

An Analysis on Vitamin D Status of Patients Attending a Tertiary Care Hospital in Southern India - An Overview

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ABSTRACT

Introduction: The prevalence of Vitamin D deficiency and insufficiency is reported worldwide, both in sunshine deficient and sunshine sufficient countries. Vitamin D deficiency association with metabolic, autoimmune and infectious comorbidities has been extensively studied. The best indicator of human body's vitamin D status is the concentration of serum 25(OH) D.

Aims and objectives: 1. To know the prevalence of vitamin D deficiency and insufficiency. 2. To know Vitamin D levels among different age groups.

Materials and methods: The study center is located at latitude of 14° 47' N longitude of 78° 80' E. This hospital based study was undertaken in the month of July 2022. Vitamin D levels of 436 patients, who attended medical outpatient department, FIMS, Kadapa, Andhra Pradesh for a period of 6 months from January 2022 to June 2022 were collected and entered in an excel sheet and the data was analyzed.

Results: Among the total 436 patients 162 were males and 274 were females. Mean age and serum 25(OH) D of male patients was 42.98 years and 56.74 nmol/L where as in females these were 40.67 years and 47.84 nmol/L respectively. In both genders the mean age of deficient patients was around 32 years. Among 436 patients 44.49% were 25(OH) D deficient; 39.91% were insufficient and only 15.6% were having normal serum levels of 25(OH) D. Around 50% of deficient patients belong to age group of 21-40 years.

Conclusions: Though India is located in area getting abundant sunshine, the individuals with normal level of Vitamin D levels were very less when compare to deficient and insufficient patients. The most common age group with deficiency were between 21-40 years. Females were more deficient and insufficient levels of Vitamin D.

Keywords: [Vitamin D, deficiency, insufficiency]

INTRODUCTION

Vitamin D is a fat-soluble vitamin, known for its antirachitic activity, which is produced endogenously when the skin is exposed to the ultraviolet light and is also present in some foods and other dietary supplements.^[1,2] It is needed not only for the maintenance of normal blood levels of calcium and phosphate that are required for

normal mineralization of bone, muscle contraction, nerve conduction, and general cellular function in all cells of the body but also it is also found to be important for immune function, for inflammation, cell proliferation, and differentiation.^[1] Hence Vitamin D deficiency leads to immune dysregulation and has been proposed as an underlying pathogenic mechanism of

infections; There by associated with increased markers of systemic inflammation associated with multi organ failure.^[3] The prevalence of Vitamin D deficiency and insufficiency is reported worldwide, both in sunshine deficient and sunshine sufficient countries, involving both adults and children and in both genders. It is the most underdiagnosed and undertreated nutritional deficiency in the world.^[4,5] Reports from various parts of India and in all age groups from neonates to adolescents as well as pregnant and lactating mothers have reported vitamin D deficiency to the tune of 30-90%.^[6] Vitamin D deficiency association with metabolic, autoimmune and infectious comorbidities has been extensively studied.^[7] The best indicator of human body's vitamin D status is the concentration of serum 25(OH) D.^[8-11] Vitamin D testing has exponentially increased in recent years.^[12] Hence the present study was done to know the vitamin D status of patients attending medical outpatient department in our area.

Aims and objectives:

1. To know the prevalence of vitamin D deficiency and insufficiency.
2. To know Vitamin D levels among different age groups.
3. To know Vitamin D levels among gender wise.

MATERIALS & METHODS

The study center is located at latitude of 14° 47' N longitude of 78° 80' E. The average duration of cloud-free sunshine is 8-10 h/d throughout the year The UV index at the

above-said latitude during those periods is 5-10. Most often, there is a little seasonal variation of the peak intensity of sunlight. This hospital based study was undertaken in the month of July 2022. Vitamin D levels of 436 patients, who attended medical outpatient department, FIMS, Kadapa, Andhra Pradesh for a period of 6 months from January 2022 to June 2022 were collected and entered in an excel sheet. Vitamin D levels were estimated by detecting serum 25(OH) D. The patients were categorized as follows:- deficient: <50 nmols/ L; insufficient: 51-75 nmols/ L; normal: 75- 250 nmols/ L; intoxication: >250 nmols/ L and the data was analyzed.[10,11]

RESULT

Among the total 436 patients 162 were males and 274 were females. The most common age group tested was 41-50 (24.77%) followed by 31-40 (22.25%) as shown in table 1. Mean age and serum 25(OH) D of male patients was 42.98 years and 56.74 nmol/L where as in females these were 40.67 years and 47.84 nmol/L respectively as shown in table 2. In both genders the mean age of deficient patients was around 32 years. Among 436 patients 44.49% were 25(OH) D deficient; 39.91% were insufficient and only 15.6% were having normal serum levels of 25(OH) D. majority of deficient patients were females (30.05%) as shown in table 3. Around 50% of deficient patients belong to age group of 21-40 years as shown in table 4.

TABLE 1- AGE AND GENDER VISE DISTRIBUTION OF PARTICIPANTS

Age group	MALE	FEMALE	TOTAL	PERCENT (%)
< 10	1	0	1	0.23
11-20	10	17	27	6.19
21-30	35	56	91	20.87
31-40	31	66	97	22.25
41-50	30	78	108	24.77
51-60	31	33	64	14.68
61-70	14	20	34	7.8
>70	11	4	15	3.44
TOTAL	162	274	436	100

TABLE 2 – MEAN AGE AND VIT D VALUES OF THE PARTICIPANTS

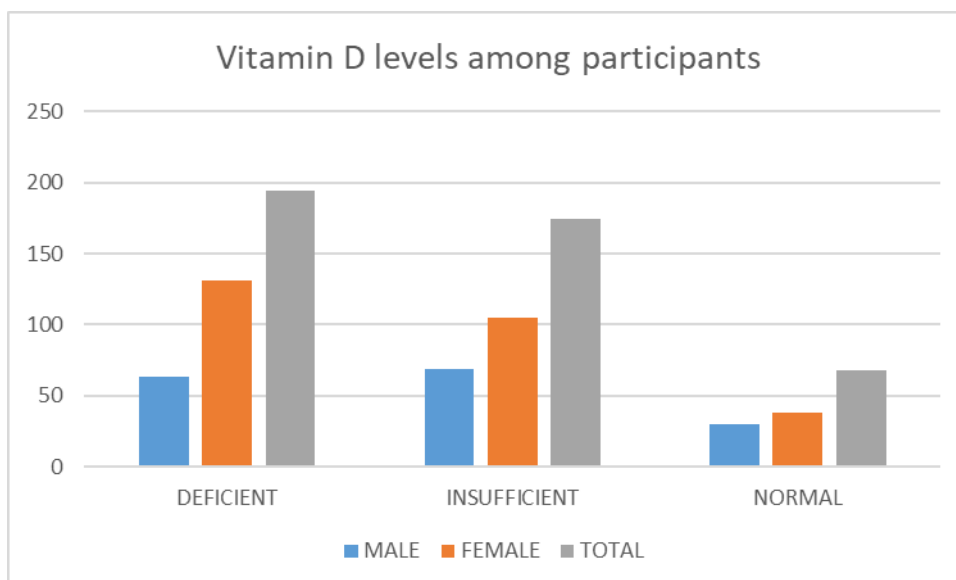
STATUS	MALE		FEMALE	
	AGE	VALUE	AGE	VALUE
DEFICIENT	31.87	36.7	32.11	33.52
INSUFFICIENT	36.57	57.64	45.21	57.21
NORMAL	46.1	84.8	45.16	86.53
ALL PATICIPANTS	42.98	56.74	40.67	47.84

TABLE 3 – VIT D LEVELS

	DEFICIENT	INSUFFICIENT	NORMAL	TOTAL
MALE	63(14.44%)	69(15.82%)	30(6.88%)	162(37.15%)
FEMALE	131(30.05%)	105(24.09%)	38(8.72%)	274(62.85%)
TOTAL	194(44.49%)	174(39.91%)	68(15.60%)	436(100%)

TABLE4: DISTRIBUTION OF VITAMIN D DEFICIENT PATIENTS

AGE GROUP	MALE	FEMALE	TOTAL
< 10	0	0	0
11-20	4	12	16 (8.25%)
21-30	15	34	49(25.26%)
31-40	12	37	49(25.26%)
41-50	8	30	38(19.58%)
51-60	12	13	25(12.89%)
61-70	5	4	9(4.63%)
>70	7	1	8(4.12%)
TOTAL	63(32.47%)	131(67.52%)	194(100%)



DISCUSSION

Vitamin D is the widespread nutritional deficiency in India and it has been widely undiagnosed and untreated.^[13] The major source of vitamin D for children and adults is exposure to natural sunlight. Very few foods like – oily fish, egg yolk, and liver naturally contain significant amount of vitamin D.^[10] Hence, the major cause of vitamin D deficiency is inadequate exposure to sunlight.^[14] There is growing evidence that higher vitamin D status is protective against various cancers, including prostate and colorectal cancer, and also against

prediabetes and the metabolic syndrome.^[15]

A recent review analyzed the mechanisms by which vitamin D reduces the risk of microbial infections by stimulating innate cellular immunity, through the induction of antimicrobial peptides, such as cathelicidins, IL-37 and defensins. It also inhibits the cytokine storm, reducing the production of pro-inflammatory cytokines such as IFN γ and TNF α . Finally, it modulates the adaptive immune response, suppressing the Th1 response and promoting cytokines production by Th2 cells.^[7]

Nowadays vitamin D deficiency has become research topic as the role of vitamin D deficiency has been identified in various disorders besides its worldwide known skeletal problems. Signs of Vitamin D deficiency are muscle soreness, weakness and bone pain.^[10] Latitude, season, aging, sunscreen use and skin pigmentation influence the production of Vitamin D by the skin.^[11]

Though southern India is having abundant sunlight, the prevalence of vitamin D deficiency is significant. The present study was aimed to estimate the prevalence of Vitamin D deficiency in patients attending hospital with musculo skeletal and neuropathic symptoms. The mean age of male and female participants was 42.98 years and 40.67 years respectively. The present study showed 44.49% of participants were deficient and among them majority were females (30.05%) 47.02% of tested patients were in age group between 31-50 years. But it was estimated to be 40% among males and 70% among females as per Garg et al.^[13] The percentage of young children (<10years) was negligible in present study (0.23%) and none of them were deficient. It might be due to good exposure to sunlight along with diet. But surprisingly patients between 11-20 years were 6.19%. Among the deficient patients these group were 8.15%. (16/194); Which might be due to use of certain methods like complete covering of skin with clothes, applying lotions and creams; for protection against sun light.^[13] Matsuka et al showed that the long-term use of sunscreens may be associated with low body stores of vitamin D in some persons.^[16] Goswami et al showed that despite of abundant sunlight, healthy persons in Delhi remained vitamin D deficient.^[17] This may be because of skin pigmentation, inadequate direct sun exposure as well as low-calcium, high-phytate diets, pregnancy, and winter-related reduced sunlight exposure which may affect vitamin D levels.^[13]

Among the vitamin D deficient patients (194) 2/3rds were females. 44.52%

(122/274) of female patients belong to reproductive age group and among them 58.19% (71/122) were deficient. Whereas in a study from South India by Harinarayan, et al 76% of women of reproductive age group were found to be Vitamin D deficient.^[18] High prevalence of Vitamin D deficiency in Indian females could be multi factorial – engaged in house hold work, accustomed to watch television, applying sunscreen lotions and creams etc. though males engaged in outside work, involving the chance of exposure to sunlight; a significant percentage of males were deficient (14.45%) in present study. Out of 63 deficient males 27 male patients were young adults 21-40 years. We strongly opined that these individuals were engaged in professional work during peak hours of sunlight and their working area might be completely closed for air conditioning.

The present study was also analyzed vitamin D insufficient patients, who were 39.91% and among them also female (24.09%) were more than males (15.89%). The mean age and vitamin D levels among insufficient males were 37.57 years and 57.64 nmol/L and females these were 45.21 years and 57.21 nmol/L. If these individuals were supplemented with vitamin D by appropriate dosage, normal status of Vitamin D would be attained; otherwise, this might be led to deficiency. Our study showed very less percentage (15.6%) of normal levels of Vitamin D and among them males were 6.88% and females 8.72%. the mean levels of Vitamin D 84.8 nmol/L and 86.52nmol/ L in males and females respectively; and which were near to insufficient levels. As the present study was based on hospital attending patients, it became difficult to comprehend this statistics to general population. There is no evidence demonstrating benefits of screening for vitamin D deficiency at a population level. Such evidence would require demonstration of the feasibility and cost-effectiveness of such a screening strategy, as well as benefits in terms of important health outcomes.^[14]

Geographically India is located between 8.4° and 37.6° north latitude with most of the population receiving ample sunshine throughout the year. According to World Health Organization (WHO) - definition of Vitamin D deficient country considering the latitudinal location India should have been a Vitamin D deficiency resistant country but unfortunately it is not. In spite of abundant sunlight available naturally to the habitants there is a growing population with Vitamin D deficiency. At present a multidimensional approach is needed in our country at various levels by: redefining the cut offs for Vitamin D levels in Indian population, dietary Vitamin D & Calcium supplementation, life style changes, education of masses, public health policy for fortification to bring down the prevalence of Vitamin D deficiency in India as always, 'Prevention is better than cure'.
[19]

CONCLUSION

Though India is located in area getting abundant sunshine, the individuals with normal level (15.6%) of Vitamin D levels were very less when compare to deficient (44.49%) and insufficient (39.91%) patients. The most common age group with deficiency were between 21-40 years. Females were more deficient and insufficient levels of Vitamin D. At present a multidimensional approach is needed in our country at various levels to bring down the prevalence of Vitamin D deficiency in India.

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Ethical Approval: Approved

REFERENCES

1. Aparna P, Muthathal S, Nongkynrih B, Gupta SK. Vitamin D deficiency in India. J Family Med Prim Care 2018;7:324-30.
2. Al-Alyani H, Al-Turki HA, Al-Essa ON, Alani FM, Sadat-Ali M. Vitamin D deficiency in Saudi Arabians: A reality or simply hype: A meta-analysis (2008-2015). J Fam Community Med 2018;25:1-4 (haneen)
3. de Haan et al.: Vitamin D deficiency as a risk factor for infection, sepsis and mortality in the critically ill: systematic review and meta-analysis. Critical Care 2014 18:660.
4. Van Schoor NM, Lips P. Worldwide Vitamin D status. Best Pract Res Clin Endocrinol Metab 2011;25:671-80.
5. Mithal A, Wahl DA, Bonjour JP, Burckhardt P, Dawson-Hughes B, Eisman JA, et al. Global Vitamin D status and determinants of hypovitaminosis D. Osteoporos Int 2009;20:1807-20.
6. KHADILKAR et al: Prevention and Treatment of Vitamin D and Calcium Deficiency in Children and Adolescents: Indian Academy of Pediatrics (IAP) Guidelines
7. Carpagnano et al; Vitamin D deficiency as a predictor of poor prognosis in patients with acute respiratory failure due to COVID-19; Journal of Endocrinological Investigation (2021) 44:765-771
8. Szu-Wen Chang, Hung-Chang Lee; Vitamin D and health - The missing vitamin in humans; Pediatrics and Neonatology 2019; 60; 237-244
9. Michael F Holick and Tai C Chen: Vitamin D deficiency: a worldwide problem with health consequences: Am J Clin Nutr 2008;87(suppl):1080S- 6S.
10. Harrison's Principles of Internal Medicine; 20th edition: volume 2; chapter: ; page no 2316.
11. Tietz text book of Clinical chemistry and molecular diagnostics; first south asia edition; Chapter 64: Bone and Mineral Metabolism; page no 1461-1462.
12. Karin Amrein et al; Vitamin D deficiency 2.0: an update on the current status worldwide European Journal of Clinical Nutrition (2020) 74:1498-1513
13. Garg R et al. Prevalence of vitamin D deficiency in Indian women: Int J Reprod Contracept Obstet Gynecol. 2018 Jun;7(6):2222-2225
14. Michael F. Holick: Vitamin D Deficiency: N Engl J Med 2007;357:266-81

15. Harper's Illustrated Biochemistry; 30th edition; Chapter 41: The diversity of endocrine system; page no: 508&509
16. Matsuoka LY, Wortsman J, Haddad JG, Kolm P, Hollis BW. Racial pigmentation and the cutaneous synthesis of vitamin D. Arch Dermatol. 1991;127:536-8.
17. Goswami R, Gupta N, Goswami D, Marwaha RK, Tandon N, Kochupilli N. Prevalence and significance of low 25-hydroxyvitamin D concentrations in healthy subjects in Delhi. Am J Clin Nutr. 2000; 72:472-5.
18. CV Harinarayan, Alok Sachan, P Amaresh Reddy, KM Satish, UV Prasad, P Srivani. Vitamin D Status and Bone Mineral Density in Women of Reproductive and Postmenopausal Age Groups: A Cross-Sectional Study from South India; Journal of Association of Physicians of India; vol 59; Nov 2011
19. Sareen R, Dutt A, Gupta GN (2018) Vitamin D Deficiency in Indian Population- Myth or Reality. J Vitam Miner: JVM-103. DOI:10.29011/JVM-103.100003

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