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Original article

Prevalence of Vitamin - D Deficiency & Associated Factors Among the Medical Personnel of Medical College of Western Gujarat India

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Abstract

Vitamin D plays a major role in Calcium and Phosphate homeostasis and bone formation. Vitamin D deficiency can be a serious occurrence among healthy individuals, especially Medical Community, but Limited numbers of studies were found to know the vitamin D level in the medical community. As many clinicians and even nutritionists have not focused their attention on Vitamin D status may be due to it is assumed that exposure to sunlight > 15 minutes is sufficient to maintain an adequate level of vitamin D in the blood. Thus vitamin D deficiency can be a serious occurrence among healthy individuals, especially Medical Community. The present study was conducted with the objective of evaluating the prevalence Of Vitamin D deficiency among medical personnel in the medical college of western India. A cross-sectional study was conducted among 509 medical professionals of a medical college of western India irrespective of age, gender, college department, and medical conditions using a universal sample after ethical clearance from institutional IEC. Vitamin D level assessment was done by solid-phase enzyme-linked immunoassay (ELISA) based on the principle of competitive binding. Data entry and statistical analysis were done by Epi Info software. A total of 509 medical professionals participated in the study. Vitamin D Level was deficient in 45.97%, insufficient in 32.42%, and sufficient in 21.61%. Statistically, a significant association was found with less than an hour of sunlight exposure and Conclusions: Mean level of Vitamin D is 21.95 ng/ml which suggest insufficient level or near deficit level of vitamin D in the medical professional.

Keywords: ***Medical professional, Vitamin D, Associated factors***

Introduction

Vitamin D is a part of fat-soluble vitamin which is a secosteroid, responsible for increasing intestinal absorption of minerals like calcium, phosphate, magnesium along with other biological effects [1,2]. Vitamin- D is considered a hormone rather than a cofactor in an enzymatic reaction or an antioxidant. In both children and adults, the primary source of vitamin D is exposure to the sun while the content of Vitamin D in food is low [3]. The seafood only consists significant proportion of Vitamin. D especially fleshy fish [1,4]. Vitamin D deficiency is found in all age groups but is a more common finding in vulnerable age groups like the elderly & children [5,6,7]. The deficiency of vitamin D can lead to a spectrum of diseases which includes rickets, osteomalacia, hyperparathyroidism, osteopenia, osteoporosis, increased tendency for fractures [8,9]. Low blood vitamin D can result from staying away from the sunlight [10]. If there is a deficiency of vitamin D, it can consequence in reduced intestinal absorption of dietary calcium to 15%. A low level of vitamin- D can affect bone health, innate immunity, and exercise innate immunity and inflammation and thus affect the overall health and ability of a person [11,12]. The assessment of Vitamin D is done using measurement of 25-hydroxy vitamin D (25OHD) levels in the blood. 25OHD level is >75 nmol/l (>30 ng/ml) is considered a normal value, whereas 21-29 ng/ml is denoted as insufficient [13]. Goes along with the criteria of deficiency. Increasing industries of food processing & food fortification, initially there was a thought of reduction in Vitamin deficiencies including Vitamin D, but it's not the case. The world is facing a modern epidemic of deficiencies [15]. It was cited that in all age groups i.e. throughout the life cycle & both the gender have the same issue [15]. Clinicians and even nutritionists not focused their attention on Vitamin D status may be due to it being assumed that exposure to sunlight > 15 minutes is sufficient to maintain an adequate level of vitamin D in the blood. But we ignored that many factors play an important role in clothing, atmospheric pollution, skin pigmentation, latitude > 35 N or S & time of day viz. limits the amount as well the quality of sun exposure can hamper serum vitamin D levels [16]. Thus vitamin D deficiency can be a serious occurrence among healthy individuals, especially the Medical Community, The primary objective of the present study is to screen for Vitamin D deficiency among medical personnel in the medical college of western India. The secondary objective of the study was to evaluate Factors associated with Vitamin -D deficiency among study participants.

Materials and Methods

The present study was a cross-sectional analytical study that included a Universal sample compromising 509 medical personnel

working at tertiary care hospitals which includes resident doctors, tutors, assistant professors, associate professors, and professors of all the departments of the medical college of the western part of Gujarat. The study duration was from 1st April 2018 to 30th September 2019. The study began after obtaining IEC approval from the Institutional ethics committee. Ethical approval was obtained from the Institutional Ethical Committee (IEC) with letter No. IEC/Certi/43/208 dated 20/02/2018 and informed written consent was taken from all participants after they were reassured that all data will be kept confidential with the principal investigator & co-principal investigators. Only those medical personnel who were willing to participate were included in the study. Exclusion criteria were the ones who were on vitamin D supplements and pregnant females. Before commencement of data, collection piolet study was conducted and then proforma was finalized. Data was collected in pre-tested & structured proforma which contains socio-demographic details of participants, chief complaints if any, past history, personal history, addiction of tobacco/alcohol, diet history, use of dairy products in regular diet, physical exercise, exposure to sunlight, etc. Blood samples were collected from study settings i.e. individual departments wise on scheduled time & date. 19 participants were on Vitamin D supplements and one pregnant female was excluded. The benefit of post-study Information, education & communication was provided to them too. The blood sample was taken to perform Vitamin D level by a solid phase enzyme-linked immunoassay (ELISA), based on the principle of competitive binding technique. Following values as an operational definition for Vitamin D were used to define vitamin D status in the present study.

Blood collection was ensured under sterile conditions. One participant can be enrolled once only was ensured by the study investigators. For investigation, the kits available from MDRU (Multi-disciplinary research unit) were used. Following data collection, data was entered in Microsoft excel. Data cleaning, processing & analysis was done using Microsoft excel & Epi info. (WHO software). Quantitative variables were analyzed in the terms of Mean & SD (Standard deviation), SE (Standard error), variance, median, 95% confidence limits whereas qualitative variables were analyzed in the terms of frequencies, proportion, range & interquartile range. A test of significance for qualitative data was used. The Binary logistic regression was applied to check the association with Factors associated with vitamin D deficiency among study participants. *P value<0.005 was considered statistically significant.

Interpretation of Vitamin - D level [17].

Level of 25 (OH) D	Status of 25 (OH) D
<20 ng/ml	Deficient
20 - 30 ng/ml	Insufficient
>30 ng/ml	Sufficient

Results

Table 1: Demographic variables of study participants

Variable		No.(n=509)	Percentage
Age (yrs.)	21-30	382	75.05
	31-40	74	14.54
	41-50	38	7.47
	51-60	15	2.95
Gender	Female	242	47.5
	Male	267	52.5
Occupation	Resident Doctor	412	80.9
	Assistant Professor	68	13.4
	Associate Professor	17	3.3
	Professor	12	2.4

Table -1 shows almost three fourth of the participants belong to 21-30 years of age due to the participation of Post-Graduate students in the study followed by 31-40 (14.54%). The ratio of Female Vs. Male medical teacher was almost 1. The proportion of Resident doctors in participation was 80% followed by Assistant Professor 13.4% and Associate Professor and Professor.

Table 2: Vitamin D profile among study participants

	Statistic		Value
Vitamin D 25 (OH) Level (mg/ml)	Mean (SE)		23.0758 (0.57)
	95% CI of Mean	Lower Limit	21.9518
		Upper limit	24.1998
	Median		22.0000
	Variance		166.597
	Std. Deviation		12.90726
	Minimum		01.49
	Maximum		95.00
	Range		93.51
	Interquartile Range		14.76

Table -2 shows the Level of Vitamin -D in medical teachers. The mean level of 25 (OH) is 21.95 ng/ml. This is to be noted that even mean vitamin-D level is below subnormal level and falls in the category of "Insufficient Level" (Insufficient level: 20 - 30 ng/ml), so statistically, it could be concluded that all medical teachers dose has an insufficient level of vitamin-D. The standard Deviation is 21.90 ng/ml shows a wide distribution of levels of vitamin D in their blood while the minimum level reported was as low as 1.49 ng/ml and the maximum was as high as 93.51 ng/ml. The difference between third quartile Q3 and first quartile Q1 is 14.76ng / ml.

Table 3: Prevalence of 25 (OH) D among study participants

Level of 25 (OH) D	Status of 25 (OH)D	No.	Percentage	Mean (SD)
<20 ng/ml	Deficient	234	45.97	12.82 (04.82)
20 - 30 ng/ml	Insufficient	165	32.42	25.04 (2.48)

>30 ng/ml	Sufficient	110	21.61	41.94 (11.25)
Total		509	100	23.07 (12.90)

Table - 3 shows the prevalence of vitamin –D deficiency among medical teachers. As many as 78.39% (399) of study participants found deficient vitamin level and insufficient level. Only 110 (21.61 %) medical teachers had normal 25 (OH) D levels in their blood. As in the present study, more than 75% of participants belonged to a Resident doctor and they are a young population below 30 years of age, shows that vitamin D deficiency is quite prevalent even in the younger population. Almost half 234 (45.97%) of participants suffer from "Deficiency" of vitamin D. 165 (32.42%) which almost matches our Mean Vitamin D level (23.07 ng/ml) that also lies in the category of "Insufficiency".

Table - 4 describes the association of various independent variables Gender, Alcohol, Tobacco intake, sunlight exposure, physical exercise, intake of dairy products, and intake of fish/egg & Diet viz. with the occurrence of vitamin - D (dependent variable) deficiency in the blood. Prevalence of vitamin –D deficiency among female and male medical teachers was almost the same 78.9 % and 77.9% respectively. The risk ratio is 0.94 shows gender doesn't affect the occurrence of vitamin D deficiency and the difference is statistically insignificant. As a very less proportion of participants had a habit of alcohol intake (Only 2 participants), thus it is very difficult to come out with any conclusion whether alcohol has any impact on the occurrence of vitamin D deficiency and the difference is statistically insignificant. Prevalence of Vitamin- D deficiency among tobacco users was 29.79% Vs non-users 20.78%. The risk ratio is 1.62 indicates the chances of vitamin - D deficiency is 1.62 times higher in tobacco users as compared to non-users, but this difference is statistically not significant. 89 (25.65%) out of 347 individuals who had exposure to sunlight less than 1 hour developed vitamin D deficiency as compared to 21 (12.95%) out of 162 who had exposure more than 1 hour daily indicates a higher prevalence of vitamin-D deficiency in those who less exposed to sunlight. A risk ratio of 2.32 suggests the risk of developing vitamin D deficiency is 2.32 times higher in those who had < 1-hour exposure to sunlight. This difference is statistically significant (p=0.0015). Those who do regular physical exercise > 30 min/day were found to have a prevalence of 23.1% as compared to 18.1% of those who don't do regular physical exercise but this difference is statistically not significant. Daily intake of dairy products has a great impact on the occurrence of vitamin D deficiency suggested by higher prevalence, 40% among non-users and 19.15% among daily users of dairy products i.e. milk & milk products. The odds ratio indicates a 2.81 higher risk of developing vitamin – D deficiency in non–users of dairy products ad compared to daily users. This difference between daily users and non-users is statistically significant (p= 0.0004). Prevalence of vitamin D deficiency was 4.5 % vs. 3.1% among Egg/Fish eaters. The difference is statistically not significant. Almost equal prevalence is seen (3.7% vs 3.2%) in Vegetarian and Mixed/Non- vegetarian even this difference is also statistically not significant.

Table 4: Factors associated with Vitamin -D deficiency among study participants

Factors		Vitamin D Deficiency		Total	Crude Odd Ratio	p-value
		Present	Absent		(95% CI)	
Gender	Female	191(78.9%)	51(21.1%)	242 (100%)	0.94 (0.62-1.44)	0.78
	Male	208(77.9%)	59(22.1%)	267(100%)		
Alcohol	No	110(21.7%)	397(78.3%)	507(100%)	0.78 (0.75-0.82)	0.46
	Yes	0(0%)	2(100%)	2(100%)		
Tobacco	No	96(20.78%)	366(70.21%)	462(100%)	1.62 (0.83-3.14)	0.15
	Yes	14(29.79%)	33(70.21%)	47(100%)		
Sunlight exposure	< 1 hr.	89(25.65%)	258(74.35%)	347(100%)	2.32 (2.38-3.89)	0.0015*
	> 1 hr.	21(12.96%)	141(87.04%)	162(100%)		
Physical Exercise	<30 min	27(18.1%)	122(81.9%)	149(100%)	0.74 (0.46-1.20)	0.21
	>30 min	83(23.1%)	277(76.9%)	360(100%)		
Daily intake of Dairy products	No	24(40%)	36(60%)	60(100%)	2.81 (1.60-4.96)	0.0004*
	Yes	86(19.15%)	363(80.85%)	449(100%)		
Intake of fish/egg	No	73(20.6%)	281(79.4%)	354(100%)	0.82 (0.52-1.30)	0.41
	Yes	37(20.6%)	118(79.4%)	155(100%)		
Diet	Vegetarian	83(21.7%)	299(78.3%)	382(100%)	1.02 (0.63-1.68)	0.91
	Mixed Non-veg	27(21.26%)	100(78.74%)	127(100%)		

**P value<0.005 is considered statistically significant.*

Discussion

In the present study, it was found that vitamin D deficiency was highly prevalent in Medical Professionals of the medical college of western India. Only a cent number of the participant had been found to have normal levels of vitamin D. The prevalence of Vitamin D deficiency is 78.39%, According to Al-Elq AH; in their study, no one had a normal Vitamin D level [18]. another study, conducted in Saudi Arabia showed a very high prevalence of Vitamin -D levels in medical students [19,20]. Almost 4/5th of medical teachers have serum 25 (OH) D levels below 30 ng/ml. A study by Al-Elq AH. The status of Vitamin D in medical students in the pre-clerkship years of a Saudi medical school showed. There were 95 male and 103 female students, while the current study has an almost equal male vs. female ratio. With an average age of 19.54 years, which is lower than our study may be due to researchers enrolled first- and fourth-year medical students while we included medical teachers too. A study by Sowah, D et al. showed that vitamin D level was low among indoor workers with a mean value of 40.6 whereas outdoor workers had a mean value of 66.7 nmol/l, which was statistically significant with a value of <0.0001. Shift workers also showed similar kinds of results. Medical workers including resident doctors, & students, the values were mean 44.0 nmol/L and 45.2 nmol/L, respectively and, with a Standard deviation of 8.3 & 5.5 respectively. The consultant showed 55nmol/d values, which on the statistical analysis found significant with p<0.0001 [21].

Our study shows a significantly lower prevalence of vitamin D in those who have daily exposure to sunlight and those who consume dairy products daily. No significant difference has been noted among males and females while Al-Elq AH [18] reported. They found a statistically significant association with consumption of dairy products among Males with a P-value = 0.027, although the

duration of their exposure to the sunlight was found not significantly longer with a P-value of 0.077 [18].

As per et al. Zehra Edis, There are so many factors that affect vitamin D. One can narrate it as Sunlight Exposure, which again depends on geographical distribution, seasonal variations, and types of solar radiation. Now a day our food is deficient in Vitamin D because of food industries, which focus mainly on processed food & financial gain. The use of preserved food also increased. There is a need for an hour to adopt a healthy lifestyle including proper sunlight exposure, diet, and exercise. For which healthcare providers must act as crucial personnel of society. Seeking care for Vitamin D deficiency for screening and treatment is a must at an individual level. [22].

Conclusion

Most of the participants belong to 21-30 years of age. The mean level of 5 (OH) is 21.95 ng/ml. The prevalence of vitamin -D deficiency was 78.39%. Almost all departments show more or less the same rate of prevalence. Prevalence of vitamin –D deficiency among male and female medical teachers was almost the same 21.1 % and 22.1% respectively. Prevalence of Vitamin- D deficiency among tobacco users was 29.79% Vs non-users 20.78%. Those who do regular physical exercise > 30 min/day were found to have a prevalence of 23.1 %. 89 (25.65%) out of 347 individuals who had exposure to sunlight less than 1 hour developed vitamin D deficiency indicates a higher prevalence of vitamin-D deficiency in those who were less exposed to sunlight. A risk ratio of 2.32 suggests a risk of developing vitamin D deficiency is 2.32 times higher in those who had < 1hour of exposure to sunlight. This difference is statistically significant (p=0.0015).

Recommendations

Vitamin D levels should be screened once in all medical professionals as an opportunistic screening. Once its confirmed Vitamin D supplement must be provided for corrections and prevention of complications. Intake of dairy products & exposure to sunlight should be advised for betterment.

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Conflicts of interest

Nil

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