|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **vitamins** | **functions** | **Food sources** | Symptom of deficiency | Symptom of excess | **Causes** | **prevention** |
| **Vitamin A** | * Maintains eye health * Promotes growth and development, maintains healthy bones and teeth * Enhances the protection and regeneration of cells and mucous membrane * Maintains healthy respiratory and intestinal tracts * Maintain healthy hair, nails and skin * Protection against infection | Dairy products, cod liver oil, liver, dark green and yellow vegetables and fruits | * Night blindness, dry eyes * Dry skin * Stomach discomfort * Poor growth * Weak bones and teeth | * Dry, scaly, peeling, and itchy skin, rash * Hair loss * Poor appetite, fatigue * Vomiting, stomach discomfort * Liver injury * Headache, bone pain * Nervousness, irritability | * Of course the biggest reason behind Vitamin A deficiency is malnutrition. People who have a low intake of animal foods usually are at a risk of this deficiency. Animal food products and some vegetables are a rich source of Vitamin A. * Breast milk contains good amount of Vitamin A for newborns. The mothers who don’t breast feed their children put them at a risk of developing Vitamin A deficiency. * If a pregnant or lactating mother is Vitamin A deficient then the newborn baby is very likely going to be vitamin A deficient as well. * Mal-absorption of vitamin A by the body can also lead to its deficiency. It can be due to sprue, celiac disease, obstructive jaundice, cirrhosis, giardiasis, cystic fibrosis or an over use of mineral oil as laxative. * Over excretion of urine is also known to cause Vitamin A deficiency. Massive excretion can be caused by tuberculosis, UTI, cancer, pneumonia and nephritis. * Lack of storage ability of Vitamin A by the body resulting from hepatic disease also causes vitamin A deficiency. | * Liver, beef, chicken, eggs, whole milk, fortified milk, carrots, mangoes, orange fruits, sweet potatoes, spinach, kale and other green vegetables are among foods rich in vitamin A. * Eating at least five servings of fruits and vegetables per day is recommended in order to provide a comprehensive distribution of carotenoids. * A variety of foods, such as breakfast cereals, pastries, breads, crackers and cereal grain bars, are often fortified with vitamin A. * In at-risk populations, vitamin A supplements are associated with a reduction of morbidity, mortality and blindness in young children aged 6 months to 5 years.[[9](http://patient.info/in/doctor/vitamin-a-deficiency#ref-9)][[10](http://patient.info/in/doctor/vitamin-a-deficiency#ref-10)]   There is, however, no convincing evidence that either maternal postpartum or infant vitamin A supplementation results in a reduction in infant mortality or morbidity in low- and middle-income countries. |
| Vitamin B2 | * Helps in carbohydrate, protein and fat metabolism, enables the body to get energy from food * Maintains healthy mouth, lips, tongue, and eyes * Maintains healthy skin, hair and nails | Dairy products, eggs, meat, green leafy vegetables, liver, whole-wheat cereals, nuts, yeast | * Inflammation of the oral cavity, mouth corner and tongue * Itchy, dry and bloodshot eyes * Dry skin * Weakness | Uncommon |  | Treatment involves diet, high in Sources of Vitamin B2.   * Normally, people may get required riboflavin from the following, source: Beef liver, dairy products, eggs, meat, wheat germ and Tuna fish, * The most nutrient dense sources of riboflavin are liver, mushrooms, spinach and other green leafy vegetables, broccoli, asparagus and milk products. * Supplements can be used to increase the amount of B2 consumed, however should be only on prescription. Supplements should be prescribed or recommended by a qualified heath professional.   Exposure to light (ultraviolet radiation) causes riboflavin to breakdown rapidly. To prevent this light-induced breakdown, paper and plastic cartons-not glass- are usd in packaging riboflavin rich foods, such as milk, milk products and cereals. |
| Vitamin B3 | * Helps in carbohydrate and fat metabolism, enabling the body to get energy from food * Regulates cholesterol level * Maintains healthy skin, mucous membranes, tongue and the digestive system | Dairy products, fish, meat, poultry, vegetables, whole-wheat cereals | * Dyspepsia * Rough and inflamed skin * Listlessness | * Stomach discomfort, vomiting * Listlessness, headache, fatigue | * Low niacin intake in [chronic alcoholism](http://www.nutrientsreview.com/alcohol/craving-abuse-dependence-alcoholism.html) * Predominantly cornmeal-based diet (vitamin B3 from cornmeal is not absorbed well) in certain parts of India, China or Africa, especially among refugees [5]. * Niacin malabsorption (niacin is absorbed in the stomach and upper small intestine) in celiac disease, Crohn’s disease and tryptophan malabsorption in the genetic disorder called Hartnup disease * Increased demand for niacin in carcinoid syndrome * Interaction with the anti-tuberculosis medication isoniazid | Consumption of a balanced diet rich in niacin and/or tryptophan including meat, chicken and fish, peanuts, milk, eggs, and fortified cereals is central to the prevention of vitamin B3 deficiency.  Continued compliance with niacin supplements and/or a balanced diet are essential for the prevention of recurrence. In those who chronically abuse alcohol, 10 mg per day of niacin is recommended as a preventive measure. [[87]](javascript:;" \o "Hoffman RS, Goldfrank LR. Ethanol-associated metabolic disorders. Emerg Med Clin North Am. 1989;7:943-961.)  Continued niacin supplementation may be advisable in such clinical settings as alcohol abuse, chronic inflammatory bowel disorders (e.g., Crohn disease), and following clinically significant small-bowel resection, or bariatric surgery |
| Vitamin B6 | * Helps in protein metabolism * Helps produce red blood cells, hormones, enzymes and antibodies * Helps in transmission of nervous impulse | Dairy products, meat, whole-wheat cereals, green leafy vegetables, fish | * Anaemia * Nervousness, insomnia, depression * Muscle cramps | Limb numbness, partial loss of sensation | * Low vitamin B6 intake in starvation, [chronic alcoholism](http://www.nutrientsreview.com/alcohol/craving-abuse-dependence-alcoholism.html) * Chronic kidney disease * Malabsorption in Crohn’s and celiac disease * Rheumatoid arthritis * Homocystinuria (a genetic disease) * Medications: theophylline (for asthma), isoniazid and cycloserine (for tuberculosis), penicillamine (a metal chelator), L-dopa (for Parkinson’s disease) | You should take dietary supplements only under the supervision of a knowledgeable health care provider because of the potential for side effects and interactions with medications.  Very high doses, 200 mg or more per day, of vitamin B6 can cause neurological disorders, such as loss of feeling in the legs and imbalance. Stopping high doses usually leads to a complete recovery within 6 months |
| Vitamin B12 | * Helps produce red blood cells * Maintains healthy nervous system * Promotes appetite * Helps in protein metabolism | Dairy products, fish, eggs, liver, meat | * Anaemia * Slowness in thinking, emotional chaos, poor memory * Weakened sensation | Uncommon |  | The recommended daily allowance for vitamin B12 is 2.4 micrograms/day.Most vitamin B12 is obtained through ingestion of meat and dairy products, and body stores of vitamin B12 remain for years. Vegans and vegetarians may be at risk of vitamin B12 deficiency, and should supplement their diet with vitamin B12-fortified foods or a multivitamin containing a minimum of 2.4 micrograms of vitamin B12 per day. Those with history of gastric bypass surgery or gastrectomy should supplement their diet with additional vitamin B12. |
| Vitamin C | * Helps synthesize collagen; promotes the growth and repair of cells, gum, teeth, blood vessels and bones * Helps healing after operation and injury * Helps calcium and iron absorption * Enhances immunity | Citrus fruits (mandarin, orange, grapefruit, lemon), strawberry, black current, kiwi fruit, tomato, green leafy vegetables, green pepper | * Scurvy * Gum inflammation and bleeding, fall of teeth * Susceptibility to skin bleeding, burst of capillary vessels * Weakness, fatigue * Bone pain, swollen and aching joints | * Abdominal pain * Diarrhea * Kidney stone | * Low vitamin C intake in anorexia, chronic alcoholism, illegal drugs abuse, malnutrition, exclusive cow milk diet in babies, “bread and water” diet [1,6] * Low absorption in celiac disease, Crohn’s disease, Whipple disease, gastric bypass (bariatric surgery for weight loss) [7] * Smoking, cancer, thyrotoxicosis, pregnancy, breastfeeding, hemodialysis and peritoneal dialysis decreases vitamin C levels [1,6] | * An adequate dietary intake of vitamin C is essential. * Around 90% of vitamin C in the diet comes from fruit and vegetables. Cooking reduces vitamin C content by 30-40%. * The recommended daily intake of vitamin C in the diet depends on age and sex. * Dietary Reference Values for Food Energy and Nutrients for the UK suggest the following recommended nutrient intake:[[7](http://patient.info/in/doctor/vitamin-c-deficiency-pro#ref-7)]   + For children aged 1-10 - 30 mg/day.   + For children aged 11-14 - 35 mg/day.   + For children aged over 15 and adults - 40 mg/day. * As a rough guide, one large orange will provide the recommended daily intake of vitamin C for an average adult. |
| Vitamin D | * Helps body absorb and utilize calcium and phosphorus, so as to maintain bones, teeth and brain healthy * Maintains normal calcium level in blood | Egg yolk, liver, cod liver oil, fish. Our skins also produces Vitamin D when exposed to sunlight | * Children: rickets * Adults: osteoporosis | * Calcified cartilage * High calcium level in the blood causes abnormal heart beat and damage to organs such as kidneys * Vomiting, diarrhea * Sore eyes * Itchy skin | Dietary intakes of vitamin D are less than the recommended level in many children. In addition low exposure to sun may contribute to vitamin D deficiency. It is recommended that approximately 30 min of skin exposure (without sunscreen) of the arms and face to sunlight can provide all the daily vitamin D needs of the body. | In India, where there is no fortification of food with vitamin D, supplementation remains an important alternative for improving the vitamin D status of individuals. (8) Children may need supplement containing at least 200 IU vitamin D. In the absence of adequate sun exposure, children and adults need 800-1000 IU of vitamin D/day. |
| Vitamin E | * Maintains normal conditions of cells, and healthy skin and tissues * Protects red blood cells * Antioxidation * Enhance immunity | Green leafy vegetables, whole-wheat cereals, nuts, egg yolk | * New born infants: haemolytic anaemia * Adults: weakness | * Low thyroxine level * Headache, dizziness, fatigue * Stomach discomfort, poor appetite | * [Low birth weight](http://www.rightdiagnosis.com/sym/low_birth_weight.htm) * [Malabsorption](http://www.rightdiagnosis.com/m/malabsorption/intro.htm) | Consuming proper diet can prevent Vitamin E deficiency. Vitamin E deficiency patients can also take oral supplements for a certain period of time.  The principal source is vegetable oils – Corns, Soy Bean, Cottonseed, Safflower oil, Wheat Germ Oil & Peanuts.  Whole grains, nuts & seeds also contain a good amount of Vitamin E.  Wheat germ oil is an important source of vitamin E.  Vitamin E can be obtained from cooked dried beans and black gram. |
| Vitamin K | * Helps blood clotting, prevent over bleeding * Maintains health of the liver | Green leafy vegetables, soya beans. The human body can also produce Vitamin K through germs in the colon | Uncontrol bleeding from wounds due to clotting difficulty | Uncontrol bleeding from wounds due to clotting difficulty | * Health problems like gallbladder or cystic fibrosis, celiac disease, biliary disease and Crohn’s disease. * Liver disease * Taking blood-thinners * Serious burns | A diet rich in vitamin K – eg, green leafy vegetables and oils (such as olive, cottonseed, and soybeans), green peas and beans, watercress, asparagus, spinach, broccoli, cauliflower, oats and whole wheat.  The bacteria present in the lower intestinal tract can also synthesize Vitamin K.  Vitamin K given to neonates is very effective in preventing vitamin K deficiency. |
| Folic acid | * Helps produce cells and red blood cells * Promotes growth and reproductive functions | Dairy products, liver, whole-wheat cereals, beans, banana | * Anaemia * Decreased immunity * Fatigue * Stomach discomfort | Uncommon |  |  |
| Protein |  |  |  |  |  |  |