

Vitamin D status and its determinant among medical undergraduate students

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Abstract

Background: Vitamin D is essential for calcium absorption, bones strengthening, hemopoiesis, protection against heart failure, prevention against upper respiratory infection, acts as anti-oxidant and strengthening immunity. Its deficiency has turn out to be epidemic globally, but still majority of population is unaware about the problem. The prevalence can be appreciated in all age groups in both the genders, such as, youngsters, adult, pregnant women and geriatric group. As vitamin D functions in bone remodeling and its normal growth, the deficiency leads to retarded growth and skeletal deformities in infants and adolescents, whereas, muscle weakness and fractures are common in adults. Present study was carried out to sensitize the medical undergraduates regarding deficiency, prevention and treatment of vitamin D.

Objective: To study status of Vitamin D and its determinants among medical undergraduate students.

Material and Method: Present cross-sectional study was carried out among the undergraduate students of government medical college Saharanpur, Uttar Pradesh from November 2018 to February 2019. A total of 99 medical students included in the study. The routine biochemical tests, LFT, RFT, Vitamin D along with the height, weight, food habits and their knowledge about the vitamin D were assessed to ascertain the awareness of medical undergraduates. The statistical analysis was carried out using SPSS software.

Result: The present study included 55.55% male and 44.44% female students with a ratio of 1.25:1. A majority of students (79.79%) had severe deficiency of Vitamin D (less than 10ng/ml) and unexpectedly none of the medical students had sufficient range (>30 ng/ml). Among the variables compared; the diet pattern, exposure to sun and physical activity were seen in positive correlation with Vitamin D concentration in blood. Also, majority of students observed to be unaware about the factors essential to maintain Vitamin D levels in human.

Conclusion: Present study highlights a lack of awareness of vitamin D deficiency, prevalence and its management among medical undergraduates. There should be training programs among health workers to accomplish the knowledge deficit and provide awareness about adequate intake of vitamin D to

improve overall health of society.

Keywords: Vitamin D deficiency, sun exposure, awareness, health professionals, nutritional status

Introduction

Vitamin D, the nutrient obtained when skin is exposed to the UV rays of sunlight, has been of immense importance in recent time. Normal serum levels of vitamin D maintenance is essential for human body to carry out many essential functions, like calcium absorption, bones strengthening, hemopoiesis, protection against heart failure, prevention against upper respiratory infection, acts as anti-oxidant and strengthening immunity^[1, 2]. Its deficiency has turn out to be epidemic globally, but still majority of population is unaware about the problem. The prevalence can be appreciated in all age groups in both the genders, such as, youngsters, adult, pregnant women and geriatric group^[3]. Recently, the research studies have revealed that youths are equally at high risk of vitamin D deficiency^[4]. As vitamin D functions in bone remodeling and its normal growth, the deficiency leads to retarded growth and skeletal deformities in infants and adolescents, whereas, muscle weakness and fractures are common in adults^[5, 6]. The prime cause of dissemination of the vitamin D deficiency worldwide is due to unawareness about health benefit and its role in many physiological and biochemical processes. It has been proposed that educational campaign about vitamin D at community level could help in preventing long-term health consequences^[7]. Primary education targeting younger populations may improve the likelihood of positive health behavior that persists throughout and protect from disease development and its progression^[8]. Apart from this, the young medical students also need to impart awareness about the long-term health consequences of Vitamin D as they would be the future health provider of the community^[9]. The young professional of present generation could influence the progression of health education program, policy making, beliefs about health and health promoting behaviors in our community^[10]. A proper assessment will provide crucial information to determine the necessary steps about providing sufficient amount of vitamin D supplementation among medical students and health professionals. Present study was carried out to sensitize the medical undergraduates regarding deficiency, prevention and treatment of vitamin D. The findings from this study will ascertain the next necessary steps to promote sufficient levels of vitamin D among medical graduates.

Materials and Methods

This cross-sectional study was carried among the undergraduate students of government medical college Saharanpur, Uttar Pradesh, India from November 2018 to February 2019. A total of 99 medical students participated in this study. The participants willing to participate and gave written consent were included in the study. The main aim of this research was to determine nutritional status and assessment of vitamin D levels along with factors affecting it among the medical undergraduates. Confidentiality was assured.

Questionnaire: A self-administered questionnaire having two parts was framed with the help of previously conducted studies. The first part of the questionnaire consists of identifying socio-demographic status of the participants like age, residence, life style assessment, food habits, type of clothing and use of sunscreen, use of calcium or vitamin D supplements and duration of exposure to sunlight every day and extent of physical activities. The second part consisted of multiple-choice questions based on the knowledge related to sources, biochemical functions, effects, deficiency manifestations, prevention and management of vitamin D deficiency. The questionnaires session was started on one fine occasion among the students in presence of the faculties in an examination hall. All the appearing students were prohibited from internet access or using mobile phones. At the end of questionnaire session, all candidates were imparted the basic knowledge about importance of nutrients and Vitamin D.

Data collection: For routine biochemical tests, fasting blood sample were collected from all 99 participants. Data regarding age, body weight, height, and body mass index were recorded from each participants. The values of different biochemical parameters were grouped using computer software MS Excel. Descriptive statistics were used to characterize the study population. Frequency tables were constructed and presented as percentages to identify the participant's knowledge regarding vitamin D. Blood samples for routine biochemistry tests were processed using standard procedure. Serum Vitamin D levels were estimated using chemiluminescent immunoassay (CLIA) method. Criteria for defining levels of serum vitamin D deficiency was >30ng/ml sufficient, 20-30ng/ml insufficient, 10-20ng/ml deficient and <10ng/ml severely deficient.

Data analysis: Statistical analysis was carried out using SPSS software. Descriptive statistics were used to characterize the population and to identify the frequencies of participant's knowledge of vitamin D deficiency. A $p < 0.05$ was considered significant.

Result

A total of 99 medical students, apparently healthy and aged between 17 to 25 years, studying at Government Medical College Saharanpur, U.P. were included in the study. The present study included 55.55% male and 44.44% female students. The male to female ratio was 1.25:1. A majority of students (79.79%) had Vitamin D values less than 10ng/ml, which falls under severely deficient range, while 15.15% had deficient range (11-20ng/ml) and 5% had insufficient range (21-30ng/ml). Unfortunately, none of the medical students had sufficient range (>30 ng/ml) in the study group. The variables in the questionnaire based on their knowledge of Vitamin D had been compared between two groups, deficient (<20ng/ml) and insufficient (>20ng/ml). The mean vitamin D levels were 8.63 ± 4.98 ng/ml, ranging from 3.1 to 30.0ng/ml. The association between gender and vitamin D levels were found significant with p value 0.04, where 85.45% male were in deficient and 14.54% insufficient range. Out of 44 female participants, 68.1% were deficient and 31.8% had insufficient range of vitamin D, where mean value slightly higher in males (8.7) than in female (8.4) (Fig. 1 & 2).

The duration of sun exposure (>30 min) and vitamin D levels have positive association with 8.8% insufficient and 91% deficient subjects, where as those having low exposure (<30 min) to sun have 70.7% deficient and 29.2% insufficient range with p value 0.02.

Table 1: Routine Biochemistry tests

Sl. No.	Parameters	Mean (n=99)	SD
1.	Fasting Blood Sugar	86.62	8.78
Lipid Profile			
2.	Total Cholesterol	142.35	22.34
3.	Triglyceride	92.81	28.40
4.	HDL	44.92	6.39
5.	LDL	78.46	18.68
6.	VLDL	18.58	5.71
Liver Profile			
7.	Total Protein	7.22	0.33
8.	Albumin	4.23	0.26
9.	ALP	233.21	57.39
10.	AST	24.56	7.52
11.	ALT	22.05	8.23
Renal Profile			
12.	Urea	22.71	6.08
13.	Creatinine	0.86	0.15
14.	Uric acid	5.11	1.26
15.	Vitamin D	8.63	4.97

The study participants involved in physical activity have positive association with vitamin D levels having 7.69% students in insufficient range whereas; physically inactive group had 27.39% participants in insufficient range having significant p value <0.05 . About 77% study subjects were non-vegetarian; among them 83.5% non-vegetarian and 61% vegetarians were vitamin D deficient whereas 38% vegetarian and 16% non-vegetarian had insufficient vitamin D level. In present study the association of BMI to vitamin D levels found to be negative with insignificant p value (0.6). The participants taking vitamin D supplements ($n=12$) and the individuals without supplement ($n=87$) are under similar risk of vitamin D deficiency; however, 83% students taking vitamin D supplement were deficient and 16% insufficient, compared to 77% deficient and 23% insufficient in the students not taking vitamin D supplement. The association between intake of vitamin D supplement and non-intake is insignificant, having p value 0.61 [Table-2].

Table 2: Vitamin D Status among Study Variables

Sl. No.	Study Variables	Insufficient	Deficient	p -value
1	Gender Male:	8	47	0.04*
	Female:	14	30	
2	Diet Veg:	10	16	0.02*
	Non-veg:	12	61	
3	Average duration of sun exposure per day			0.02*
	>30 min:	03	31	
	<30 min:	19	46	
4	Physical Activity Yes:	02	24	0.03*
	No:	20	53	
5	Vitamin D supplement Yes:	02	10	0.6
	No:	20	67	
6	BMI <24.9:	05	29	0.5
	25-29.5:	11	37	
	>30:	06	21	

* P value <0.05 is significant.

The other routine biochemistry tests, like: fasting blood sugar, fasting lipid profile, liver function tests and kidney function tests were performed for all participants and the values found within the normal limits as described in Table-1.

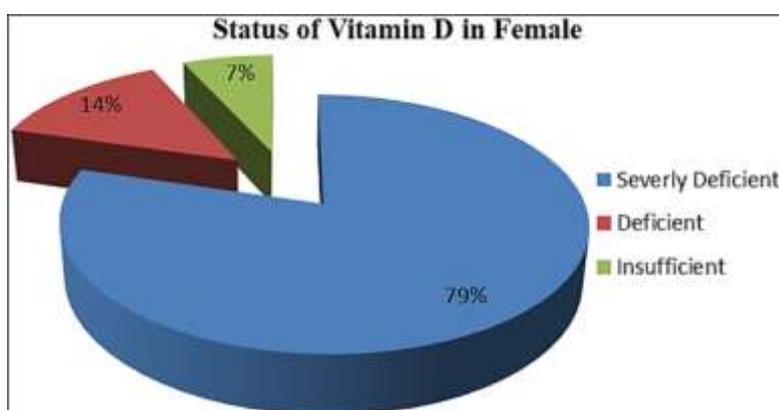


Fig 1

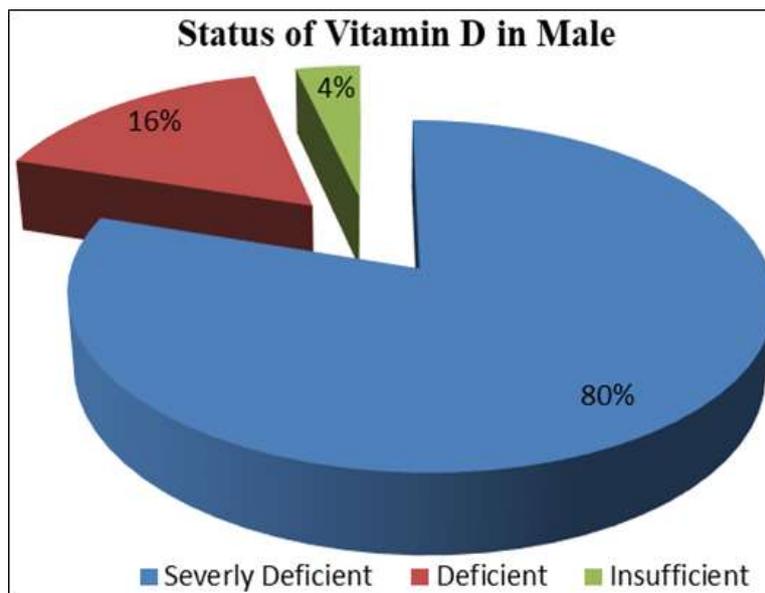


Fig 2

Discussion

The present research depicts lack of basic knowledge about vitamin D, its dietary sources, benefits, biochemical & physiological role and its deficiency management among medical undergraduate students. Majority of the students believed that vitamin D deficiency is prevalent among high-risk groups confined to urban areas^[11]. They were unaware that vitamin D deficiency has attained epidemic proportions not only among the literate population but across the world irrespective of age groups, ethnic background, food habits and geographical regions^[12]. The importance of vitamin D with respect to maintenance of calcium and phosphate metabolism and bone homeostasis, majority of students (91.9%) correctly reported that vitamin D deficiency could lead to bone and skeletal disorders^[13]. The adequate sun exposure, fortified milk, milk products and food stuffs like, salmon, cod liver oil, sundried mushroom and egg yolk are rich in vitamin D^[14]. In this study it was observed that students were unaware about natural, dietary and fortified sources and that these dietary sources alone are inadequate in treatment of deficient states^[15]. Vitamin D deficiency have been overlooked in developing countries like India, perhaps on the assumption that vitamin D deficiency is unlikely to occur in the geographical location that receive ample amount of sunshine throughout the year^[16]. Exposure to sun is one of the essential natural sources for prevention and treatment of vitamin D deficiency^[16, 17]. Various socio-cultural and dietary factors, limited outdoor activity due to urbanization, air pollutants, extensive use of sunscreens and negative attitudes towards sunlight attribute to high prevalence of vitamin D deficiency in our country^[17, 18]. The studies also reveal that sun rays passing through glass can't synthesize vitamin D^[19]. Most medical students were unaware about these important facts. Also adequate sun exposure varies according to time of the day and latitude in different parts of the world^[20]. In Northern India, where the study was conducted, it is recommended that exposure of arms and legs to sunlight between 10 am to 2 pm for 10 min to 30 min twice a week is sufficient to achieve adequate vitamin D synthesis in Indian skin type^[21]. Thus, there is a need to sensitize students to the fact that sunlight is one of the most important sources of vitamin D and stimulates the synthesis of vitamin D in the skin, depending on hour of the day, duration of exposure, age, skin pigmentation, dietary pattern, clothing style, and use of sunscreen^[22]. The participating 78% study subjects were unaware about the amount of dietary intake of vitamin D required per day of different age groups, in pregnancy or lactating female according to ICMR guidelines. ICMR recommends RDA of 600 IU daily for adult male and females to optimize bone health and suggests that serum vitamin D levels in an adult indicate insufficiency at 20-29 ng/mL and deficiency at <20 ng/ml^[23]. Apart from RDA for normal healthy adult, students should be made aware of how it varies according

to age, sex, pregnancy, advancing age and disease conditions such as renal and liver diseases. However, in absence of adequate vitamin D intake, insufficiency or deficiency may result. Serum vitamin D levels that indicate sufficiency and insufficiency also needed to be emphasized. It is recommended that vitamin D should be administered in a dose of 50,000 IU per week for 8 weeks in addition to bimonthly supplements to maintain adequate vitamin D concentration [24]. Appropriate treatment to prevent long term health consequences of vitamin D deficiency or toxicity, vitamin D supplements, adequate dose and duration is imperative. It is important to understand that proper dosing schedule ensures a stable circulating concentration of vitamin D and optimal autocrine environment for vitamin D metabolism in non-bony tissues [25]. Unfortunately, present study observes a lack of awareness among undergraduate students regarding the various biochemical forms, dose, and duration of vitamin D supplementation for treatment of nutritional deficiency. Though vitamin D toxicity is one of the rarest medical conditions in India, students must be made aware that adverse effects of treatment can be considerable, as nearly 12% students were taking supplements without a confirmatory diagnosis of vitamin D deficiency. Since the undergraduate medical students joined our institution just after qualifying medical entrance exam and most of them were preparing for the competition over two or more years, their daily schedule and stress or adverse condition during the preparation may have attributed the Vitamin D deficiency among the students, though other nutritional parameters like, serum total protein, Albumin, Uric acid, Total cholesterol, HDL, etc. were found within normal limits.

The facts observed in present study has emphasized the necessity for sensitization of medical students, who are the future health care professionals and considered as the most educated among the whole lot in society. This study, though carried out among limited medical undergraduates but it draws an important indication about the knowledge and role of the vitamin D, its deficiency manifestation and management, which is silently spreading as a pandemic throughout the country and not only affecting the general population or patient, rather the future medical practitioners.

Conclusion

Present study highlights a lack of awareness of vitamin D deficiency, prevalence and its management among medical undergraduates. There should be training programs among health workers to accomplish the knowledge deficit among medical professionals so that it would help them in identification, prevention, and treatment of vitamin D deficiency. Awareness at an early stage of medical undergraduates could instill adoption of health-related behaviors at personal and professional level and could be effective against specific target populations to increase awareness among them about adequate intake of vitamin D, hence improving overall health.

Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of the paper.

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