Research Article

Prevalence of vitamin D deficiency among health care professionals in a medical college of India

Abstract

Background: Vitamin D is unique among vitamins as it can be synthesized from the action of ultra violet radiation upon the skin. This study was done to investigate prevalence of Vitamin D deficiency among health care professionals.

Method: This was an institution based cross sectional prevalence study conducted over period of one year at Medical College, Kolkata, India. The study was conducted among 50 doctors, 25 nurses and 25 laboratory technicians. After getting demographic data, serum Vitamin D level was measured in each subject and statistical analysis done.

Result: Mean age of study subject was 51.69±7.61 years. Result showed that 63% were male and 37% were female. In this study 73% of the subjects were deficient in Vitamin D level. 25% of subjects had insufficient Vitamin D level and only 2% subject has sufficient D level.

Conclusion: Vitamin D deficiency is highly prevalent among health care professionals. Lack of sunlight exposure, changes in lifestyle and food habits contribute to low Vitamin D levels in this population.

Keywords: doctors, nurses, laboratory technicians, vitamin D deficiency

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Abbreviations: VDR, vitamin D receptor; UV-B, ultraviolet B; BMI, body mass index; CLIA, chemiluminiscent immuno assay; SAS, statistical analysis system

Introduction

Vitamin D is a fat-soluble vitamin, known for its antirachitic activity.[1] Vitamin D, in general, refers to Vitamin D3. Vitamin D can be synthesized endogenously. About 90% of the required Vitamin D is synthesized in the skin under sun exposure.[2] It is needed 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. It is also found to be important for immune function, for inflammation, cell proliferation, and differentiation.[2,3] The active form of Vitamin D stimulates the absorption of calcium in the duodenum and increased calcium influx in distal tubules of kidney through nuclear Vitamin D receptor (VDR); latter is specifically regulated by parathormone level.[4] The major source of Vitamin D is the endogenous synthesis in skin on exposure to sunlight, namely, ultraviolet B (UV-B) radiation of wavelength 290-320 nm. Main dietary sources are fish, fortified food, and supplements. Vegetables and grains are poor sources. Synthesis of vitamin in skin on exposure to UV-B is also affected by latitude, solar zenith angle, atmosphere pollution, ozone layer and melanin pigmentation.[5] 25(OH)D is the most useful measures and reflects the Vitamin D status in the body because the level depends on the available and circulating Vitamin D.[6] According to the classification given by the United States Endocrine Society, <20ng/mL of serum 25(OH) D with consequent and consistent elevation of parathyroid hormone and a decrease in intestinal calcium absorption is considered to be Vitamin D deficiency.[7] With the use of such definitions, it has been estimated that 1 billion people world-wide have Vitamin D deficiency or insufficiency.[8] Vitamin D deficiency has been documented across all age groups and both sexes form India and different parts of the world.[9] However, there are few studies on Vitamin D status in a cohort of health care professionals.

Aim and objective:
To assess the Vitamin D status in a cohort of doctors, nurses, and laboratory technicians in Medical College, Kolkata, India.

Materials and methods

This is a cross-sectional Prevalence Study which was conducted over a period of 1 year at Medical College, Kolkata, India from February 2015 to May 2016 among health care professionals (50 doctors, 25 nurses and 25 laboratory technicians). After getting institutional ethical committee clearance (MC/KOL/EC/non-spon/377/11-2014) recruitment procedure started. After taking informed consent from the participants, each subject was interviewed personally by the investigator and their physical examination was carried out. Data regarding age, sex, body weight, height, and body mass index (BMI) were recorded from each subject. Serum Vitamin D levels were estimated using chemiluminiscent immuno assay (CLIA) method. Total 100 subjects from different departments participated in this study.

Inclusion criteria:

• Healthy doctors, nurses and laboratory technicians of Medical College, Kolkata, India.

• Age group – 40 years and above

Exclusion criteria:

- Known case of chronic kidney disease defined by Serum Creatinine >1.5 mg/dl

- Known case of chronic liver disease or hepatic dysfunction having ALT & AST >2.5 times upper level of normal value.

- Malabsorption including history of inflammatory bowel disease, small bowel or gastric surgery.

- Diseases associated with altered bone metabolism (Hyperthyroidism, Hyperparathyroidism, Type 1 Diabetes mellitus).

- Known metabolic bone diseases.

- Treatment with medications that interfere with Vitamin D metabolism (Anticonvulsants, Rifampicin, Glucorcorticoids) either taking actively or have taken more that 2 weeks during previous months.

Statistical analysis:

Descriptive statistical analysis was carried out with SAS (Statistical Analysis System) version 9.2 for windows, SAS Institute Inc. Cary, NC, USA and Statistical Package for Social Sciences (SPSS Complex Samples) Version 21.0 for windows, SPSS, Inc., Chicago, IL, USA, with Microsoft Word and Excel being used to generate graphs and tables. Results of continuous measurements are presented as mean±SD and results on categorical measurements are presented in number (%). Unpaired t-test was used to find the significance of study parameters on continuous measurement scale between two groups. Analysis of variance (ANOVA) was used to find the significance of parameters on continuous measurement scale between more than two groups. Correlations between the study variables were tested using Pearson's correlation test. Significance is assessed at a level of 5 %.

Results

Majority of the study subjects (47%) were in age group of 40-49 years, followed by 32% subjects were in the age group of 50-59 years and 21% of the subjects were between 60-69 years (Table 1). Gender wise 63% were male and 37% were female (Table 2). The mean age was found to be 51.69±7.61 years. The mean weight was found to be 70.22±8.27 kg. The mean BMI was found to be 26.75±2.03 kg /m². The mean 25 (OH) D3 Level was found to be 16.62±6.41 (ng/ml) (Table 3). Considering the distribution of severity of Vitamin D deficiency 73% of the study subjects were deficient and 25% of study subjects have insufficient levels of Vitamin D. Only 2% subjects have sufficient levels of Vitamin D (Table 4). There was no significant difference between male and female with regards to Vitamin D level, p=0.522 as computed by t-test (Table 5). There was no significant difference in age group with regards to Vitamin D Level, p=0.921 as computed by ANOVA-test (Table 6). There was no significant correlation between

age, weight, BMI and vitamin D level as computed by Pearson Correlation test (Table 7). A scatter matrix plot was generated between study variables to find out any correlation between them. Carefully observing the scatter plot between Vitamin D and the other study variables we could not find any correlation between them (Figure 1).

Table 1 Age distribution

		Frequency	Percent
Age Group	40-49	47	47
	50-59	32	32
	60-69	21	21
	Total	100	100

Table 2 Gender distribution

		Frequency	Percent
Sex	F	37	37
	M	63	63
	Total	100	100

Table 3 Descriptive status, N=100

Descriptive Statistics, N=100

	N	Minimum	Maximum	Mean	Std. Deviation
Age	100	40	66	51.69	7.613
Weight	100	44	88	70.22	8.271
BMI	100	22	31	26.75	2.032
25(OH) D3 Level	100	6	32	16.62	6.413

Table 4 Severity of vitamin D deficiency

Vitamin D Status	Serum level of 25 (OH) D3 in ng/ml	Percentage of Subjects
Deficiency	< 20	73
Insufficiency	21–29	25
Sufficiency	> 30	2
Toxicity	> 150	0

Table 5 Comparison of vitamin D level between genders

Group Statistics

	Sex	N	Mean	Std. Deviation	Std. Error Mean	P (unpaired t-test)
25(OH) D3 Level	Male	63	16.94	6.799	0.857	0.522
	Female	37	16.08	5.746	0.945	

| Independent Samples Test		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
25(OH) D3 Level	Equal variances assumed	0.941	0.334	0.642	98	0.522	0.855	1.332	-1.788	3.499
	Equal variances not assumed			0.671	85.836	0.504	0.855	1.275	-1.68	3.391

Table 6 Comparison of vitamin D level between age group

Age	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		P (ANOVA)
					Lower Bound	Upper Bound	
40-49	47	16.64	6.138	0.895	14.84	18.44	0.921
50-59	32	16.31	6.066	1.072	14.13	18.5	
60-69	21	17.05	7.717	1.684	13.54	20.56	
Total	100	16.62	6.413	0.641	15.35	17.89	

Table 7 Pearson correlation test

Correlations		Age	Weight	BMI
25(OH) D3 Level	Pearson Correlation	-0.036	0.065	0.055
	Sig. (2-tailed)	0.719	0.518	0.584
	N	100	100	100

**. Correlation is significant at the 0.01 level (2-tailed).
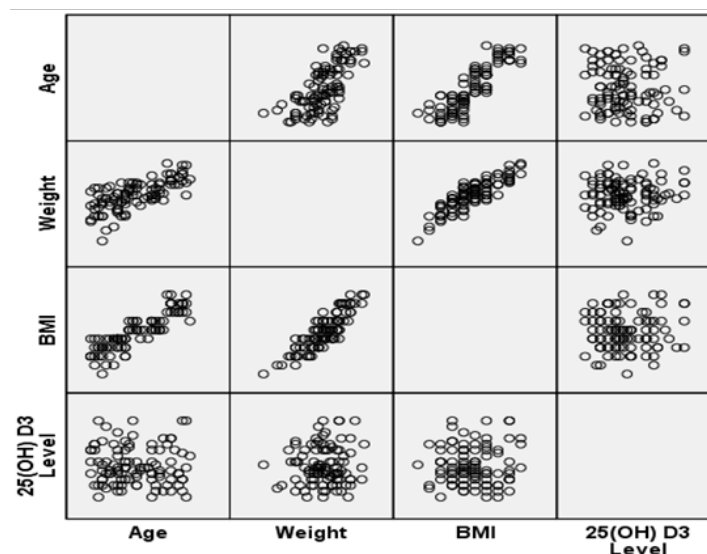
Figure1 Scatter matrix plot.

Discussion

Vitamin D has received considerable interest from the medical community and the public at large because of recent evidence for the non-skeletal effects of Vitamin D combined with the finding of widespread global deficiency. Vitamin D deficiency is more common than previously thought. The study sample in our study consisted of both male (63%) and female (37%) healthy adults serving as doctors, nurses and laboratory technicians. Among the 100 study subjects Vitamin D deficiency was observed in 73% of subjects, 25% of subjects had insufficient level and only 2% of study subjects had adequate level of Vitamin D. Similar study was done by A. Baidya et al.,[10] in 2012 among 40 physicians and diabetologists in Kolkata. In their study mean age of the cohort was 52.22±10.91. Mean serum Vitamin D level was 13.02±4.77 ng/ml. Nearly 92.5% and 5.0% of subjects had Vitamin D deficiency and insufficiency respectively.[10] Another study was done by Haney EM et al.,[11] on 90 internal medicine residents in the post graduate department at Oregon Health & Science University in Portland, Oregon (OHSU). In their study they included 51.4% women and 48.6% men, primarily Caucasian (83%) and evenly distributed among the postgraduate training years (31.4% PGY–1, 31.4% PGY-2 and 37.7% PGY-3). Women with an average age of 30.1 years (range, 26-44 years) and Men with an average age of 30.6 years (range, 26-40 years). Severe deficiency was present in 30.41% of study subjects, moderate deficiency was present in 60.82% of study subjects and very few study subjects had mild vitamin D deficiency. Only 3% of study samples found to have adequate vitamin D levels.[11] Some of the earlier studies have shown levels of 25 (OH) D are inversely associated with body mass index, waist circumference, and body fat but are positively associated with age, lean body mass and vitamin D intake.[12–14] In our study we have found no correlation between age, sex, BMI and Vitamin D levels. The results of the study demonstrated that even educated medical professionals have low Vitamin D levels and are often unaware or unaccepting the fact that they can be affected by this common epidemic.[15] Lack of sun exposure and indoor activity may be the predominant cause. Therefore, prevention of Vitamin D deficiency by sensible sunlight exposure, food fortification and routine supplementation are the currently recommended options for tackling this nutritional deficiency (Raina K et al).[16]

Conclusion

Undiagnosed Vitamin D deficiency is highly prevalent in apparently healthy healthcare professionals in Kolkata, India. Larger studies are required to assess its effect on biochemical markers like serum calcium, phosphorus and alkaline phosphatase and parathyroid hormone level. Prospective longitudinal studies are required to access the effect on bone mineral density, a surrogate marker of fracture risk and fracture rates. Doctors, nurses and laboratory technicians are integral and indispensable part of health care system. They often neglect their own health. The hectic schedule and unrelenting duty hours, sedentary nature of work, minimal exposure to sunlight and no provision of timely food intake predisposes them to a number of health related issues. This calls for an urgent action to prevent adverse consequences of low Vitamin D level in health care professionals of this country.

Acknowledgments

Conflicts of interest

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