

Unit - 2

Nutrients in Food

Objectives :

- To study the important constituents of food and their functions
- To gain the knowledge about the diseases occurred due to the deficiency of nutrients
- To know the different sources of the nutrients
- To understand the energy value of food and various methods to calculate it
- To understand the terms BMI and BMR

“Good nutrition is a fundamental requirement for positive strong health, functional efficiency and productivity.”

Living systems are made up of various complex bio - molecules like carbohydrates, proteins, fats, vitamins and minerals, etc. Good nutrition involves an accounting of calories and other essential nutrients. These are required for human body and can be supplied in many ways. It is known that no universal food will satisfy all nutrient requirements. Humans consume a variety of foods such as cereals, pulses and legumes, nuts and oilseeds, fruits and vegetables, milk and milk products, meat and meat products, eggs and poultry, spices and herbs, etc. Upon consumption they undergo physio-chemical changes during digestion and absorption to supply energy and various other nutrients required by the body.

Contents at a glance

- 4.1 Classification of nutrients
- 4.2 Carbohydrates
- 4.3 Proteins
- 4.4 Fats
- 4.5 Vitamins
- 4.6 Minerals
- 4.7 Water

A-Z of Nutrients



Can you recall?

- 1) How are foodstuffs and nutrient useful for body?
- 2) What happens when people consume too little food?
- 3) How can people get vitamin from sunlight?

Food is any substance consumed to provide nutritional support for human being. It includes food intake, absorption, assimilation, biosynthesis, catabolism, and excretion.

Food is composed of Nutrients

- ❖ Nutrients are chemical components present in food that supply nourishment to the body. A nutrient must accomplish at least one of the following three functions:
 - Supply energy to the body.
 - Build, repair and maintain body tissues
 - Regulate body processes.

There are six main nutrients, which perform specific function in our body- Carbohydrates, Proteins, Fats, Vitamins, Minerals and Water.

4.1 Classification of Nutrients:

Nutrients are classified into two main groups according to the amount required.

- Macronutrients are required in relatively large amounts. These include carbohydrate, protein and fat.
- Micronutrients are required in smaller amount by the body. These include vitamins and minerals etc.

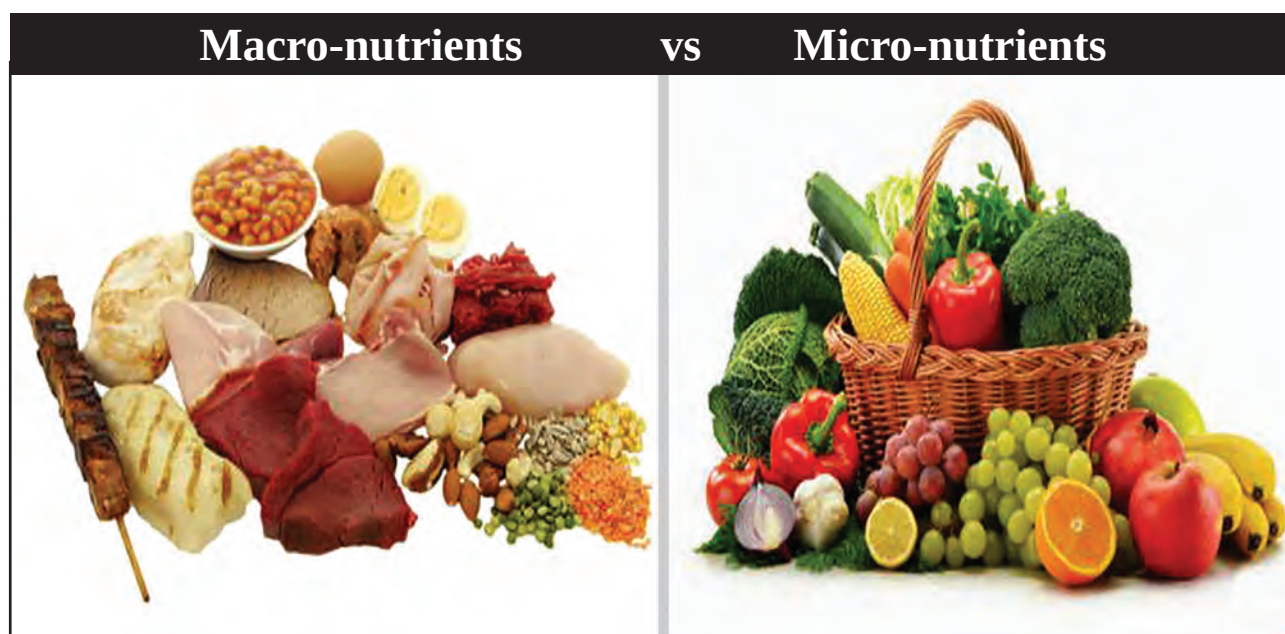


Fig. 4.1 : Sources of macro-nutrients and micro-nutrients

Table 4.1 Difference between Macro - nutrients and Micro - nutrients

Macro-nutrients	Micro-nutrients
1. Macronutrients are required in large amounts.	1. Micronutrients are required in small amounts.
2. Carbohydrates, proteins, fat, and water are examples of macronutrients.	2. Vitamins and minerals are examples of micronutrients.
3. Macronutrients contribute to the bulk energy needed for the metabolic system	3. Micronutrients assist in various functions of metabolic activities of body, growth and disease prevention.
4. Cereals, legumes, meat, fish, roots and tubers, nuts, oilseeds are rich in macronutrients.	4. Mainly, fruits, vegetables (green leafy vegetables) germinated food, fermented foods, etc are rich in micronutrients.

4.2 Carbohydrates:

Carbohydrates are main source of energy and present in major quantity in our foods. Carbohydrate is a chemical compound made up of elements-carbon, hydrogen and oxygen. The chemical building blocks (units) of carbohydrates are given below.

Classification of Carbohydrates

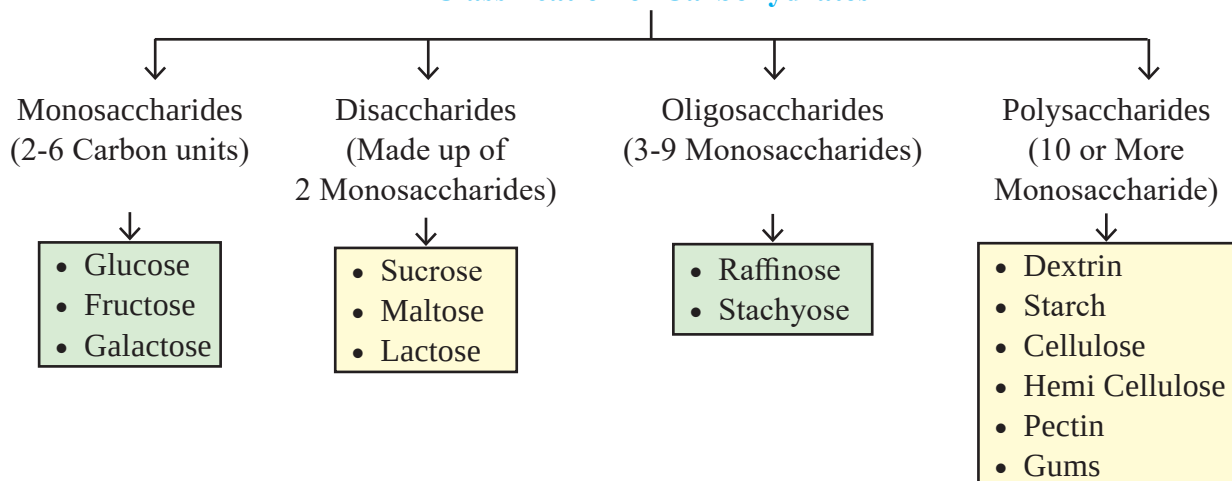


Table 4.2 Sources, functions, deficiency of carbohydrates

Sources		Functions	Deficiency disease
Plant	Animal		Marasmus
1. Cereals and Millets 2. Pulses and Legumes 3. Vegetables 4. Fruits and dry fruits 5. Sugar	1. Milk (Lactose) 2. Muscles and Liver (Glycogen)	1. To provide energy 2. Protein sparing action 3. Utilization of fat 4. Role in gastrointestinal function 5. Energy for brain	Symptoms: 1. Insufficient energy 2. Loss of weight in adults.

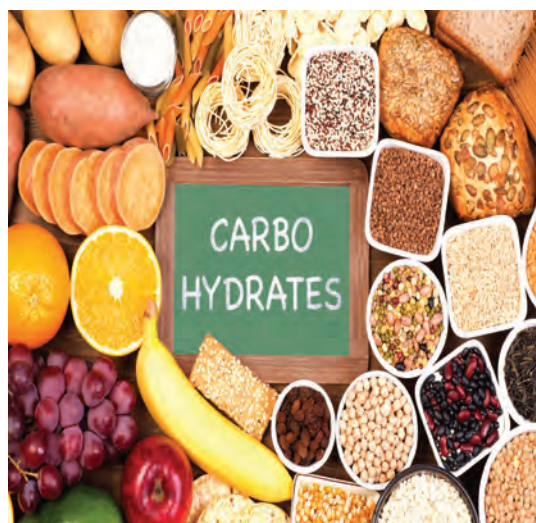
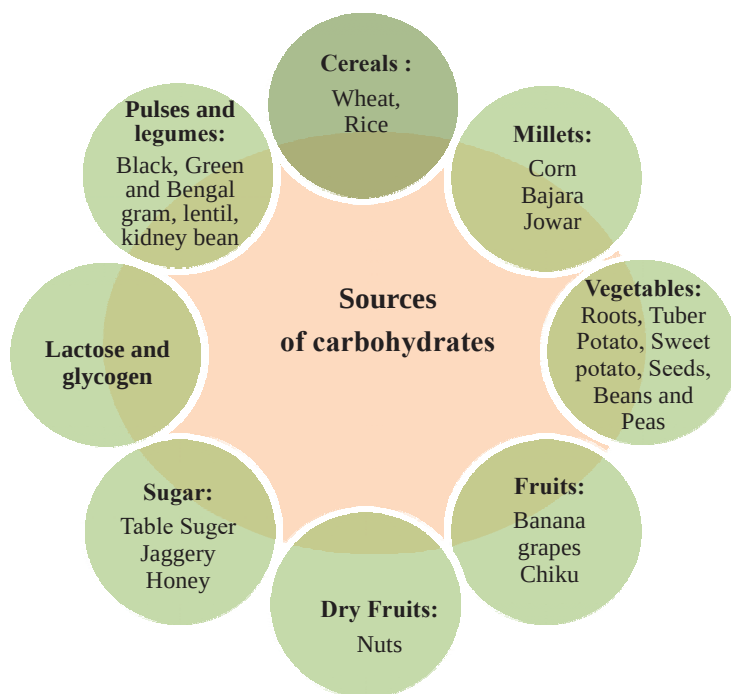


Fig. 4.2 : Sources of carbohydrate

Functions in detail:

1. **To provide energy**-The main function of carbohydrate is to provide energy. 1gram carbohydrate gives 4 kilocalories
2. **Protein sparing action**- Insufficient amount of carbohydrate will force the body to breakdown proteins for releasing energy instead of using them for their major functions i.e. body's growth and maintenance.
3. **Utilization of fat**-Carbohydrate is essential for proper utilization of fat from the diet.
4. **Role in gastro-intestinal function**- Carbohydrate encourages the growth of desirable intestinal bacteria and provides faecal bulk, which facilitates elimination.
5. **Energy for brain**- Carbohydrates supplies glucose to central nervous system to perform the body function.

Do You Know ?

The **Glycemic Index (GI)** is a relative ranking of carbohydrate in foods according to how they affect blood glucose levels. Carbohydrates with a low **GI** value (55 or less) are more slowly digested, absorbed, metabolised and cause a lower, slower rise in blood glucose e.g. oat products.

4.3 Proteins :

The word protein is derived from Greek word “Proteios”, which means prime or principal. Protein is the main component of all living cells. Protein is a complex organic compound. It contains the elements, carbon, hydrogen, oxygen and nitrogen. Some proteins contain sulphur, iron, phosphorus, iodine and copper.

Amino Acids: Proteins are made up of small units or building blocks known as amino acids. Protein consumed in food is broken down and absorbed in blood stream as amino acids. Amino acids are joined together by peptide link to form peptide chain.

Types of Amino Acids: There are 20 common amino acids that occur frequently in food proteins, of these nine are considered essential. Essential amino acids are those which are necessary for growth and health of an individual but they are not synthesized in adequate amount in the body. Non essential amino acids are those that are equally important but can be synthesized in body.

Table 4.3 : Essential and Non Essential Amino acids

Essential Amino Acids	Non Essential Amino Acids
Methionine	Alanine
Isoleucine	Asparagine
Threonine	Aspartic acid
Phenylalanine	Glutamic acid
Valine	Glutamine
Tryptophan	Serine
Histidine	Arginine
Leucine	Cysteine
Lysine	Glycine
	Proline
	Tyrosine

Do You Know ?

Complete and incomplete protein

Complete protein or whole protein is a food source of protein that contains an adequate proportion of each of the nine essential amino acids necessary in the human diet. Examples of single-source complete proteins are eggs, red meat, poultry, fish, milk, cheese, yogurt.

Complete protein	Incomplete protein
Milk	Vegetables
Eggs	Fruits
Beef	Oats
Cheese	Bread
Yogurt	Rice

Incomplete Proteins: Plant foods are considered incomplete proteins because they are low or lacking in one or more of the essential amino acids necessary in the human diet. Incomplete proteins found in plant foods can be mixed together to make a complete protein e.g. rice and pulses.

Do You Know ?

Calculate your daily protein need

Protein requirement / day is same as your body weight.

Table 4.4 : Sources, functions and deficiency of proteins

Sources		Functions	Deficiency disease
Plant	Animal		Kwashiorkor
1. Pulses 2. Legumes 3. Nuts and Oilseeds 4. Vegetables: Peas	1. Milk and Milk products like Paneer, Cheese, <i>Khoa</i> 2. Meat 3. Egg 4. Fish	1. Body building, growth and maintenance 2. Regulation of body processes 3. Supply of energy 4. Transport nutrients	Symptoms: 1. Weight loss 2. Nutritional oedema 3. Muscular wastage 4. Growth retardation 5. Weakness 6. Anaemia 7. Drying of skin 8. Sparse dry, brittle and discoloured hair

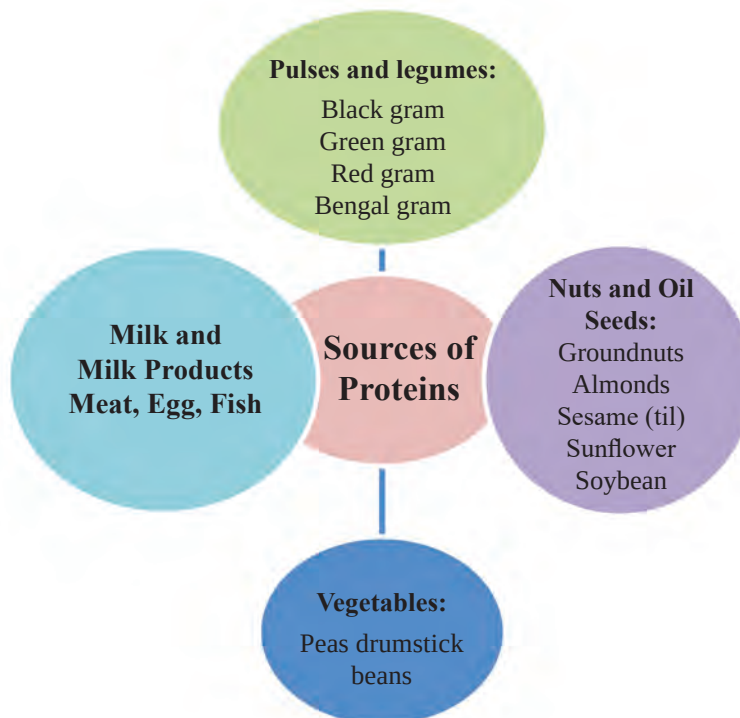


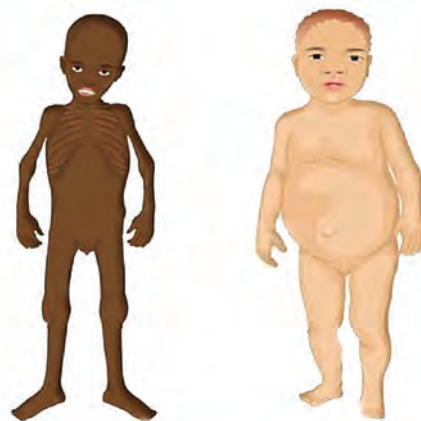
Fig. 4.3 : Sources of proteins

Functions in detail:

- Protein is the main structural component of cells.
- It supplies building blocks (amino acids) to the body.
- Proteins are required for highly specialized metabolic functions as follows:
 - a) Hormones and enzymes (proteins) are essential for digestion and metabolic activities in the body.
 - b) Protein helps in making antibodies, which are natural, defence against infection.
 - c) Haemoglobin (found in blood) is a protein which carries oxygen.
- Proteins provide energy to body if carbohydrates are less. Each gram of protein gives 4 kilocalories.

Do You Know ?

Biological value : It is the percentage of absorbed protein which is converted into body protein e.g. The score of egg is 100 which means that it is absorbed 100% in body.



Marasmus

Kwashiorkor

Fig. 4.4 : Deficiency of carbohydrate and protein

4.4 Fats

Fats or lipids are largest group of organic compounds, which are important for body. Fat is a more concentrated form of energy. It contains carbon, hydrogen and oxygen. The simplest form of fat is fatty acids.

Fat is a complex molecule consisting a mixture of three fatty acids and an alcohol generally glycerol.



Do You Know ?

Oils are liquid at room temperature while fats are solid at room temperature (20⁰ C)

Table 4.5 : Sources, functions and deficiency of fat

Sources		Functions	Deficiency
Plant	Animal		Permanent learning defects
1. Edible nuts and oil seeds. 2. <i>Vanaspati ghee</i> and margarine	1. Whole milk and milk products. 2. Pork 3. Egg yolk 4. Poultry	1. Concentrated source of energy 2. Carrier of fat soluble vitamins (A, D, E, K) 3. Insulation and padding 4. Palatability and satiety value	Deficiency of fat may lead to deficiency of fat soluble vitamins. Fats provide essential fatty acid (EFA) which may lead to permanent learning defects.

- Oil obtained from edible nuts and oilseeds- groundnut, sesame (til), coconut, soybean, sunflower, mustard, etc
- Vanaspati ghee and margarine



Plant source

- Whole Milk and Milk products like cream, butter, ghee, cheese, khoa.
- Pork / beef fat
- Egg yolk
- Poultry



Animal source

Fig. 4.5 : Sources of fat

Functions in detail:

- Fats are richest source of energy and 1gm of fats provide 9 Kilocalories.
- Fat is a carrier of fat-soluble Vitamin A, D, E, K in the body and helps in their absorption.
- Fat provides padding around the vital organ such as kidney, heart which serves to hold them in position and protect them from physical shock.
- Fats serve as insulating barrier against cold and thus helps to conserve body heat and regulate body temperature.
- Fat increases the taste of food. Fat tends to leave the stomach relatively slowly that helps to delay the onset of hunger and gives a feeling of satiety.
- Fat / oil also supply omega fatty acids.

Micro-nutrients

4.5 Vitamins

Vitamins are the vital organic dietary substances. Vitamins are defined as organic compounds occurring in small quantities, but necessary for growth, reproduction and maintenance of good health in human beings. Vitamins may occur in its active form in the food or as a precursor compound which can be changed into its active form in body.

Do You Know?

Most of the vitamins are not synthesized in body and must be supplied through diet.

Classification of Vitamins: Vitamins are classified into two groups on the basis of their solubility into fat and water i.e. fat soluble and water soluble vitamins.

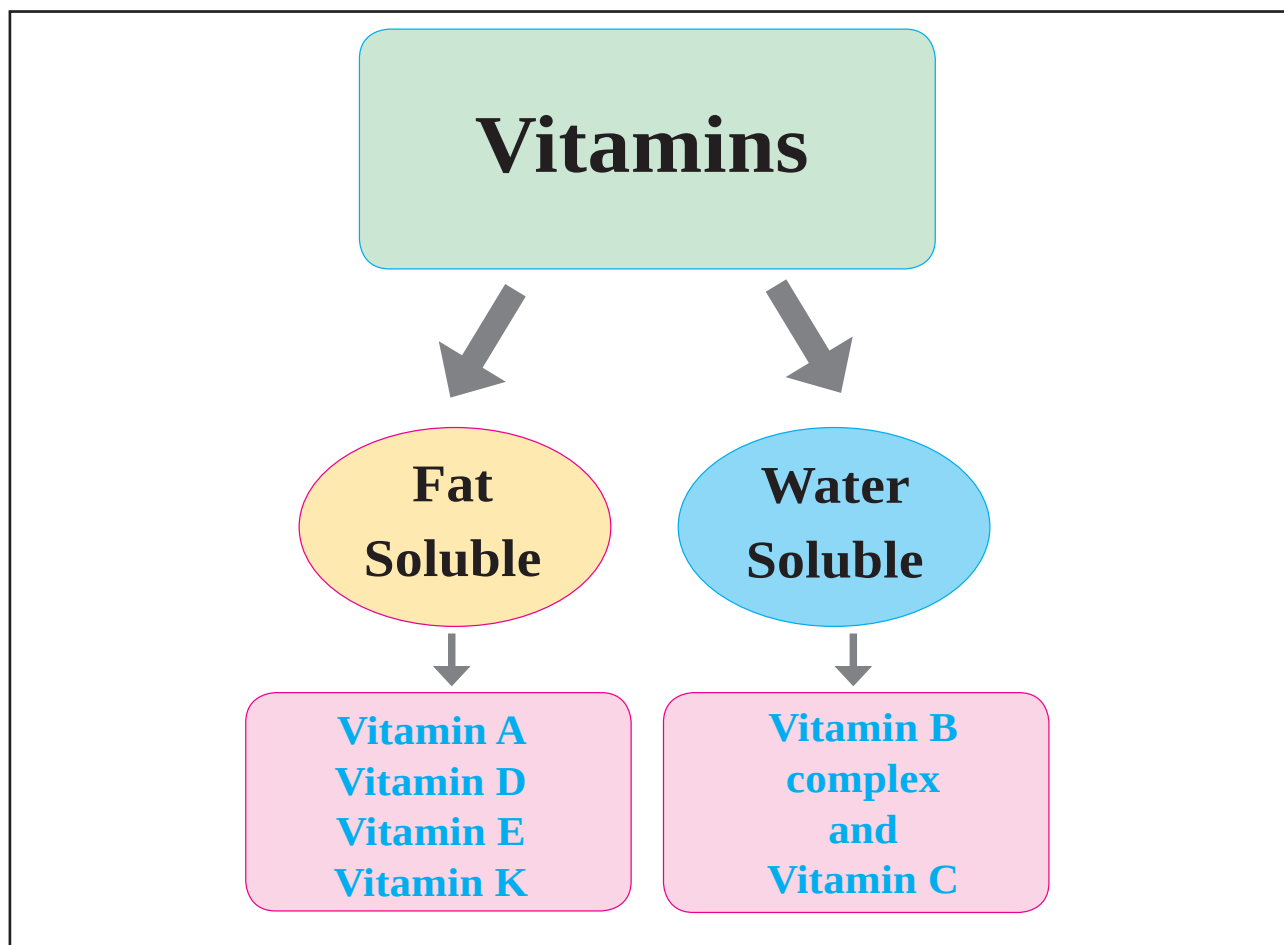


Fig. 4.6 : Classification of Vitamins

Table 4.6 : Difference between fat soluble and water soluble vitamin

Fat soluble vitamin	Water soluble vitamin
1. These vitamins are soluble in fat	1. These vitamins are soluble in water
2. These include vitamin A, D, E, K	2. These include vitamin B complex and C
3. They can be absorbed in presence of fat	3. They can be absorbed in the presence of water
4. The amount of fat soluble vitamin, not utilized, can be stored in body.	4. The amount of water soluble vitamin, not utilized, are excreted in the urine.
5. Not much of fat soluble vitamins are lost in cooking procedures.	5. Some of the water soluble vitamins are lost in normal cooking procedures.

A) Fat Soluble Vitamins : A, D, E and K are the fat soluble vitamins.

- Vitamin A:** Vitamin A is found in plants in the form of **Beta-carotene** and in animals in the form of **Retinol**. It is found in all yellow and orange fruits and vegetables. Beta-carotene is called as precursor of vitamin A

Table 4.7 : Sources, functions and deficiency of vitamin A

Sources		Functions	Deficiency
Plant	Animal		Night Blindness
1. It is found in Yellow and orange fruits and vegetables like mango, papaya, carrots and pumpkin 2. Green Leafy Vegetables: Fenugreek, spinach, coriander and drumsticks	1. Milk and Milk products. 2. Fortified vanaspati ghee 3. Liver meat 4. Egg yolk 5. Fish 6. Fish liver oil (cod liver oil)	1. Vision process: It is necessary in maintenance of good vision 2. It is essential for growth of skeletal and soft tissues 3. Protects body from infection 4. Support normal functioning of reproductive system in both females and males	1. Xerophthalmia 2. Conjunctival xerosis 3. Bitot's spot 4. Corneal xerosis 5. Keratomalacia 6. Reduced resistance to infection. 7 Severe deficiency causes blindness. 8. Skin becomes rough

2. **Vitamin D:** It is formed in skin by the action of ultraviolet rays from the sun. Our skin consists of a substance called '7 Dehydrocholesterol' which gets converted into vitamin D in our body in the presence of sunlight.

Table 4.8 : Sources, functions and deficiency of vitamin D

Sources		Functions	Deficiency
Plant	Animal		Rickets (children), Osteomalacia (adults)
Vitamin D is not found in plant foods. Natural Source- Sunlight	1. Fortified vanaspati ghee 2. Egg yolk 3. Fish 4. Fish liver oil	1. Plays important role in absorption of calcium from digested food. 2. Plays important role in mineralization and calcification of bone.	A) Rickets (children) • Impairment of calcification function • Bones and skull become soft and fragile • Bowing of legs • Swelling of wrist, knees and ankle joints • Restlessness • Nervous irritability B) Osteomalacia (adults) • Bone malformation

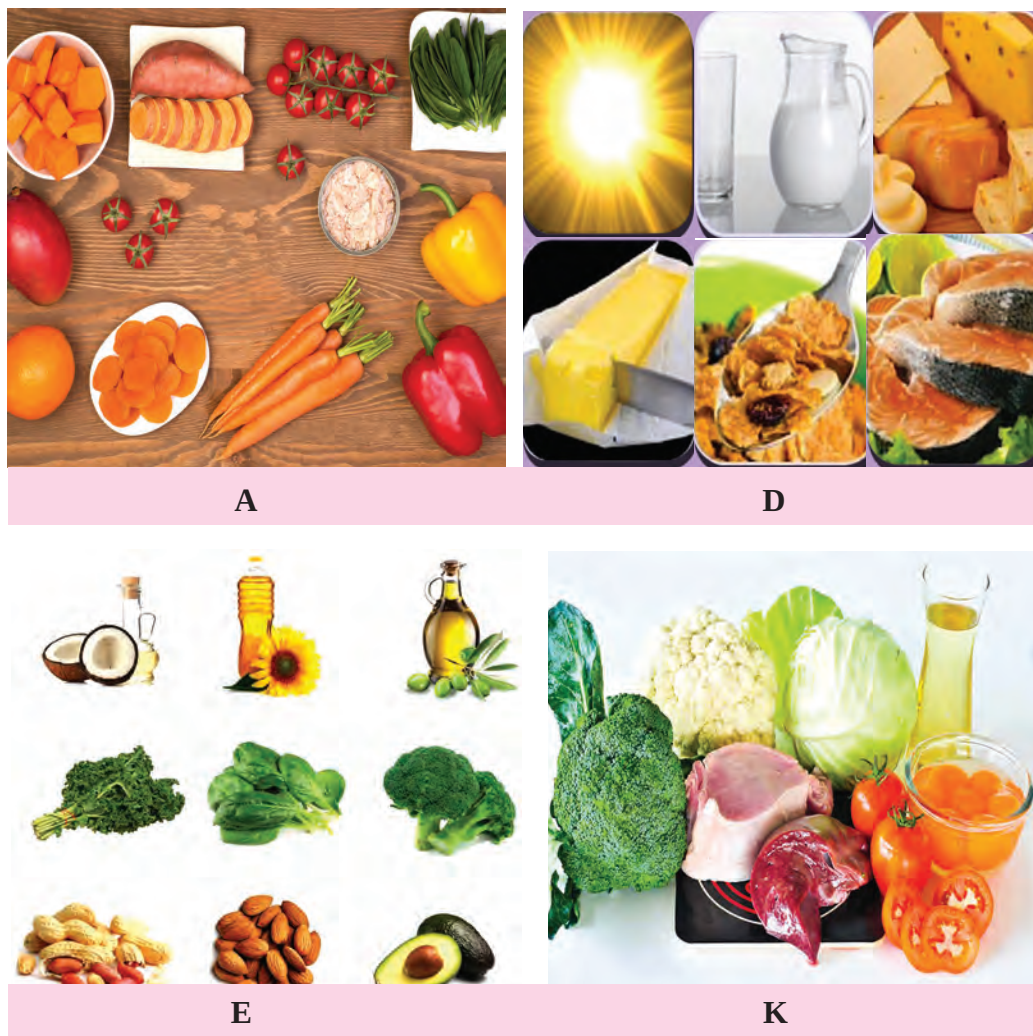


Fig. 4.7 : Sources of fat soluble vitamin A, D, E and K

3. **Vitamin E:** Vitamin E designates a group of compounds called Tocopherols, which act as antioxidants.

Table 4.9 : Sources, functions and deficiency of vitamin E

Sources		Functions	Deficiency
Plant	Animal		Reduces fertility
1. Cereals: Wheat and rice 2. Pulses: black gram, green gram, bengal gram 3. Green leafy vegetables 4. Nuts 5. Vegetable oils	1. Meat 2. Eggs 3. Dairy products.	1. Required for normal reproduction to maintain fertility and potency 2. Vitamin E acts as an antioxidant 3. Maintain stability and integrity of cell membrane	Symptoms: 1. It reduces fertility 2. Causes impotency 3. Premature aging 4. Muscular dysfunction 5. Liver damage 6. Weakness in heart muscles

4. **Vitamin K:** Vitamin K is often called as coagulation vitamin. Vitamin K is available in plants as well as animal food having similar biological activity. It is widespread and also synthesized by some usefull bacteria.

Table 4.10 : Sources, functions and deficiency of vitamin K

Sources			Functions	Deficiency
Plant	Animal	Physiological:		Haemorrhage
1. Green Leafy Vegetables fenugreek, colocasia, cabbage, spinach 2. Vegetables: tomatoes, cauliflower 3. Soybean oil	1. Egg yolk 2. Milk 3. Organ meat like liver	Synthesized by a bacteria in intestinal tract	Helps in blood clotting	Symptoms: It reduces the clotting tendency of blood. Continuous bleeding from wounds and cuts may occur.



Fig. 4.8 : Deficiency of fat soluble vitamins A, D, E and K

- B) **Water soluble vitamins:** Water soluble vitamins consists of a large number of substances. These include B - complex vitamins like thiamine, riboflavin, niacin, etc. and vitamin C. Some of the water soluble vitamins are partly lost during cooking. Being water soluble, these cannot be stored in the body for a long time.

1. **Thiamine:** It is also known as vitamin B₁ and rapidly destroyed by heat.

Table 4.11 : Sources, function and deficiency of vitamin B₁

Sources		Functions	Deficiency
Plant	Animal		Beriberi
1. Whole cereals 2. Legumes 3. Wheat germ 4. Nuts 5. Vegetables 6. Fruits	1. Meat 2. Fish 3. Milk	1. Controlling agent in energy metabolism 2. Involved in proper functioning of nerves and muscles	Symptoms: 1. Affects digestive and nervous system 2. Loss of appetite, Impaired digestion 3. Weakness and numbness 5. Pain in the legs 6. Irritability 7. Mental depression 8. Confusion and fear

2. **Riboflavin:** It is also known as Vitamin B₂. This vitamin is slightly soluble in water and stable to heat in neutral or acidic solution but destroyed rapidly in alkaline media.

Table 4.12 : Sources, function and deficiency of vitamin B₂

Sources		Functions	Deficiency
Plant	Animal		Ariboflavinosis
1. Whole cereals 2. Legumes 3. Millets 4. Green leafy vegetables	1. Milk and milk products 2. Eggs 3. Organ meat like liver and heart 4. Yeast extract	1. Controlling agent in energy production and tissue building 2. It is a vital factor in protein and carbohydrate metabolism	Symptoms: 1. Affects oral and facial skin and eyes 2. Angular stomatitis 3. Cheilosis which includes inflammation of lips and tongue 4. Cracks at corner of the lips 5. Eyes become sensitive to light with itching and burning

3. **Niacin:** It is also known as Vitamin B₃. The precursor of niacin is tryptophan, which gets converted into niacin in body. Niacin is also water soluble, fairly stable to acid, heat, alkali, light and oxidation.

Table 4.13 : Sources, functions and deficiency of vitamin B₃

Sources		Functions	Deficiency
Plant	Animal		Pellagra
1. Whole cereals 2. Beans and peas 3. Nuts 4. Oilseeds	1. Meat 2. Fish 3. Poultry 4. Milk 5. Egg	1. It is essential for normal function of skin, intestinal tract and nervous system. 2. Niacin is a part of coenzyme which helps in carbohydrate, protein and fat metabolism. (Coenzyme is a compound that is necessary for the functioning of an enzyme.)	Symptoms: 1. This condition involves gastrointestinal tract, skin and nervous system 2. It is also known as disease of 4D's because it causes- a) Dermatitis b) Diarrhoea c) Dementia d) Death



Fig. 4.9 : Sources of water soluble vitamin B₁, B₂, B₃ and C

4. **Vitamin C:** It is also known as ascorbic acid. It is the most unstable vitamin as it is easily destroyed by heat, oxygen, alkalies and high temperature.

Table 4.14 : Sources, functions and deficiency of vitamin C

Sources		Functions	Deficiency
Plant	Animal		Scurvy
1. Citrus Fruits are the richest sources of vitamin C 2. Best source of vitamin C is amla 3. Other sources- guava, ber, orange 4. Green leafy vegetables 5. Sprouted pulses and others	Not present in animal sources	1. It is a powerful reducing agent 2. Helps in formation of haemoglobin 3. Formation of structural protein collagen that helps in bone, teeth formation and healing of wounds 4. Activation of many enzymes. 5. Increases resistance to disease 6. For better absorption of iron	Symptoms : 1. General weakness 2. Fatigue 3. Shooting joint pains 4. Anaemia 5. Infections 6. Poor wound healing 7. Spongy bleeding gums 8. Rough and dry skin.

Fig. 4.10 : Deficiency of water soluble vitamin B₁, B₂, B₃ and C.



4.6 Minerals

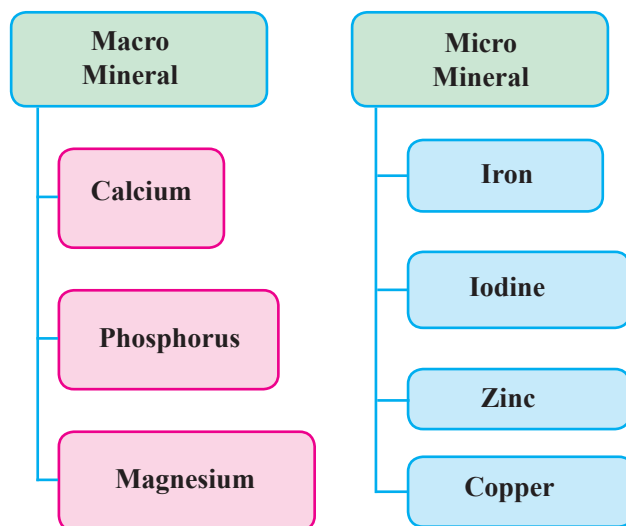
Minerals are an inorganic element occurring in the form of their salt e.g. calcium, phosphorus, sodium, iron etc. They are also required in small amounts and are vital to body. Minerals are present in all body fluids and tissues. Minerals have two distinct characteristics:

- Minerals do not provide energy, but are highly essential for metabolic and physiological activities.
- Minerals are not destroyed during food preparation.

Do You Know ?

Minerals do not act singly in their function and regulation of body process, but work with the help of other minerals and organic compounds.

Classification of Minerals:



- A) Calcium:** The name calcium is derived from Latin word ‘calx’ which means chalk. Calcium is inorganic mineral element. It is a white substance which is stable to heat and light and dissolves in an acid medium.

Table 4.15 : Sources, functions and deficiency of calcium

Sources		Functions	Deficiency
Plant	Animal		Rickets (children) Osteomalacia (adults)
1. Green leafy vegetables: Fenugreek, colocasia, cabbage, spinach, drumstick, mustard 2. Nuts and oilseeds 3. Ragi 4. Dry Fruits 5. Paan (eaten after Indian meal)	1. Milk and milk products like cheese 2. Small fish	1. Important for formation and maintenance of bones and teeth 2. Necessary for normal growth 3. It plays a vital role in mechanism of blood clotting 4. Needed for activation of many enzymes and secretion of hormones 5. Important role in regulation of cell permeability, thus control the uptake of nutrients by the cell	A) Rickets (children) 1. Bones become soft and fragile 2. Bowing of legs 3. Knock knees 4. Enlargement of wrist, knees and ankle joints B) Osteomalacia (adults) 1. Softening of bones of leg, spine, thorax and pelvis which may bend and show deformities 2. General weakness

B) Phosphorus: It is an important constituent in every body tissue.

Table 4.16 : Sources, functions and deficiency of phosphorus

Sources		Functions	Deficiency
Plant	Animal		
1. Whole grain cereals and flour 2. Legumes and pulses 3. Vegetables 4. Nuts	1. Milk and milk products 2. Eggs 3. Fish 4. Liver	1. Plays a vital role in 'Calcification' of bone and teeth 2. Regulates energy released and acid base balance of body 3. Facilitates absorption and transportation of nutrients 4. Constituent of essential compounds like DNA and RNA	This deficiency is rare, but if it occurs, the symptoms are: 1. Retarded growth 2. Poor teeth and bone formation 3. Weakness 4. Anorexia 5. Pain in bones

C) Iron: Iron is a very important nutrient. In the body most of the iron is found in blood and rest of it is stored in organs like liver, spleen and kidney.

Table 4.17 : Sources, functions and deficiency of iron

Sources		Functions	Deficiency
Plant	Animal		Anaemia
1. Whole grain cereals 2. Legumes 3. Dark leafy vegetables 4. Dry fruits	1. Meat 2. Fish 3. Poultry	1. Component of haemoglobin is necessary for carrying oxygen 2. Myoglobin is an iron containing protein required for muscle contraction 3. Iron is an integral part of many enzymes which are required for metabolism	Symptoms: This is more common in women 1. Paleness of skin, tongue, lip and conjunctiva 2. General fatigue 3. Breathlessness 4. Anorexia 5. Headache 6. Spoon shaped nails 7. Poor attentiveness and memory 8. Lower physical work capacity 9. Adverse effect on immune system

Do You Know ?

Iron is a carrier of oxygen :- Haemoglobin which is a red coloured compounds present in red blood cells contains iron in the 'haem' part. Haemoglobin carries oxygen to various parts of the body and bring back carbondioxide to the lungs.

D) Iodine: Iodine is an essential element for normal growth and development of human body. It occurs widely in nature.

Table 4.18 : Sources, functions and deficiency of iodine

Sources		Functions	Deficiency
Plant	Animal		Goiter (adults)
1. Vegetables 2. Fruits 3. Iodised salt	1. Salt water fish 2. Shell fish 3. Eggs 4. Dairy products 5. Meat 6. Poultry	1. Component of thyroxine hormone secreted by thyroid gland 2. Regulates the rate of oxidation and metabolism within the cells 3. Influences physical and mental growth	Symptoms : 1. Enlargement of thyroid gland 2. Reduced mental function
The iodine content of food obtained from animals and plants depend upon the iodine in the animal's diet or the soil in which the plants are grown.			

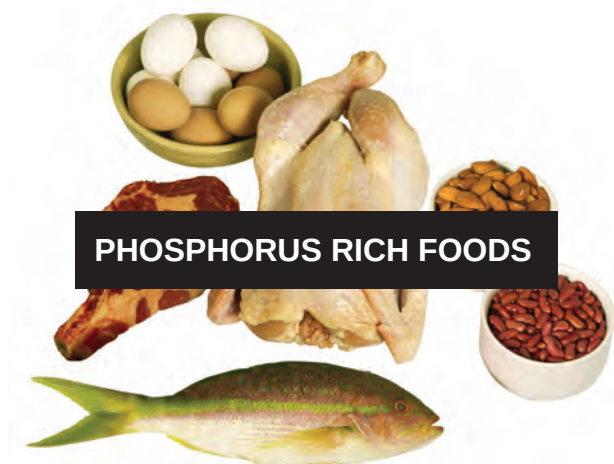


Fig. 4.11 : Sources of calcium, phosphorus, iron and iodine

4.7 Water :

Water is the largest constituent of the body. About 70% of body weight is water. Body water is distributed as follows:

- a) Intracellular water-Inside the cells of tissues
- b) Extracellular water- Outside the cells of tissues.

Table 4.19 : Sources, functions and deficiency of water

Source	Functions	Deficiency
1. Drinking water: We should consume at least 6-8 glasses of water every day 2. Water contributed by food: All foods contain water in varying amount eg. Cereals -12-15% Fruits -70-90% 3. Water contributed by beverages. 4. Water used in food preparation. 5. Water formed in body due to nutrient metabolism: Chemical reactions involved in nutrient metabolism produce water in the body	1. Major constituent of our body: All body fluids like blood, saliva, sweat, digestive juices, and urine have water as an important constituent 2. Universal solvent: Water dissolves a variety of substances including all the products of digestion. 3. Regulation of body temperature: Water regulates body temperature through evaporation of water from lungs and skin 5. Acts as lubricant and prevents friction	Dehydration 1. Fatigue 2. Headache 3. The person may even collapse

Know About Facts :

The Mid-day meal scheme has been launched by the Government of India. Under this scheme school going children are provided free nutritious food in their schools .It has two main motives- to promote education in rural India, especially among poor children, and to prevent malnutrition in children.



Mid Day Meal Scheme



Fig. 4.12 Mid day meal in School

Points to remember

- Food is made up of nutrients which are carbohydrates, proteins, fats, minerals, vitamins and water.
- Carbohydrates make up the bulk of our diet. They are primary source of energy. They are mainly present in plants in the form of sugar, starch and fibre.
- Proteins are mainly responsible for tissue building and cell repair, regulation of various body processes and provide energy when needed.
- Fats are most concentrated form of energy in the food.
- Minerals are required to build body tissues, activate, regulate and control metabolic processes.
- Vitamins play a very vital role for maintaining and protecting good health as they regulate various body processes.
- Water is an essential solvent and performs many functions.
- A diet lacking in specific nutrients leads to specific deficiency disorders.

Exercise

Q.1 (a) Select the most appropriate option:

- i. Deficiency of carbohydrates leads to a disease called _____.
(Kwashiorkor, Obesity, Marasmus)
- ii. Proteins are made up of _____.
(Glucose, Amino acid, Fatty acid)
- iii. Vitamin A is found in animals in the form of _____.
(Beta carotene, Retinol, Tryptophan)
- iv. Goiter is caused by deficiency of _____.
(Fats, Calcium, Iodine)
- v. Citrus fruits are rich source of _____.
(Vitamin A, Vitamin C, Iron)
- vi. _____ is a precursor of vitamin A.
(Beta carotene, Tryptophan, Ascorbic acid)

(b) Match the following:

A		B	
i.	Thiamine deficiency	a.	Amino acids
ii.	Iron deficiency	b.	Green and yellow fruits
iii.	Protein	c.	Blood clotting
iv.	Vitamin K	d.	Anaemia
v.	Vitamin A	e.	Beriberi
		f.	Scurvy

(c) State whether the following statements are true or false:

- i. Carbohydrates are good sources of energy.
- ii. Proteins are made up of amino acids.
- iii. Monosaccharides mean 10 or more polysaccharides.
- iv. Deficiency disease of iron is Beri-Beri.

Q.2 Answer in one word

- i. I give 4 Kcal and help to spare the protein.
- ii. I give 4 Kcal but my main function is body building.
- iii. I am the richest source of Vitamin C.
- iv. I am found in both green and yellow fruits and vegetables.

Q.3 Short answer questions

(a) Enlist three important dietary sources of the following nutrients:

- i. Fats
- ii. Carbohydrates
- iii. Iodine
- iv. Vitamin A
- v. Vitamin D

(b) Explain the Deficiency disorders of following:

- i. Vitamin D
- ii. Vitamin A
- iii. Thiamine
- iv. Iron
- v. Protein

(c) Write in short

- i) Give difference between fat and water soluble vitamin.
- ii) Give classification of carbohydrates.
- iii) Give classification of minerals.

Q.4 Long answer questions

• Explain the functions of following:

- i. Carbohydrate
- ii. Vitamin C
- iii. Riboflavin
- iv. Iron
- v. Vitamin K

❖ Project

- i. Prepare a scrap book on different sources, functions and deficiency diseases of any five nutrients.
- ii. Prepare a chart on fat and water soluble vitamins.

...