

Vitamin D Scenario in healthy community of India

Anamika Dwivedi¹, Abhimanyu Kumar Jha²,Varsha Gupta³

1 Department of Biotechnology, Chhatrapati Shahu Ji Maharaj University, Kanpur, U.P., India

2 Department of Biotechnology, Faculty of Life Sciences, Institute of Applied Medicine & Research, Ghaziabad, U.P., India

3 Institutes of Technology and Management, Meerut, U.P., India

ABSTRACT

In Indians, the deficiency of vitamin D is prevalent and is now associated with many diseases like cancer, cardiovascular diseases and autoimmunity apart from its important role in calcium metabolism. In various regions, despite of fish being the staple food demographic study shows higher rate of hypovitaminosis D. Apart from the skeletal metabolic functions this vital nutrient has great impact on the immunesystem. As India is facing increased vitamin D deficiency and increased incidences of bone and joint disorders, and other chronic diseases such as cancer, rheumatic diseases, autoimmune diseases and several other metabolic disorders. Therefore this study would shed some light on prevalence of vitamin D in different age groupsof India. The article would glorify the necessity of vitamin D in daily routine and its preventive effect towards diseases.

Keywords – VDD- Vitamin D deficiency; VDI- Vitamin D insufficiency; Hypovitaminosis D;

1. INTRODUCTION

Vitamin D commonly called “antiricketic factor” is one of the most important nutritional necessity for the overall body development. VDD prevalence has been documented among all toddlers, men, women, adolescents, school children pregnant

and lactating women[1]. India had been assumed to have the sufficient vitamin D status in its population due to its geographical position but the population is highly deficient in Vitamin D. The sunshine vitamin has been widely known for its role in bone health and its metabolism but it also plays important role in preventing and management of various chronic diseases such as cardiovascular diseases[2], type 2 diabetes[3], rheumatoid arthritis[4], osteoarthritis[5-8], systemic lupus erythematosus[9] and several others. According to Indian Academy of Pediatrics there is a vast difference between the dosage recommendation in western countries and actual requirement of population of India. Similar dosage shows poor response in Indian population as the absorption of vitamin D through skin is low[10]. Dosages of vitamin D supplementation should be standardized in Indian children to meet the adequate levels in population[11]. Several studies report vitamin D deficiency in healthy individuals of all socio- economic strata in India. Factors that influence vitamin D absorption and synthesis in body are

1. Dietary habits such as intake of junk food, no or least consumption of fish, egg or vitamin D supplementation as daily routine. Diets having high fibre content also depletes stored vitamin D and creates deficiency of calcium[12].
2. Non consumption of oily fish, eggs, and fortified foods, which were not consumed especially by the infants and adults also for varied reasons.
3. Pollution in the air which absorbs the UVB photons hence preventing the skin pores from absorbing UV rays essential for conversion of 7-dehydrocholesterol to cholecalciferol[13].
4. Use of sun blocks also inhibits the absorption of the vital nutrient[14].
5. Genetic variabilities that interferes in the metabolism of 1-25(OH) D and 25 (OH)D. Polymorphism in various genes related to vitamin D such as VDR, CYP27B1[15-18].
6. Skin pigmentation also affect the bioavailability of the vitamin[19].
7. Urban civilization of indoor living prevents sufficient sun exposure. It is directly dependent on duration and time of sun exposure.
8. Cultural and regional practices of clothing such as Burqa, Salwarkammej, etc. also prevents the exposure of sun to skin.
9. Pregnancy in nutritionally compromised women causes severe deficiency in both mother and child.
10. The availability of sun rays are also dependent on latitude of the area under consideration.

11. Seasonal variation also have markable impact on the serum vitamin D levels i.e. higher vitamin D serum levels in summer as compared to winter concentration[20,27].
12. Unawareness about the importance of vitamin D in daily routine whether diseased or not.

2. METHODS

Literature survey with keywords Vitamin D deficiency, Vitamin D status in India, Vitamin D insufficiency, reports on hypovitaminosis D were used for computational searches. Medline, Pubmed, Google are the databases used for mining information. References of articles were searched to find out the missing links. Initially 186 articles assessed according to the keywords used. 67 articles identified to be informative. Abstract reading became the pioneer tool to select the article for consideration. Result is then intrigued for final inclusion in the study.Finally 36 manuscripts analysed for the article. In this review serum 25(OH)D levels < 20ng/ml indicates for vitamin D deficient, whereas value between range $\leq 20-40$ ng/ml justifies for vitamin insufficiency. Prevalence data considered significant of those articles that has a sample size more than or equal to 100.

2.1 Popular techniques of Vitamin D estimation

25(OH)D is the best indicator of serum vitamin D levels. The LCTMS (liquid chromatography tandem mass spectrometry) is the most widely preferred method for accurate quantification. For accurate and more specific values practitioners generally suggest chemiluminescence immunoassay (HPLC). Both of these tests are expensive and time consuming as well. However, other quantification assays such as radioimmunoassay (RIA), enzyme linked immunosorbant assay (ELISA), and protein binding assays (CLIA, ECLIA) are also in routine testing of 25(OH)D in clinical laboratories. However, the LCTMS (liquid chromatography tandem mass spectrometry) is the most widely preferred method for accurate quantification but it is expensive and time consuming as well. 12 hr fasting is often recommended before the sample collection for the test.

2.2 Vitamin D status in upcoming generation

A study in Andhra Pradesh by Nageshu et al estimated vitamin D in newborns found 13.8% prevalence of vitamin D <10ng/ml[21]. A study that investigated slum area toddlers suggest that case of hypovitaminosis D are more prone in sunlight deprived people rather than sunlight exposed of the same society[22]. Goswami et al found low levels of vitamin D in the population of capital of India[23]. A study in New Delhi involved infants and toddlers of age between 9-24 months from two localities differing in their pollution level. This study prompted out the role of pollution in low absorption of vitamin D through skin. It also found the inverse relationship between vitamin D and PTH levels[24].Marwaha et al also studied adolescents in Delhi and found low levels of vitamin D in both lower and higher socioeconomic strata. The study found that even after supplementation except 47% of the individuals others did not responded well. This study suggest that many factors are responsible for vitamin D absorption in the body[25]. Outcome of several studies suggest that instead of plenty sunlight exposure VDD still exist due to presence of phytates in diet. Phytate is the major phosphorous component of grains that is indigestible and also chelates calcium and iron. It has a great impact on low levels of PTH as well[12]. Anitha A et al reported 60.92% prevalence of vitamin D deficiency with boys having higher levels than girls in school going children of central Kerala[26].The researchers did not found any major difference in the serum levels of vitamin D between vegetarians and non vegetarians. Northern keralastudy suggest variance in vitamin D levels according to season[20].

Table 1 : Prevalence of vitamin D in healthy individuals of India

Area	Sample size	Age group	Sex	VDD(<20ng/ml)	VDI(<30ng/ml)	Reference
Agra	1052	15-60 years	F=1052	64.06%	98.75%	Garg et al;2018[27]
Ballabhgarh (Haryana)	381	20-60 years	F= 381	90.8%	8.9%	Misra et al; 2017[29]
Chennai	204	6months-18 years	M=118; F=112	37%	–	Vasudevan et al;2013[35]
Gurgaon	26346	20-60 years	M=17,754; F=8592	59%	93%	Kritikar et al;2016[28]
Kerala	174	5-13 years	M=98; F=76	60.92%	–	Anitha et al;2019[26]
Lucknow	Girls=12	10-20 years		88.6% in girls	–	Sahu et al;

	1 Pregnant woman= 139	(Girls) Pregnant (women age not mentioned)	F= 260	74% in pregnant women		2009[36]
Pune	111	2.6 years(mean age)	M=56 F=55	77%	-	Ekbote et al; 2010[22]
Shimla (H.P.)	626	6-18 years	M=298 F= 328	93%	5.9%	Kapil et al; 2017[34]
Varanasi	200	≥50 years	M=200	58%	28.5%	Agarwal et al; 2013[33]

2.3 Vitamin D status in Adults

A case study of 1052 women shows prevalence of VDD <20ng/ml in 64.06 % women of in the most populous state of Uttar Pradesh[27]. Such kind of studies suggests that the prevalence is higher in housewives and indoor residents than the working individuals of society. Kritikar et al studied 26,346 healthy individuals found 93% out of them having vitamin D deficiency and insufficiency[28]. Puneet et al studied adult females in Ballabgarh district and found 90.8% subjects VDD and 8.9% VDI, among all the subjects only one had sufficient vitamin D status[29]. Asadi M et al found positive correlation between age and vitamin D concentration in post menopausal women[30]. A study in Jammu & Kashmir found vitamin D deficiency in postmenopausal women with mean age ranging 45 to ≥ 60 years. Vishal R Tandon et al found low levels of vitamin D highest in 51-60 > 45-50 > above 60 years age group[31]. Sachan A et al assessed 207 pregnant women and found VDD (<15 ng/ml) in 138 women and 95.7% neonates with hypovitaminosis D[32].

3. CONCLUSION

Vitamin D deficiency is prevalent with a range of 70-100% in India. Any factor in any geographical portion can play a significant role in the depletion of sunshine vitamin among the population. Vitamin D deficiency and insufficiency is so prevalent that the medico-practitioners should make vitamin D test as a routine checkup. Dosage of the supplements or fortified food should be standardized according to physiology of Indian population. To make it a affordable test ELISA kits should be preferred. The population should also be aware by the scientist community by the means of publishing articles in newspapers, social blogs and media so that the lay-man can be aware. Daily physical activity in morning sunshine should be a common socio curriculum. Government of India should take necessary actions for supplying fortified food to the low socio-economic strata of our country. The Government hospitals can play a remarkable role in popularizing the significance of vitamin D among the rural as well as urban population.

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