

## Does Vitamin D deficiency call for global public health concern and policy making?

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### Background

About 80-90% Indians are vitamin D deficient according to most studies [1]. Vitamin D deficiency is homogenous; it isn't specific to any particular age group. In this context we shall discuss the role of vitamin D in the body and how to prevent deficiency of vitamin D especially among Indian population.

### Role of vitamin D in the body

Vitamin D, a fat soluble vitamin, is needed for calcium absorption from the gut. This calcium is utilised for bone building, for muscle contraction and for nerve conduction. Besides these important functions, calcium is also necessary for the proper functioning of a number of enzymes and for normal cell division in the body. It follows that vitamin D is necessary for all these vital functions and for other miscellaneous actions at the cellular level.

### Vitamin synthesis paradox in India

Vitamin D can be synthesised in the human body itself. Endogenous cholesterol in the presence of UV light, is converted to 1, 25 dihydroxycholecalciferol, the active form of vitamin D. In India, despite being a tropical country with abundant sunshine, vitamin D deficiency has reached epidemic proportions. This is largely due to prevalent cultural and religious practices like the purdah and vastly indoor lifestyle (particularly for women). Besides, a large portion of Indian population is vegetarian and therefore does not consume vitamin D rich foods like fish, beef liver, egg yolk etc. Vegetarian diets full of fibre are rich in phytates and phosphates; both of these cause further depletion of body calcium and vitamin D stores.

Vitamin D deficiency is defined by the following three criteria [2]:

- <20ng/ml serum 25(OH) cholecalciferol level
- Consequent and consistent elevation of parathyroid hormone
- Decrease in intestinal calcium absorption

### Manifestations Of vitamin D deficiency

Vitamin D deficiency causes a wide array of symptoms and diseases. Decreased calcium levels cause skeletal manifestations in the form of rickets (in children) and osteomalacia (in adults). Many studies have shown an association between vitamin D deficiency and an increased risk of fractures [3-6].

- **Obesity and diabetes mellitus:** Vitamin D deficiency has been associated with increased predisposition to develop obesity and type 2 diabetes [7-12].
- **Infections and autoimmunity:** Various groups of studies show individuals with hypovitaminosis D to have an increased risk of infections (tuberculosis, influenza) and of developing autoimmunity [13-18].
- **Psychiatric manifestations:** Vitamin D deficient individuals have been shown to have poor prognosis in depression. Besides studies have also demonstrated a link between Parkinson's disease and hypovitaminosis D [19-21].

### Combating vitamin D deficiency

Despite its vital functions, vitamin D deficiency is the most under diagnosed and undertreated nutritional disorder in the world [22,23]. Given that around 80-90% of the population is vitamin D deficient, it's imperative that radical measures be taken to address the problem. Vitamin D deficiency can be combated like Vitamin A deficiency has been. Just a few decades ago, one-third of all under five children were vitamin A deficient and at a very high risk of developing night blindness. Today vitamin A deficiency is very rare in India (<100 thousand cases per year). Food fortification and vitamin A supplementation in the National Immunisation Program have made great strides in reducing the number of vitamin A deficient individuals.

Similar methods can be adapted to alleviate hypovitaminosis D

- Food fortification (milk, curd, ghee) is perhaps the easiest way to provide vitamin D supplementation to the masses.

- Inclusion of vitamin D supplements in national nutritional initiatives will effectively address the problem of vitamin D deficiency in children and especially reduce the incidence of rickets.
- Besides, creating awareness about this deficiency is of paramount importance. Parents need to be educated about various vitamin D rich foods, supplements and the importance of proper sun exposure for their children.
- Informed people can get themselves tested for serum 25(OH) cholecalciferol levels. These testing facilities must be made cheaper and accessible to all to ensure that more people benefit from them.
- All primary health centres in the country should provide subsidised vitamin D supplements to the general population, especially pregnant women and children. This will ensure grass root level action in decreasing the prevalence of vitamin D deficiency in India.

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