

Components of Food

Major Nutrients of Food and Their Importance

We eat a variety of food items such as *chapattis*, pulses, different vegetables, meat, eggs, milk etc. We are often advised by our parents to eat various types of food items.

Can you tell why?

This is because each food item usually consists of one or more ingredients. Each ingredient contains some important component required by our body. These important components are known as **nutrients**.

Let us learn about the nutrients required by our body.

Major nutrients

Five major nutrients are present in the food we eat. These are carbohydrates, proteins, fats, vitamins, and minerals. In addition, our food also contains water and fibre, which are required by our body.

Do you know which food item is rich in which nutrient? Let us explore the sources of nutrients.

Sources of major nutrients:

- Some important sources of carbohydrates are sugarcane, potato, wheat, papaya, rice, mango, maize etc.
- Some important sources of proteins are meat, milk, pulses, eggs, nuts etc.
- Some important sources of fats are oil, butter, *ghee*, cream, milk etc.
- Some important sources of vitamins and minerals are vegetables, spices, and fruits.

We know that our diet consists of carbohydrates, fats, proteins, vitamins, minerals, water, and roughage.

However, do we know what functions they perform in our body and why are they essential to our diet? Let us explore.

Importance of carbohydrates

You must have observed sports persons consuming fruit juices during matches. Can you tell why?

They do so because fruit juices are rich in carbohydrates and fluids, both of which refuel our system. They act as an instant source of energy.

Fruit juices are not only a rich source of fluids and carbohydrates but they also contain some vitamins and minerals, which are useful for the body.

Carbohydrate-rich food forms the main part of our diet. They provide energy for physical activities and proper body function. Thus, the food containing carbohydrates is referred to as **energy giving food**. Carbohydrates include sugars, starch, cellulose, etc.

1. Sugars: These are the simple forms of carbohydrates that are soluble in cold water and are sweet in taste. They are broadly categorised as:

- **Monosaccharides ($C_6H_{12}O_6$):** Simplest sugars, made up of single saccharide unit. Examples include glucose (most common sugar), fructose (commonly found in plants), galactose (found in milk), etc.
- **Disaccharides ($C_{12}H_{22}O_{11}$):** Made up of two saccharide units. Examples include sucrose (made up of glucose and fructose), maltose (made up of two glucose units), lactose (made up of glucose and galactose), etc.
- **Polysaccharides:** Made up of repeated units of monosaccharides or disaccharides. Its examples include starch, cellulose and glycogen.

2. Starch: It is an insoluble carbohydrate, which is commonly found in plants as storage carbohydrate. It contains many units of glucose and thus is a polysaccharide.

3. Cellulose: Another insoluble polysaccharide found in cell wall of plants. It is indigestible in most of the animals, but provides roughage.

4. Glycogen: It is a type of storage polysaccharide found in animals and human beings. It is also known as animal starch.

Some Interesting Facts:

- **Did you know that carbohydrates supply 70–80% of the energy required by our body?**

- **While some carbohydrates are stored in muscles and liver as glycogen, excess carbohydrates get converted into fats and get stored in the body.**

Importance of proteins and fats

Do you know the functions of proteins and fats in our body?

Proteins are required for the growth and repair of our body.

Fats also provide energy to the body as carbohydrates. However, they provide more amount of energy to the body as compared to carbohydrates. Therefore, foods containing fats and carbohydrates are known as **energy giving foods**.

Fats or lipids helps in smooth functioning of joints and to lubricate the joints, It also helps to absorb and move fat soluble vitamins like vitamin A,D, E and K through the bloodstream.

Some Interesting Facts:

- **Did you know food is either cooled or warmed in our mouth to bring it to a suitable temperature?**
- **We eat 500 kg (approximately) of food every year.**
- **We sometimes call fats and oils as Lipids, as they are the main constituent of our cell membrane.**

Importance of vitamins

Probiotics and vitamins are one of the five major nutrients required by our body.

Do you know why vitamins are important for our body?

- They help in protecting our body from diseases.
- They also help in keeping some body parts such as eyes, bones, gums, and teeth healthy.

Let us now study the types of vitamins that are required by our body and their functions.

Types of vitamins

Vitamins are of the following types:

(1) Fat-Soluble: They are easily soluble in fats or fatty substances. These vitamins are

stored in the body tissues and there is a possibility that our body stores too much of these vitamins. The fat-soluble vitamins are:

Vitamin A: It keeps our skin and eyes healthy.

Vitamin D: It helps our body absorb calcium for bones and teeth.

Vitamin E: It helps in maintaining the efficiency of muscle cells and functioning of metabolism.

Vitamin K: It helps regulate normal blood clotting.

(2) **Water-Soluble:** These vitamins are easily soluble in water. They are not stored in our body. They are released by the means of our excretory system and sweat. Hence, regular intake of these vitamins is necessary. The water-soluble vitamins are:

Vitamin B-complex: Vitamin B-complex performs a number of functions in the body. It is a collective group of vitamins. It includes vitamin B₁, B₂, B₃, B₅, B₆, and B₁₂.

- **Vitamin B₁:** It helps to convert sugar and starch into energy. It also promotes digestion, strengthens heart muscles, promotes growth and prevents fatigue.
- **Vitamin B₂:** It helps in releasing energy to body cells and enables utilisation of fats, proteins and sugars.
- **Vitamin B₃:** It helps to maintain healthy digestive tract and nervous system.
- **Vitamin B₅:** It helps in the breakdown of fats and carbohydrates to release energy. It is also important for the production of red blood cells and sex-related hormones.
- **Vitamin B₆:** It is helpful in amino acid metabolism. It also prevents skin disorders, retarded growth and convulsions.
- **Vitamin B₁₂:** It promotes utilisation of fats, proteins and carbohydrates. It is also essential for the formation of RBCs, nucleic acids and also prevents anaemia.

Vitamin C: It helps the body fight against many diseases.

Some Interesting Facts:

- There are some substances which are not actually vitamins but get converted into the vitamin in our body, such substances are known as pro-vitamins.
- Examples of pro-vitamins include beta-carotene and folic acid, which gets converted into the vitamin A and vitamin D respectively.

We usually think of bacteria as something that causes diseases. But our body is full of good and bad bacteria. The good bacteria or yeasts that are good for our health are known as **probiotics**.

- They help us to keep our intestines healthy and are present in large numbers.
- Regular intake of yoghurt and buttermilk would help in maintaining them in our body.

Importance of minerals

Minerals are one of the major nutrients required by our body. They are required for the proper growth and functioning of the body. Iron, iodine, calcium, and phosphorus are some of the essential minerals required by our body.

Importance of fibre and water

Carbohydrates, proteins, fats, vitamins, and minerals are important nutrients required by our body. **Do you know that our body also requires dietary fibres and water?**

Dietary fibres/ roughage and water are important for the human body.

How does roughage help in maintaining a healthy body?

Importance of roughage

Roughage is indigestible in the human body. Hence, they do not provide any nutrient to our body. However, they form an important component of our food because of the following reasons:

- They help to prevent constipation by increasing the volume of stool in our body. Therefore, people who include a lot of dietary fibres in their diet suffer from fewer problems of constipation.
- They help in retaining water in the body.
- They help in getting rid of undigested food.

Importance of water

Do you know why water is important for our body?

Water performs various functions in our body.

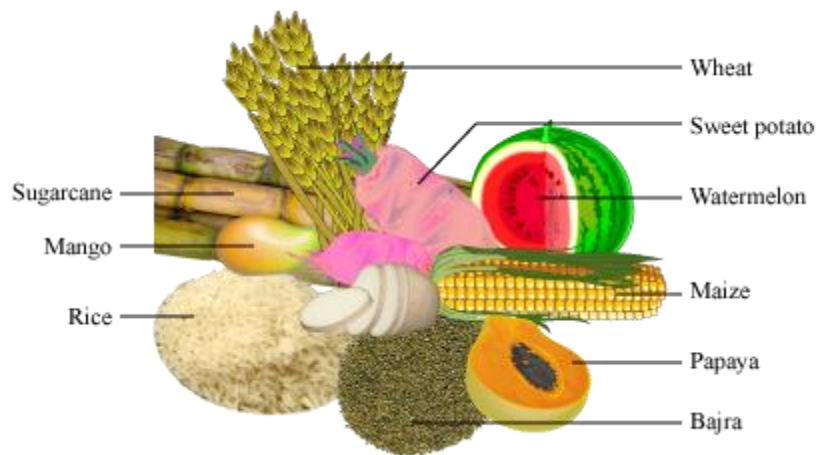
- It helps in cooling our body.

- It helps in the digestion of food.
- It helps in the transport of nutrients.
- It helps in removing waste products from our body.
- It protects important organs and joints from injury.

Some interesting facts:

- **Did you know that 70% of the human body is made up of water?**
- **Herbivores are able to digest roughage. Their diet includes grass, forage, roughage, crops, straw etc.**
 - Sources of Food Components
 - **We know that carbohydrates, proteins, fats, vitamins, minerals, water, and roughage are important for our body. However, can you tell which food is the source of which nutrient? Let us explore.**

Sources of carbohydrates



Can you give some examples of plant sources of carbohydrates?

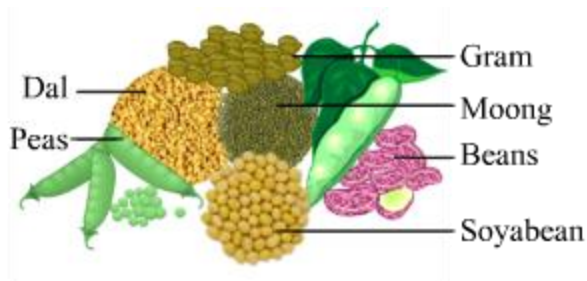
Some plant sources of carbohydrates are potato, sweet potato, sugarcane, papaya, watermelon, mango, wheat, rice, maize, *bajra*, etc.

Sources of proteins



Can you name the major nutrients present in the above illustrated food items?

All these food items are rich sources of proteins and fats.



Gram, peas, soyabeans, beans, etc. are some sources of proteins obtained from plants.

Sources of fats

Fats are obtained from various animal sources such as red meat, eggs, and milk products (*ghee*, butter, cream) etc.

Can you list some plant sources of fats?

Some plant sources of fats are groundnuts, *til*, nuts, coconut oil, sunflower oil, etc.

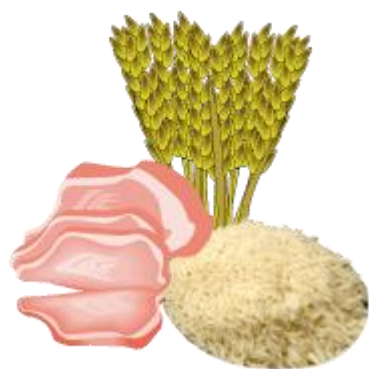
Sources of vitamins

Vitamin A



Vitamin A is present in various animal sources such as egg, butter, *ghee*, milk, etc. Plant sources rich in vitamin A are carrots, tomatoes, papaya, mango, guava, and leafy vegetables.

Vitamin B-complex



Some important sources of vitamin B-complex are animal liver, wheat, and rice.

Sources of various types of vitamin B-complex

Main Sources
Whole wheat, dried yeast, peanuts, oatmeal, prawn, sunflower seeds, soyabean, sprouts etc.
Dairy products, kidney, yeast, green leafy vegetables, fish, eggs etc.
Prawn, mushroom, chicken, peanuts, beef, enriched grains etc.
Yeast, corn, cauliflower, tomatoes, lentils, egg yolks, liver, kidney, peanuts etc.
Cereal grains, yeast, liver, milk, bananas, beef, eggs etc.
Beef, liver, eggs, dairy products, shellfish etc.

Vitamin C



Some important sources of vitamin C are tomato, orange, guava, lemon, and *amla*.

Vitamin D



Some important sources of vitamin D are milk, butter, liver, eggs, and fish.

Vitamin K

Some important sources of vitamin K are cabbage, tomato, spinach, and soyabean.

Vitamin E

Some important sources of vitamin E are soyabean, vegetables oils, leafy green vegetables, sprouts, cereals, eggs etc.

Sources of minerals

Minerals are one of the major nutrients required by our body. They are required for proper growth and functioning of the body. Iron, iodine, calcium, and phosphorus are some of the essential minerals.

Let us explore the sources of these minerals in detail.

Iron is a mineral required by our body. It is commonly present in food items such as spinach, liver, apple, etc.

Iodine

Some common sources of iodine are fish, spinach, ginger, etc.

Calcium

Some common sources of calcium are milk and eggs.

Phosphorus

Milk, banana, green chilly, wheat, and rice are the important sources of phosphorus.

Some interesting facts:

- Did you know that minerals constitute about 5% of our body weight?
- Some important sources of minerals are meat, egg, milk, fruits, vegetables, and common salt.

Sources of roughage and water

Dietary fibres/ roughage and water are important for the human body.

Roughage is obtained mainly from plant products. For example, grains, pulses, fruits, and vegetables are some important sources of roughage.

Which food items provide us with water?

Water is lost from our body (skin) in the form of sweat and urine. This lost water is replaced by the fluids we consume such as water, milk, juice, soup, soft drinks, and tea.

In addition to these sources, water is also present in fruits and vegetables.

Take a tomato or an orange and squeeze it.

Do your hands get wet while squeezing it?

Do you find water in it?

Balanced Diet

A diet which contains all the nutrients in correct proportions is called a **balanced diet**.

Let us study the components of a balanced diet.

Balanced diet

Do you know why all nutrients are required by our body?

Proper quality (i.e., having all the nutrients) and quantity of food are very important for proper health, growth, and functioning of our body.

Thus, a balanced diet should not have too much or too little of any nutrient. It should include all the nutrients in the required quantity.

For example, the consumption of excess fat-rich food (such as *samosa*, *poori*, *malai*, *peda* etc.) will not provide much energy to the body and can lead to a condition called **obesity**.

Food Pyramid - How to get a balanced diet?

Food Pyramid is a chart that represents the optimal number of servings of food required to have a balanced diet.



To make sure that we are getting a balanced diet, we should include food items from each group (as shown in the food pyramid) in appropriate quantity in our diet daily. Also, we should consume fruits, vegetables, and cereals in our diet to get adequate quantity of fibre.

Did you know that the daily nutritional requirement of an average Indian is fulfilled by 50% carbohydrates, 35% fats, and 15% proteins?

Tests For Major Nutrients

Nutrients are components of food that provide energy to the body. Five major nutrients are present in the food we eat. These include carbohydrates, proteins, fats, vitamins, and minerals.

How can we find out that a particular food item is rich in which nutrient?

The presence of carbohydrates, proteins, and fats can be tested by performing simple experiments. Let us learn how these tests are carried out and what materials are required to perform them.

Dilute solutions of iodine, copper sulphate, and caustic soda are required (they can be easily prepared in the laboratory) to perform these tests.

Test for carbohydrates

Test for glucose (Benedict's solution)

- Take a small amount of glucose and dissolve it in water in a clean test tube.
- To this solution add 5-6 drops of Benedict's solution (mixture of copper sulphate, sodium hydroxide and tartaric acid) and heat for about two minutes.
- If a brick-red precipitate is observed, it confirms the presence of glucose.

Test for starch

- To prepare a **dilute solution of iodine**, a few drops of tincture iodine are added to a test tube half-filled with water.

When the dilute solution of iodine is added to food items containing starch e.g., raw potato, the colour of the food item changes to blue, indicating the presence of starch.

Let us perform a test to find the presence of starch in a food item.



Take a raw potato and cut it into two halves. Put one half of the potato on a plate and use a dropper to put 2-3 drops of iodine solution on it.

You will observe that the colour of the potato slice changes to blue-black.

The presence of this blue-black colour indicates that potatoes contain starch.

Other food items containing starch are rice, sugarcane, maize, mango, sweet potato, etc.

Test for proteins (Biuret test)

- To prepare a **copper sulphate solution**, 2 g copper sulphate is dissolved in 100 mL of water.

- To prepare a **solution of caustic soda**, 10 g of caustic soda is dissolved in 100 mL of water.

These two solutions are used to test the presence of proteins in food items.

A food item containing proteins turns violet when two drops of copper sulphate and ten drops of caustic soda are added to it.

Let us perform an activity to test the presence of proteins.

Test for fats

In order to test the presence of fats, the food item containing fats is crushed on a piece of paper. This paper is then dried and viewed against light.

You will observe that the crushed food leaves an oily patch on the paper, making it translucent i.e., light is faintly visible through it.

This confirms the presence of fats in the food item.

Let us perform a test to find the presence of fats in a food item.

Take a few groundnuts and wrap them in a piece of paper. Crush them in such a way that the paper is not torn. Let the paper dry and then hold the paper against light.

What do you observe?

An oily patch is formed on the portion of the paper where the nuts were crushed.

You will observe that light can faintly pass through this oily patch, confirming the presence of fats.

An interesting fact:

- Did you know that milk, apart from being a perfect human food, is also a perfect nutrient medium for the growth of bacteria? Hence, milk must be properly handled as it can become unwholesome.

Malnutrition and Deficiency Diseases

Malnutrition is defined as the lack of sufficient food or the non availability of proper nutrients in the food we consume or the physical inability to absorb and metabolize the nutrients.

It can be classified into-

Under nutrition: this condition results when there is insufficient amount of food consumed over a period of several days. It is also known as starvation. It affects the physical and mental abilities of the person.

Over nutrition: it is caused by the over consumption of food over extended period of time. It may lead to a condition called obesity.

Deficiency Diseases

	Vitamin	Sources	Essential for	Deficiency disease
1.	Vitamin A	Milk, butter, cheese, tomatoes, carrots, cod liver oil, yellow fruits	Good eyesight	Night-blindness (poor night vision)
2.	Vitamin B complex (mixture of several vitamins)	Milk, eggs, cheese, meat, liver, husk of cereals and pulses	Digestion, growth	Beri-beri (nervousness, loss of appetite, paralysis)
3.	Vitamin C (ascorbic acid	Citrus fruits (orange, lemon, lime), green vegetables, tomatoes	Muscles and teeth	Scurvy (bleeding of gums and swelling of joints)

4.	Vitamin D (produced by sun in skin)	Milk, yellow of egg, liver, fish liver oil, especially sunlight, cod liver oil.	Strong bones and teeth	Rickets (decaying teeth, weak bones) in children and osteomalacia in adults
5.	Vitamin K (made by bacteria in large intestine)	Leafy green vegetables (spinach, cabbage)	Blood clotting	Haemorrhage (bleeding)

Diseases that occur due to the lack of nutrients are called **deficiency diseases**. Deficiency diseases can be of various types:

	Chemical element	Sources	Functions	Deficiency effect/disease
1.	Calcium	Cheese, milk, green leafy vegetables, pulses, eggs, meat	Bone and teeth formation, blood clotting, Muscle activity	Rickets , Brittle bones, excessive bleeding, bad muscle movement
2.	Phosphorus	Fish, eggs, meat, milk, cheese, potatoes	Bone and teeth formation, nucleic acid formation, energy transfer, ATP	Bad bones and teeth body weakness
3.	Potassium	Beef, eggs, milk, cheese, potatoes	Osmocontrol-blood and tissue fluid, nerve impulse conduction	Muscle weakness and paralysis
4.	Sodium	Salt, cheese, bread, butter	Osmocontrol-blood and tissue fluid, nerve impulse conduction, Gastric juice, HCl acid	Dehydration, extreme weakness
5.	Magnesium	Cheese and green vegetables	Energy transfer, bone and teeth formation	Activity of muscles and nerves, weakness
6.	Iron	meat, liver, eggs, green leafy vegetables	Blood haemoglobin formation, Muscle myoglobin formation, Enzyme activity	Anaemia

7.	Iodine	Sea fish, iodised salt	Thyroid gland function	Goitre (enlarged thyroid), abnormal metabolism
8.	Fluorine	Sea fish, tea, and some drinking water	Bone and teeth formation	Dental cavities

Vitamin Deficiency

Vitamins are needed by the body in small amounts yet their deficiency leads to various deficiency diseases. Vitamins are of two types – fat soluble (vitamins A, D and K) and water soluble (Vitamin B and C).

If taken in excess, the water soluble vitamins are excreted with the urine but if fat soluble vitamins are taken in excess, they are not excreted easily and harm the body and cause restlessness and nausea.

The sources, uses and associated deficiency diseases for various vitamins are given in the following table

Mineral Deficiency

Some important sources of minerals are vegetables, spices, and fruits. Though they are needed in small quantities, they are indispensable for proper growth of the body and to protect the body from various diseases.

The detail information on various vitamins is given in the following table

Protein and Carbohydrates/Energy (Calorie) Deficiency

There are certain diseases which are caused due to the deficiency of proteins or proteins and energy (calories). These are termed as Protein Energy Malnutrition (PEM).

Deficiency of proteins leads to Kwashiorkor whereas deficiency of proteins and carbohydrates/calories/energy leads to marasmus.

The diet that is poor in proteins lead to a disease called **kwashiorkor** in which the growth of the infant is retarded. This disease affects the children in age group of 1 to 5 years. The symptoms of this disease are

- Stick like thin legs
- Protruding belly
- Water retention
- Bulging eyes
- Discolouration of hair
- Mental retardation

The deficiency of both proteins and carbohydrates in the diet leads to a condition called **marasmus**. It occurs when the child under the age of one year does not get sufficient food. The symptoms of marasmus are as follows

- Lean and weak body
- Prominent ribs
- Dry, thin, wrinkled skin with folds of loose skin.
- Mental retardation

Do you know that improper cooking methods such as cooking in iron vessels, overcooking, and boiling can lead to the loss of taste and nutrients from vegetables?

This happens because during cooking, some volatile acids and gases are released from the vegetables. These acids and gases spoil the taste and look of the food.

Hence, cooking should be fast to prevent the loss of taste and look of the food.

- Repeated washing of rice, pulses, and some fruits should be avoided as the vitamins and minerals present in them may also get washed away.
- The skins of many fruits and vegetables contain vitamins and minerals. Hence, they should not be peeled before eating.
- Vegetables and fruits should not be washed after they have been cut or peeled.
- Water (in which grains are soaked) should not be thrown away as it contains many useful proteins and minerals.

Therefore, the loss of nutrients while preparing food can be minimized by keeping the above mentioned points in mind.