

We have learnt about various nutrients of food, their sources and deficiency diseases, in brief, in junior classes. In this chapter again we will learn about the various classes of nutrients in detail. To begin with let us recall a few things -

What is nutrition?

Nutrition means providing the body with the essential nutrients (or food) for its proper growth and development.

What are nutrients?

All the essential organic and inorganic chemical compounds which we take in or supply to our body so that the body can remain healthy and can function efficiently are called nutrients.

What is food?

Any substance which we eat or drink and which is a source of nutrients to us is food.

A few more such definitions are given below

Meal is the food taken at one time to satisfy appetite (i.e. breakfast, lunch, dinner etc.)

Diet is the combination of food items that we eat in our meals. It is the sum total of the foods that are eaten by an individual (Eg Vegetarian diet)

Balanced Diet includes all the essential nutrients needed by our body in appropriate amounts as required by the body.

Appetite is the desire to eat. It is psycho-logical drive for food (signal coming from brain)

Hunger is body's physiological need for food. It is the uneasy sensation due to lack of food.

Before starting with the various nutrients let us first understand the need of nutrition in the body.

Some of the general functions of food are-

1) Growth and development - Food helps in building new cells in body for its growth.

- 2) Repair - Food (like proteins) helps to repair any worn out cells in the body.
- 3) Food provides us with the energy to carry out various life processes/functions.
- 4) Food helps to maintain the normal chemical composition of cell (cell cytoplasm contains water and various organic and inorganic substances. Hence their composition is maintained by food).
- 5) Food provides raw materials for the manufacture of various secretions of the body like hormones, enzymes etc.
- 6) Food provides us protection from diseases. A nutritious diet improves your immunity, as also, saves you from deficiency diseases.

Major Classes of Nutrients

There are major 6 classes of nutrients as follows-

- | | |
|------------------|-----------------------|
| 1) Carbohydrates | } Energy giving foods |
| 2) Fats | |
| 3) Proteins | - Body building food |
| 4) Vitamins | } Protective foods |
| 5) Minerals | |
| 6) Water | |

Let's begin to learn them in detail -

- (I) Carbohydrates are the compounds of carbon, hydrogen, oxygen with a general formula $C_n H_{2n} O_n$ where you can see hydrogen and oxygen are in ratio 2:1. Now as you all know that these are energy giving foods. They are broken down/oxidised in the cells to release energy. Examples of carbohydrates include sugar, starch, cellulose, glycogen etc.

Sugars are the sweet carbohydrates, These are soluble in water and taste sweet.

Broadly sugars can be divided as follows-

- A] Monosaccharides or simple sugars These have general formula $C_6 H_{12} O_6$. These are simplest form of sugar and need no digestion in the body. They are directly reabsorbed into the blood stream. You must have heard that a weak patient is given a glucose drip by the doctors. This is done so that glucose (a monosaccharide)

can provide a readymade source of energy to the patient. There are three types of simple sugars as -

- (i) Glucose is popularly called as grape sugar, for it is commonly found in grapes and ripe fruits. It is the most common and simplest sugar found in organisms. All our food is digested into glucose in the body that is why when we say blood sugar, we are actually referring to glucose level in the blood.
- (ii) Fructose is common in plants, hence it is also called fruit sugar.
- (iii) Galactose is the simple sugar found in milk.

[B] Disaccharides or double sugars have general chemical formula as $C_{12}H_{22}O_{11}$. It is the sugar formed when two monosaccharides are joined. As it has two molecules joined together hence they require digestion before they are absorbed into the blood. These are of three types -

- (i) Sucrose is the common/commercial sugar. It is naturally produced in plants. In India we obtain sucrose from sugarcane. Another source of sucrose is sugar beet, whose roots contain a high concentration of sucrose. Sucrose is a double sugar made up of two simple sugars glucose and fructose.
- (ii) Maltose is least common disaccharide. It is made up of two molecules of glucose. It is usually found in grains and cereals (Eg. wheat, corn, barley etc. contain varying amounts of maltose).
- (iii) Lactose or milk sugar (found in the milk). It is made up of two smaller sugar molecules glucose and galactose.

Another category of sugars is Polysaccharide. Poly means many, hence Polysaccharides contain many molecules of monosaccharides.

A few polysaccharides are discussed below -

- (i) Starch It is insoluble carbohydrate. Plants during photosynthesis produce glucose which is

then converted into starch. Hence plants store their carbohydrates (food) in form of starch. Sources of starch are potatoes, grains (rice, maize, wheat etc.), bread etc. It is the most common carbohydrate in human diet and is contained in many staple foods.

- (ii) Cellulose is found in cell wall of plants. It is the part of food that forms roughage in our diet as it cannot be digested in our body due to lack of required enzymes. Hence it contributes in providing roughage for proper functioning of the gut.

What is Roughage? It is the non digestible part of our food. The cells of all plants have cell wall made up of cellulose. When we eat fruits, raw vegetables and other plant materials, cellulose is not digested in our body (as we have no cellulose digesting enzymes) and acts as roughage.

Functions of Roughage

- 1) Roughage is fibrous, hence it absorbs lot of water (during the digestion of food occurring in body) and retains it. Hence it keeps our faecal matter (excretory waste) soft, helping it to pass out of the body smoothly (without causing any sensation of pain), thus preventing constipation.
- 2) The movement of undigested food through the intestine becomes easier as roughage provides bulk to the food.
- 3) It stimulates the activity of muscles. Contraction and relaxation of muscles in the intestinal wall makes the movement of faecal matter easy.

Sources of Roughage

Whole grains, fruits, vegetables, legumes, corn, half crushed wheat (Dalia) are some sources of roughage.

- (iii) Glycogen is a polysaccharide found in the animals. It is the form in which carbohydrates are stored in animals (mainly liver and some in muscles). Excess food that we eat gets stored in our body as glycogen in the liver.

Function of Carbohydrates -

Carbohydrates are the energy giving foods. They are the main source of energy in our body.

II

Fats Now another nutrient that is providing us with energy is fats. Fats are also energy giving foods. They are composed of carbon, hydrogen and oxygen. Fats produce more energy than carbohydrates (i.e. if we consume equal quantity of Fats and carbohydrates, carbohydrates provide less energy than fats).

Sources of fats - Butter, ghee, cream, vegetable oil, fats of meat, fish liver oil, nuts

Functions of Fats -

- 1) Fats are source of energy, they help to provide us with energy.
- 2) Food can be stored in the body in liver as glycogen (Form of carbohydrate). Similarly fats are stored in the body under the skin in adipose tissues. Hence fats are an important storage form of food.
- 3) Fat soluble vitamins i.e. Vitamin A, D, E and K are retained in the body if we have fats in the body. Thus the fats serve as a solvent for fat soluble vitamins.
- 4) Fat under the skin provides insulation and protects the body against a rapid loss of heat.

Fats are made up of Fatty Acids and glycerol. When fats are digested in the body they are broken down into Fatty Acids and glycerol.

III

Proteins are the body building foods. They contain Carbon, Hydrogen, Oxygen and Nitrogen. Some proteins may contain Sulphur and Phosphorus. Nitrogen is the most important element in Proteins. Nitrogen of proteins is needed by plants for their growth. Proteins are made up of Amino Acids. Hence 'amino acids' are the breakdown product of digestion of Proteins.

Sources of Proteins - meat, poultry, fish, eggs, cheese, pulses, beans, nuts, peas, lean meat (with low fat like skinless chicken) etc. are rich sources of proteins.

Functions - Proteins are body building foods. They help to produce new cells in the body, thus, helping in growth and development of the body and repairing of any worn out cells and tissues in the body. Though proteins are not the source of energy, but in the time of emergency (like starvation) proteins may be oxidised to release energy.

Protein deficiency diseases -

General deficiency of proteins may lead to weakness but severe deficiency causes two major diseases as-

- (i) Kwashiorkor It is a severe deficiency disease affecting young children from 1-5 years of age.
Cause - It is caused when mothers stop breast feeding their children (babies) at an early stage/age. Mother's milk is rich in all nutrients and is a complete food for the babies. After weaning (i.e. gradually introducing an infant human to what will be its adult diet while withdrawing the supply of mother's milk.) the child is fed on a diet which is poor in proteins and is mainly consisting of carbohydrates. Such a child may die before the age of five years.

Symptoms of Kwashiorkor

- 1) Suffering child is underweight, having stunted growth
- 2) Belly (stomach) of the child protrudes out.
- 3) Skin becomes dark and scaly
- 4) Child loses appetite, no desire to eat anything.
- 5) Child suffers from repeated diarrhoea, enlarged liver and anaemia.
- 6) Oedema (swelling) is seen in the face and feet due to accumulation of water in the tissues of feet and the face.

Control/Treatment

Child suffering from Kwashiorkor should be given a protein rich diet like pulses, egg, fish etc.

A mixed diet of wheat, gram, peanuts, soyabean and jaggery is also useful.

'Kwashiorkor' literally means "the sickness the baby gets when the new baby comes". This is so

because elder child's source of protein (i.e. mother's milk) is no longer available to the child and he or she is now being fed on starchy diet.

- (ii) Marasmus is another severe protein deficiency disease that affects the infants below the age of one year. It occurs due to the combined deficiency of Fats, Proteins and carbohydrates in the diet.

Cause - Disease is caused due to the sudden stoppage of breast feeding by the mother and giving a diet poor in energy giving foods like carbohydrates, fats and proteins.

Symptoms -

- 1) Child suffering from Marasmus has less body weight, thin face, thin limbs. Overall he or she has retarded physical and mental growth.
- 2) Marasmus causes degeneration of muscles, resulting in a very weak body as if formed of muscle, skin and bones only. Skin of the child becomes loosely folded and ribs become prominently visible.

Control

Child suffering from Marasmus should be given a diet rich in proteins, fats and carbohydrates.

(a)



a) Kwashiorkor

(b)



b) Marasmus

Child suffering from