.

Cure : This disease can be cured by eating food stuff rich in iron and vitamin B12, e.g. eggs, meat, liver, milk, green leafy vegetables, such as spinach and fruits like apple, banana, guava (Iron tablets and tonics can also supplement the food).

Deficiency of calcium, phosphorus and vitamin D

Calcium : Chief constituent of bones and teeth, regulates heart beat and muscle contraction, helps in the clotting of blood. Calcium metabolism is closely related to that of phosphorus and vitamin D.

Deficiency of calcium causes : Rickets in children and Osteomalacia in adults.

Rickets (See Figure 28.2)

(i) The bones become soft, get deformed or bend easily,

(ii) bow legs (bent legs),

(iii) pigeon chest,

(iv) loss of teeth enamel (outer shiny layer in teeth), and

(v) tender (soft) bones that tend to fracture easily.

Osteomalacia :

The persons suffering from osteomalacia show

(i) softening of bones

(ii) pain in bones which tend to fracture easily.

Cure : Rickets and osteomalacia can be prevented by giving diet rich in calcium like milk, cod liver oil, egg yolk, and green leafy vegetables.

Goitre

Iodine is essential for the synthesis of thyroxine (hormone produced by thyroid gland). Iodine deficiency causes thyroid gland to enlarge and swell, this is called goitre. (Fig. 28.3).

Symptoms

The person suffering from goitre has

(i) protruding eyes,

(ii) stunted growth,

(iii) puffy appearance

(iv) irregular heart beat

(v) low intelligence

(vi) deficiency of iodine results in another disease called cretinism

Cure : Use of iodised table salt and eating sea food, and fish.

Cretinism

The person suffering from cretinism shows stunted growth, retarded mental growth, delayed puberty and low metabolic rate.

28.7 VITAMIN DEFICIENCY

If the diet is deficient in one or more vitamins like A, B complex, C, D, E and K, it leads to a variety of diseases as given in table 28.3

INTEXT QUESTIONS 28.2

1. Define malnutrition.

   .....

2. What is PEM ? Name two diseases caused due to PEM.

   .....

3. A person has low haemoglobin content, tires easily and looks pale. Name the disease he is suffering from.

   .....

4. Give two food items which can prevent vitamin D deficiency.

   .....

28.8 OBESITY AND EXCESSIVE INTAKE OF FOOD

If a person continues to eat more food than required by his body, he soon becomes overweight and bulky. Excess of carbohydrates and fats instead of providing energy get accumulated in the body.

The overweight and bulkiness of a person's body due to accumulation of carbohydrate and fat is called obesity.

Causes of Obesity

(i) Overeating

(ii) Insufficient exercise

(iii) Hormonal imbalance (deficiency of thyroxine) or other metabolic disturbances.

Harmful effects

An obese person tends to have high cholesterol (fatty substance) deposited in blood arteries. This leads to **hypertension** (high blood pressure) **atherosclerosis** (hardening of arteries), **coronary attack** (heart attack), diabetes and respiratory problems.

Methods to prevent obesity

The obese person should be very careful about diet. Some suggestions are :

(i) avoid fried food

(ii) not to take carbohydrate rich foods

(iii) not to take saturated fats like ghee and vansaspati hydrogenated vegetable oils. Instead, take unsaturated fats like oils, and that too in as little quantity as possible.

(iv) take regular physical exercise.

(v) eat green leafy vegetables (to add roughage).

(vi) if suffering from hormonal imbalance, take the advise of a physician

Effects of excessive intake of Iron

It leads to a condition called hemosiderosis (large deposits of iron in the liver). This may cause

(i) Constipation and diarrhoea (ii) Nausea and vomitting

(iii) Heart burn (iv) Epigastric pain

Effect of excessive intake of vitamins (Hyper vitaminosis)

Some persons tend to take vitamins in excess amounts. An excessive intake of water solouble vitamins (vitamins B complex and C) may not cause any harm to the body because they are excreted out through urine. Intake of fat soluble vitamins (vitamin A and D) can be toxic (poisonous) to the body which may lead to certain diseases.

The disease caused by presence of vitamins in excessive quantities in the body is called **hypervitaminosis.**

Hypervitaminosis A

Excess vitamin A accumulation in liver is toxic. This results in

(i) loss of hair (ii) drowsiness

(iii) painful swelling of long bones (iv) loss of appetite,

(v) nausea and vomitting.

Hypervitaminosis D

Excess of vitamin D leads to high calcium absorption in the intestine. This results in :

(i) deposition of calcium in soft tissues of body like kidney,

(ii) drowsiness,

(iii) nausea,

(iv) loss of weight.

So we find that both, deficiency and excess of nutrients is harmful to the body.

INTEXT QUESTIONS 28.3

1. List any two causes of obesity.

(i) .....

(ii) .....

2. Suggest two methods to prevent obesity

   (i) .....

   (ii) .....

3. Mention two symptoms of excessive intake of Iron.

   (i) .....

   (ii) .....

4. Define hypervitaminosis. Name two vitamins which when taken regularly in diet cause hypervitaminosis.

   (i) .....

   (ii) .....

WHAT YOU HAVE LEARNT

- Food is required for the proper growth and development of the body.
- Food provides nutrients required for a healthy body.
- Carbohydrates, fats, proteins and water are macronutrients whereas vitamins and minerals are micronutrients. In addition, roughage is also as important component of our diet.
- Food has six major components
- Food can be classified into three types : Energy giver-carbohydrates and fats, body building-proteins, protective/regulatory-minerals and vitamins.
- The requirement of energy and different nutrients for the body are needed according to age, sex and profession as well as state of the body.
- A balanced diet provides proper amount of carbohydrates, fats, proteins, minerals, water and vitamins in food.
- A balanced diet is essential for proper growth and health of an individual.
- Malnutrition is the lack of essential nutrients or food elements in the diet. It results in deficiency diseases.
- an excessive intake of fat solutble vitamins A and D results in hypervitaminosis.
- An excessive intake of food for prolonged periods results in obesity. An obese person suffers from cardiovascular diseases, respiratory problems and diabetes.

TERMINAL EXERCISES

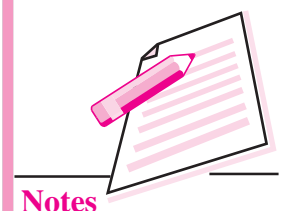
1. Differentiate between
   (i) Marasmus and Kwashiorkor.
   (ii) Rickets and Osteomalacia
   (iii) Essential and non-essential amino acids
   (iv) Body-building and protective foods.
   (v) Water soluble vitamins and fat soluble vitamins.
2. Give reasons why do children of 1-5 years develop **PEM**.
3. Why one should include more than one type of proteins in the meals?
4. What is the importance of water in the diet ?
5. What is a balanced diet ? Why does a pregnant women or a nursing mother needs special diet ?
6. Why should food contain roughage ? Name two sources of roughage in our diet.
7. Why is polishing of rice not advisable ? If a person always consumes polished rice, what is he likely to suffer from ? Give two sysmptoms.
8. State **four** important functions of food.
9. If a child is not able to see in dim light, which two food stuffs will you advise him to eat. Give reasons.
10. Name **two** sources rich in
    (i) Vitamin A (ii) Calcium (iii) iron
    (iv) Vitamin B12 (v) starch (vi) Glucose
11. What are minerals ? Name any two minerals and their sources.
12. What are deficiency diseases ? Name two diseases caused by the deficiency of protein and carbohydrates. Also write the symptoms of these deficiency diseases.

ANSWERS TO INTEXT QUESTIONS

28.1 1. Nutrition : Sum of the processes by which an organism takes in, metabolises and utilises food substances.

Nutrients : Substances which help in maintaining proper health and are required for the survival of an individual.

2. (a) Carbohydrates, fats, proteins, minerals, vitamins and water.



3. Nutrients required in large quantities are called macronutrients such as carbohydrates fats, proteins and water.

   Nutrients required in small amounts are micronutrients e.g. minerals and vitamins

4. (i) Water soluble-vitamin B and C (ii) leafy vegetables, fruits, (iii) milk, fish.

5. Butter

28.2

1. The condition resulting from lack of essential nutrients in diet is malnutrition

2. Protein Energy Malnutrition; Marasmus, Kwashiorkor

3. Anaemia

5. milk, cod liver oil, egg yolk, exposure to light (Any two)

28.3

1. Over eating, lack of exercises, hormonal imbalance.

2. Avoid fried food, carbohydrates, take regular exercise, eat green leafy vegetable (Any two).

3. Constipation, Diarrhoea, epigastric pain (any two).

4. Excess presence of vitamins in the body. vitamin A and D.