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**Review Article**

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**Hypervitaminosis**

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E-mail: [svenkatarao35@yahoo.in](mailto:svenkatarao35@yahoo.in)**Abstract**

Vitamins are readily available and sold in many different formulations and a wide variety of retail outlets. The food industry occasionally supplements foods with vitamins. Vitamins can be taken in excess and problems from hypervitaminosis, although uncommon, do occur.

Vitamins are the essential organic substances that are required in small amount for the metabolic functions of the body. Vitamins like Folate, Vitamin B12, Pantothenate, and Vitamin K are also synthesized by the intestinal bacterial flora. Vitamin D is synthesized from Ergocalciferol by the ultraviolet rays of sun light. They participate in our body metabolism either as a prosthetic group or as a co-factor of an enzyme. Many scientists presumed earlier that only fat soluble vitamins A, D, E and K can be stored in adipose tissue and liver and may produce toxicity. Water soluble vitamins like vitamin C or B-complex even if ingested in excess are excreted from the body. Now this concept was proved to be not true, some new findings are emerging out at the update level. Clearly, hypervitaminosis due to water soluble vitamins also occurs.

**Keywords:** vitaminosis, Vitamins**1.Introduction**

Hypervitaminosis refers to a condition of abnormally high storage levels of vitamins, which can lead to toxic symptoms. Toxicities of fat-soluble vitamins can also be caused by a large intake of highly fortified foods, but foods rarely deliver dangerous levels of fat-soluble vitamins[1]. The explorers to the Arctic used to feed on polar bears, fishes, and other animals which are rich in vitamin A mainly and consequently suffered from symptoms of excessive ingestion of vitamins A. High intake of beta-carotene (hypercarotenaemia) can color the skin yellow, sparing the eyes. More than 60,000 instances of vitamin toxicities are reported annually to US poison control centers.[2] According to National Health and Nutrition Examination Survey (NHANES) data, in 2003–2006, 33% of the United States population aged 1 year and older took a multivitamin supplement in a given month.[3] In a 2009 survey, 56% of US consumers said they take vitamins or supplements, with 44% saying they take them daily.[4] Owing to their ability to accumulate in

the body, fat-soluble vitamins have a higher potential for toxicity than do water-soluble vitamins. Usually nausea, vomiting diarrhea develops following by central nervous system symptoms of intense headache, vertigo, irritability, drowsiness, occasionally fits and coma. Peeling of skin commences after 24 hrs. Vitamin A excess causes bulging of fontanelles, papilloedema also seen in infants.[5][6][7] High doses of vitamin A can be teratogenic.[8]

**2. Etiology**

The main etiological factors are accidental ingestion of more amount of vitamin, excessive feeding of food due overly solicitous parents to their children and finally iatrogenic. If food contains enough vitamins, there is certainly no question of any vitamin supplementation, but if done it may be harmful. Anyhow due to Health Educative advertisements frequently children are brought to outpatient departments for vitamin supplementation sometimes excessively. (Vitamin A)

### 3. Individual hypervitaminosis:

The features of hypervitaminosis are usually due to exaggerations of their normal physiological and biochemical actions.

**3.1 Hypervitaminosis A:** It may occur as acute and chronic. In acute cases the features of hypervitaminosis are mainly due to exaggeration of their normal physiological and biochemical actions. Features in acute case are dizziness, headache, and lassitude, Irritability, pain abdomen, nausea, visual disturbances like diplopia, and bulging fontanels in infants, pruritus and excoriation of skin all over the body. Chronic cases are manifested by low grade fever, alopecia, dry fissured lip, ache in bones and joints, hyperostosis, anorexia, weight loss, hepatosplenomegaly, papilloedema, pseudotumour cerebri, if daily 25,000 IU or more vitamin A is consumed for many days. Other features suggestive of raised intracranial pressure, such as bulging fontanels (in an infant), papilloedema and diplopia, may also occur. Anemia and thrombocytopenia have also been described.[9] Complications include: Hypocalcaemia, Hypercalciuria and renal stones. It may be unwise to give vitamin A supplements to older patients with good diets, particularly if at risk of osteoporosis.[10] Experimentally chronic condition is produced when we take in excess of 50,000 units/day for more than three months. Complications include Hypocalcaemia, Hypercalciuria, renal stones and benign intracranial hypertension. Management is by stopping the supplements. If there are changes in mental state, admission to hospital is required. As far as prognosis is concerned, mortality is rare. Once identified, the prognosis is good. The yellow coloration of skin will reverse with time.

**3.2. Hypervitaminosis D:** Usually this is caused by excessive ingestion or over prescription of prescribed medications such as calcium with vitamin D. occasionally there is increased calcitriol production as in hyperparathyroidism or malignancy including some renal adenomas, sarcomas and lymphomas. In sarcoidosis there is a hypersensitivity to vitamin D. Excessive levels of vitamin D do not result from excessive exposure to sunlight because of further breakdown of D3 into products which have no effect on calcium metabolism. Recent concerns about vitamin D deficiency have led to increased use of supplements. Most symptoms occur because of secondary hypercalcaemia with increased bone resorption and hypercalciuria. They include: Polyuria, Polydipsia, Vomiting, Anorexia, and Lethargy, Dehydration, Constipation, Hypertension,

Tetany, Seizures can be fatal. The traditional description of hypercalcaemia is stones, bones and groans. Hypervitaminosis D is also recognized as a cause of depression.[11] In children it can result in dental enamel hypoplasia and focal pulp calcification. [12] Investigations include serum calcium and phosphate and 25 hydroxy-vitamin D and 1, 25 dihydroxy-vitamin D levels. Management is by stopping the supplements and treats the cause. Bisphosphonates such as pamidronate may be used to treat hypercalcaemia. Glucocorticoids are occasionally used for a short while in severe cases of vitamin D intoxication. Complications may include nephrolithiasis, nephrocalcinosis (calcium oxalate and calcium phosphate are radio opaque stones), calcinosis of the joints and peri articular tissues, and chronic kidney disease. As far as Prognosis is concerned renal disease is usually reversible if recognized early. An outbreak of hypervitaminosis D associated with the over fortification of milk from a home-delivery dairy.[13]

**3.3. Hypervitaminosis E:** Vitamin E is present in a great many foods, particularly vegetable oils, unprocessed cereal grains, nuts and seeds. There is no evidence of any adverse effects from consuming vitamin E in food. However, high doses of alpha-tocopherol supplements can affect blood clotting inhibit platelet aggregation and cause hemorrhage. Studies have also shown an increase in all-cause mortality associated with vitamin E supplements.

Vitamin E, 3 or 4 decades ago it appeared to be 'a vitamin in search of a deficiency'. Its importance had been demonstrated only for reproductive efficacy in rats. Vitamin E (alpha tocopherol) is a fat-soluble vitamin which acts as an antioxidant and disposes of free radicals. Problems only usually occur after a very large overdose.[14] The recommended daily dose is 30 mg per day, and side-effects are usually experienced at doses above 1 g/kg. Excess of vitamin E inhibits vitamin K, causes increased bleeding and impaired immune system leading to necrotic enterocolitis. Bruising and bleeding with increased prothrombin time is mediated by the inhibition of vitamin K-dependent carboxylase, and reversed by administering vitamin K. Platelet thromboxane production is also reduced. Some studies have also reported fatigue, weakness, headache and gastrointestinal upset. Management includes stop the supplements. Consider vitamin K if prothrombin time is prolonged.

**3.4 Hypervitaminosis B-complex:** In many cases skin changes, intestinal ulcers, fatty liver,

hyperglycemia, hyperuricaemia, nausea and indigestion are found.

**i). Thiamine (B1):** Over dose produce curare like action, paralysis. Blocks nerve transmission. Restlessness, convulsions, labored respiration, death (respiratory paralysis and cardiac failure). Disrupt other B-Vitamins, disrupt insulin and thyroid functions.

**ii). Riboflavin (B2):** Over dose produces bright yellow urine, fatigue, vomiting, itching, numbness, burning or prickling sensation, sensitivity to light and hypotension occurs.

**iii). Niacin (B3):** Overconsumption of niacin causes flushing syndrome, hyperemia of skin, Pruritus, GIT disturbances and acanthosis nigricans. More than 3gm niacin daily causes aggravation of bronchial asthma, gout and fasting hyperglycemia. Low blood pressure, light headedness, insomnia, liver damage, peptic ulcer, skin rash, altered liver function tests may occur.

**iv). Pantothenic acid (B 5):** Overdose produce diarrhea, GIT problems, water retention may occur.

**v). Pyridoxine (B6):** Vitamin B6 is a water-soluble vitamin and one of eight B vitamins. As such, it might be considered safe but at doses over 200 micrograms per day it can cause neurological disorders when taken over a prolonged period.[15] It used to be prescribed extensively for carpal tunnel syndrome and premenstrual tension. A sensory neuropathy mimicking multiple sclerosis may be seen, if B6 more than 2 gm is taken daily Progressive ataxia, impaired vision and vibration senses, and loss of deep tendon reflexes are seen. Preserved motor strength, perioral numbness and clumsy limbs are present. Loss of appetite, stomach upset and skin lesions also occurs.

High intakes of vitamin B6 from food sources have not been reported to cause adverse effects. However, long-term use of supplements can cause severe and progressive sensory neuropathy with ataxia. The severity of symptoms is dose-dependent and the symptoms usually stop when the supplements are discontinued. Other adverse effects of excessive vitamin B6 intake include painful skin rashes, photosensitivity, nausea and heart burn.[16] Symptoms include excessive doses damage sensory nerves. This can cause paraesthesia in the hands and feet, difficulty walking (poor co-ordination, 'staggering'), reduced sensation to touch, temperature, and to vibration and tiredness. Management is by stopping the vitamin B6 resolves symptoms in all cases. Failure to do so suggests another cause for symptoms. Vitamin B6 functions in protein and

amino acid metabolism. Pyridoxine is the treatment for isoniazid overdose. It is also used by body builders with varying results, depending on dosage.

**vi). Biotin (B 7) (vitamin H):** Biotin causes Scurvy skin due to hyperkeratosis of superficial follicular epithelium.

**vii). Folic acid (B 9):** Folic acid is useful for the RBC and DNA production. Over dosage produce convulsions in epileptics. Inhibit hepatic alcohol dehydrogenase. Stomach, sleep and skin problems occurs.

**viii). Cobalamine (B12):** Over dose of B12 causes reduction in size of vascular controlled reflexes, palpitation, tingling sensation and numbness of limbs.

**ix. Ascorbic acid (C):** Vitamin C is found in citrus fruits and vegetables. An anti-oxidant and reducing agent, its controversial uses include treatment of upper respiratory tract infections and cancer.[17]

The worst effect is the formation of oxalate stone in the kidney. It may also cause uricosuria. Large doses if taken by pregnant women that induce the metabolic enzymes in the fetus and this may lead to rebound scurvy. Absorption of vitamin B12 is interfered with high doses of vitamin C. Vitamin C interferes with healthy antioxidant, pro-oxidant balance in body. In thalassemia or hemochromatosis increased iron overload occurs. Premature infants get hemolytic anemia due to the fragility of RBC.

**x). Choline:** More than 3.5 gm/day in take causes skin rash and increased blood sugar.

#### 4. Discussion

In self-limiting acute illness spontaneous recovery occurring in an otherwise healthy individual who has ingested a large quantity of Vitamin A over a short period is characteristic of acute vitaminosis A. In this case the symptoms of nausea, vomiting, headache, visual disturbances, vertigo associated with papilloedema and followed by exfoliation of skin. It has been estimated that acute poisoning in adults may be expected with over doses over 1,000,000 IU. Acute and chronic symptoms like pruritus and exfoliation are producible experimentally. Acute syndrome in children includes increased CSF pressure, papilloedema can occur and the mechanism is not known.[18] Vitamin D3 seems to decrease mortality in elderly people living independently or in institutional care. [19]

Studies have shown that antioxidant supplements, including vitamin A and vitamin E, do not possess preventative effects and may be harmful with unwanted consequences to our health, especially

in well-nourished populations. The optimal source of antioxidants seems to come from our diet, and not from antioxidant supplements in pills or tablets. Vitamin A and vitamin E supplements may even increase mortality.[20]

Toxicity from excess of vitamins A and D and, exceptionally, vitamin E, can occur but it is important not to exaggerate the risk.[21] However, the belief that vitamins are good, therefore lots of vitamins are even better is inaccurate and simplistic. There has been an explosion of interest in vitamin supplementation and a great deal of interest in nutritional medicine. This may help to inform on better diets and better dietary supplementation. It is important for doctors to be informed and to be able to identify misinformation, harmful diets and potentially harmful misuse of vitamin supplements.

Vitamin C supplementation has not been shown to reduce the incidence of colds in the general population. Regular supplementation trials have shown that vitamin C reduces the duration of colds, but this was not replicated in therapeutic trials.[22]

## 5. Summary

Vitamins, both fat soluble and water soluble are not safe if taken in excess. Fat soluble vitamins are stored in the body and they are not excreted in urine. Therefore, even excessive amount for a short period shows toxicity. Contrasts, water soluble vitamins being water soluble are readily excreted in urine by the kidneys. Therefore a massive amount of water soluble vitamins for a long period is required to show toxicity. Hence, toxicity of fat soluble vitamins occurs earlier than the water soluble vitamins. The adverse effects are reversible in early case. Vitamin must be given with caution. Physician's role is marked in the prevention of these emergencies.

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