

Vitamin D Deficiency: Indian Scenario

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India is known for its traditional, cultural and lingual diversity and why not? It is a vast tropical country extending from 8.4° N latitude to 37.6° N latitude. Majority of its population lives in areas receiving ample sunlight throughout the year and hence there was a disbelief that Vitamin D (Vit D) deficiency is uncommon in India.¹ However from the data available in the published literature, Vit D deficiency is very common in India in all the age groups and both sexes across the country.²⁻⁴

Vit D is a fat soluble vitamin and its synthesis in the body is dependent on multiple factors like latitude, atmospheric pollution, clothing, skin pigmentation and duration and time of exposure to sunlight. The FAO/WHO Expert Consultation⁵ states that in most locations of the world between 42° N and 42°S latitude there is abundant sunshine. This is responsible for physiological production of Vit D endogenously in the skin from 7-dehydrocholesterol present in the subcutaneous fat. Thirty minutes of exposure of the skin over the arms and face to sunlight, without application of sunscreen, preferably between 10 am to 2 pm (as maximum ultraviolet B rays are transmitted during this time) daily is adequate to avoid Vit D deficiency.

Vitamin D is a part of the "Calcium-Vitamin D-Parathyroid hormone" endocrine axis.² It is crucial for calcium metabolism and its homeostasis. Adequate calcium intake along with vit D is necessary to maintain the peak bone mass achieved by an individual. Vitamin D adequacy during adolescence helps to reduce the risk of osteoporosis later in life. Vit D deficiency and low calcium intake are important risk factors for osteoporosis. Vit D deficiency causes low bone mass, muscle weakness and therefore increased risk of fracture. Vit D deficiency and low calcium cause long standing secondary hyperparathyroidism leading to increased bone turnover causing osteoporotic fractures.^{6,7} It is essential to interpret bone mineral density (BMD) with Vit D levels. Studies of BMD without knowing 25(OH)D status can be misleading. Recently, Vit D status is being strongly linked to autoimmune disorders (Crohn's disease, multiple sclerosis, rheumatoid arthritis and type I diabetes mellitus), infections and risk of developing cancers of the breast, colon, prostate and ovary.⁸

It has been estimated that 1 billion people worldwide have Vit D deficiency or insufficiency.⁸ There is widespread prevalence of varying degrees (50- 90%) of Vit D deficiency with low dietary calcium intake in Indian population according to various studies published earlier.² Apart from low dietary intake, people suffering from hepatic, renal, dermatological disorders, alcoholics and inflammatory rheumatological conditions also have Vit D deficiency. Vit D deficiency is a common problem in India due to several factors:

1. Changing food fads and food habits contribute to low dietary calcium and Vit D intake.
2. High fibre diet containing phosphates and phytates which can deplete Vit D stores and increase calcium requirement.⁹

3. Genetic factors like having increased 25(OH)D-24-hydroxylase which degrades 25(OH)D to inactive metabolites.¹⁰
4. It has been shown that increment in serum 25(OH)D in response to treatment depends on the heritability of Vit D binding protein.¹¹
5. With modernization, the number of hours spent indoor have increased thereby preventing adequate sun exposure. This is particularly true in the urban Indians.
6. Increased pollution can hamper the ultraviolet rays to adequately synthesize Vit D in the skin.¹²
7. Cultural and traditional habits prevalent in certain religions like "Burqa" and the "pardah" system in Muslims have been well known.
8. Repeated and unplanned, unspaced pregnancies in dietary deficient patients can aggravate Vit D deficiency in the mother and the foetus.

Vit D deficiency is not only a problem in India but also in countries like Pakistan, China, middle-East and Africa. It is relatively less common in Japan, USA, Canada and South-east Asia. In USA and Canada, milk is usually fortified with Vit D and the use of vitamin supplements is common.¹² Although we are all aware about the causes of Vit D deficiency, we are still lacking in preventing it. Although, there is adequate sunshine in India, high temperatures during the daytime and sultry and humid climate in many areas are the deterrents to follow the advice about sun exposure. Hence, food fortification with Vit D is a good option to solve this issue. Similarly food fortification and public health policies for Vit D supplementation and dietary guidelines for adequate calcium for Indian population should be formulated and implemented.

In the present issue of JAPI, CV Harinarayan et al have studied 25(OH)D and BMD in women of reproductive(WR) age group and post menopausal women (PMW) in South India.¹³ They have reported Vit D deficiency in 76% in WR, 70% in PMW, insufficiency in 16.5% in WR and 23% in PMW. Vit D deficiency is considered to be present when serum 25(OH)D levels are < 20ng/ml; insufficiency between 20-30ng/ml and sufficient when > 30ng/ml.¹⁴⁻¹⁶ In this study there is Vit D deficiency which coexists with low BMD. They have recommended daily calcium intake of 1-1.5 gm and Vit D supplementation as part of therapy in the study population to maintain Vit D levels > 30ng/ml.

Marwaha et al have reported Vit D deficiency in healthy Indians above 50 years from North India in this issue of JAPI.¹⁷ However, there was no correlation of BMD with 25(OH)D in this study. An interesting finding in this study is that more than half of the subjects were taking calcium and Vit D supplements, but there was no difference in serum 25(OH)D levels between the two groups. Most of the subjects were taking between 200-400 IU of Vit D₃ (cholecalciferol) which is insufficient to normalize serum 25(OH)D levels in a Vit D deficient population.¹⁷ One study from North India¹⁸ reported requirement of 60,000-120,000 IU per month to achieve Vit D level > 30 ng/ml. This is the level

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at which calcium absorption from the gut is maximum.¹⁹ Another study by Goswami et al have reported correction of Vit D level to normal after 8 weeks of supplementation with weekly dose of 60,000 IU.²⁰ Both these studies highlight the need of regular supplementation of atleast 2000 IU/day of VitD supplementation to maintain normal Vit D levels.¹⁷

As stated earlier, Vit D deficiency causes secondary hyperparathyroidism. But, it is intriguing to know that in the present study by Marwaha et al, there was absence of an anticipated PTH response to low serum 25(OH)D levels in half the participants. This finding calls for further research in this field to answer this query.

With so much said about Vit D deficiency and insufficiency, one must be careful not to overenthusiastically overtreat Vit D deficiency without actually monitoring Vit D levels and land up with Hypervitaminosis D. Hypercalcemia, constipation, decreased appetite, lethargy, dehydration, failure to thrive (in children), polyuria, polydipsia, nausea, vomiting, abdominal pain, nephrocalcinosis and headache can be the common clinical features of hypervitaminosis D. Preliminary reports also suggest that hypervitaminosis D due to an increased 1 α -hydroxylase activity seems to be a cause of the premature aging in mice.²¹ Chronic ingestion of 50 to 100 times normal physiologic requirement of Vit D (> 40,000 IU/day) can lead to severe hypercalcemia. It requires prompt therapy in the form of intravenous fluids, oral prednisolone, restriction of calcium in diet and, some patients may require pamidronate infusion for reducing hypercalcemia.²²

It is said that "Prevention is better than cure". This is true for Vit D insufficiency and deficiency which are easily preventable. Thus, the current recommendations of taking 1 to 1.5 gm of dietary calcium and 2000 IU of Vit D per day in the diet should be adhered to avoid Vit D deficiency in the Indian population.

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