# Vitamins

Vitamins are organic nutrients that are required in small amounts in our diet most of which are mainly obtained through food. When their intake is inadequate, vitamin deficiency disorders are the consequence. The term "vitamin" was derived from "vitamine", a portmanteau coined in 1912 by the biochemist Casimir Funk Casimir Funk in 1912 coined the term ‘vitamine’ The term “Vitamine” was coined from the word vital + amine since the earlier identified compounds had amino groups. Later work showed that most of them did not contain amino groups, so the letter ‘e’ was dropped and the term vitamin is used these days. Most of the vitamins cannot be synthesized in our body but plants can synthesize almost all of them, so they are considered as essential food factors. They are generally regarded as organic compounds required in the diet in small amounts to perform specific biological functions for normal maintenance of optimum growth and health of the organism. Vitamins are designated by alphabets A, B, C, D, etc. Some of them are further named as sub-groups e.g. B1, B2, B6, B12, etc. Each of the 13 vitamins known today have specific functions in the body: vitamin A, provitamin A (Beta-carotene), vitamin B1, vitamin B2, vitamin B6, vitamin B12, biotin, vitamin C, vitamin D, vitamin E, folic acid, vitamin K, niacin and pantothenic acid. Vitamin A keeps our skin and eyes healthy. Vitamin C helps body to fight against many diseases. Vitamin C gets easily destroyed by heat during cooking. Vitamin D helps our body to use calcium for bones and teeth. Excess of vitamins is also harmful to body and vitamin pills should not be taken without the advice of doctor.

Vitamins are classified into two groups depending upon their solubility in water or fat.

### Fat soluble vitamins

Vitamins **A, D, E and K** are soluble in fat and oils but insoluble in water are kept in this group. They are stored in liver and adipose (fat storing) tissues.

### Water soluble vitamins

Vitamin C and all the Vitamin B Group are soluble in water so they are grouped together.

Water soluble vitamins must be supplied regularly in diet because they are readily excreted in urine and cannot be stored (except vitamin B12) in our body.

### Vitamin deficiency disorders and common symptoms

Human body requires vitamins to function properly. If any nutrient is missed in our diet it causes some deficiency diseases or disorder. If this deficiency continue for a long time it leads to severe problems. Taking all nutrient in our diet is very important. Here we discussed about diseases from deficiency of Vitamins and also symptoms of diseases.

# Vitamin deficiency disorders and common symptoms

| Sl.No | Vitamin | Deficiency Disease/disorders | Symptoms |
|---|---|---|---|
| 1 | Vitamin A (Retinol) | Night blindness ( If not treated, xerophthalmia leads this disorder.) | • Blurry vision at night.<br>• Difficulty in seeing in dim light.<br>• Some times Complete Loss of Vision |
| 2 | Vitamin B1 (Thiamine) | Beriberi | • Weak muscles and very little energy to work.<br>• Loss of sensation in hands and feet.<br>• Difficulty in walking and also paralysis |
| 3 | Vitamin B2 (Riboflavin) | Ariboflavinosis, Cheilosis (An inflammatory condition that causes cracks, and sores scaling at the corners of the mouth cracking, crusting, and scaling of the mouth corners) and skin disorder. | • Rashes on skin and Reddish.<br>• Presence of blistered, cracked and painful skin at the corners of mouth. |
| 4 | Vitamin B3 (Niacin) | Pellagra | • Dermatitis, Dementia and Diarrhoea. It can lead to death too. |
| 5 | Vitamin B5 (Pantothenic Acid) | Paresthesia | • Fatigue<br>• Muscle cramps. |
| 6 | Vitamin B6 (Pyridoxine) | Anemia Microcytic anaemia - Presence of smaller sized red blood cells. | • Fatigue,Weakness,Tiredness,Loss of stamina,Dizziness,Pale skin<br>• Skin bruises easily. |
| 7 | Vitamin B7 (Biotin) | Dermatitis, enteritis | • Red rashes around eyes and nose.<br>• Lack of energy or sleepiness<br>• Alopecia or hair loss.<br>• Nausea |
| 8 | Vitamin B9 (Folic acid) | Megaloblastic anemia (abnormally large red blood cells) | • Pale skin, Lack of energy, Irritation, Decreased appetite, Diarrhoea |
| 9 | Vitamin B12 (Cyanacobalamin) | Megaloblastic anemia Pernicious anaemia/ Addison's anaemia (type of megaloblastic anaemia, due to decreased absorption of $B_{12}$) | • Fatigue,Chest pain,Weakness, Pale skin,Headaches,Unsteady gait, Depression,Dementia<br>• Memory loss happens in case of prolonged deficiency. |
| 10 | Vitamin C (Ascorbic acid) | Scurvy, Swelling of Gums | • Swollen and bleeding gums.<br>• Dry and scaly skin.<br>• Bulging eyes. |
| 11 | Vitamin D (Calciferol) | Rickets & Osteomalacia | • Delayed growth,Bowed legs or knock knees,Muscle cramps.<br>• Pain in bones and joints, Presence of<br>• easily breakable bones. |
| 12 | Vitamin E (Tocopherol) | Less Fertility Reproductive failure Muscular dystrophy (nutritional) | • Failure to Conceive<br>• Muscle weakness. Difficulty in standing.<br>• Unsteady and waddling gait. |
| 13 | Vitamin K (Phylloquinone) | Non-Clotting of Blood. | • Easy bruising or bleeding.<br>• Heavy menstrual bleeding in women<br>• Increased risks of nose bleeding and fractures<br>• Bleeding from the mucous membranes present inside the body. |

## Functions of essential vitamins

### Vitamin A:

- It is the primary component of retinal pigments.
- It encourages normal vision.
- It promotes bone and tooth growth.
- It helps in the maintenance of epithelial tissues.

### Vitamin B1

- It functions as a respiratory coenzyme which is required for decarboxylation, particularly during the Krebs cycle.

### Vitamin B2

- It helps in maintaining healthy skin and oral mucosa.

### Vitamin B3

- It is required for the healthy functioning of the nervous and digestive systems.
- It lowers cholesterol level.
- It is good for skin and hair.
- It is required for enzyme synthesis.
- It forms coenzymes NAD and NADP which are required as hydrogen acceptors in cellular respiration.

### Vitamin B5

- It forms coenzyme A that activates the carboxylic acid in cellular metabolism.

### Vitamin B6

- It forms coenzymes such as pyridoxal phosphate and pyridoxamine phosphate and is involved in many enzyme reactions of the amino acid metabolism.

### Vitamin B7

- It is required as a coenzyme for carboxylation reaction in cells.

### Vitamin B9

- It promotes DNA synthesis.
- It also helps in maturation of RBCs.

### Vitamin B12

- It promotes DNA synthesis.
- It also helps in maturation of RBCs.

**Vitamin C**

- It is involved in the repair and maintenance of cartilage, bone and teeth.
- It aids in formation of tendons, ligaments and blood vessels.
- It helps in wound healing.

**Vitamin D**

- It helps in the absorption of Ca2+ from the small intestine.
- It is also required for the maintenance and growth of the bone.

**Vitamin E**

- It prevents unsaturated fatty acids and vitamin A oxidation.

**Vitamin K**

- It helps in the coagulation of blood.

## Dietary sources of water soluble vitamins

**Vitamin B1**:Pulses, meats, yeasts, cereals, and sprouted beans

**Vitamin B2**:Yoghourts, Pulses, green vegetables, milks and yeasts

**Vitamin B3**:Fishes, meats, cereals, grains, pulses, yeasts and livers

**Vitamin B5**:Eggs, yeasts and most of the foods

**Vitamin B6**:All plant and animal tissues

**Vitamin B7**:Yeasts, livers and kidneys

**Vitamin B9**:Fishes, livers and vegetables. It is also produced by bacteria in colon

**Vitamin B12**:Milks, kidneys, meats, eggs and fishes. Bacteria in the colon of humans and in the digestive tract of cattle also produce this vitamin

**Vitamin C**:Green vegetables, oranges and lemons

## Dietary sources of fat soluble vitamins

**Vitamin A**:Cod liver oils, carrots, maizes, spinaches, butters, and milks

**Vitamin D**:Cod liver oils, by the action of sunlight on the skin, shark liver oils and eggs

**Vitamin E**:Brown flours, vegetable oils, green vegetables, germinated wheats and seeds

**Vitamin K**:Wheat germs, cabbages and corianders. It is also synthesised by the bacteria of the large intestine Wheat germs, cabbages and corianders.