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RESEARCH ARTICLE

Vitamin D deficiency among female students of a Government Medical College

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ABSTRACT

Background: Vitamin D deficiency is an unrecognized epidemic in many populations. **Aims and Objectives:** This study aims to assess the levels of Vitamin D among female medical students. **Materials and Methods:** A total of 100 healthy female students from all Profs. of MBBS were enrolled and their 25-hydroxyvitamin D levels were measured using an autoanalyzer. **Results:** Mean age of the subjects was 20.4 years. Moderate deficiency was seen in 42% and mild insufficiency in 57% subjects. Adequate level was present in only one subject and none was found to be suffering from severe deficiency of Vitamin D. Mean value of serum Vitamin D of the 1st year students was significantly less than those of other Profs. of MBBS. **Conclusion:** Results raise a concern about Vitamin D deficiency among female medical students and its future health consequences.

KEY WORDS: Vitamin D; Deficiency; Female; Medical Students

INTRODUCTION

Geographically, India lies close to the equator and majority of population resides in areas having abundant sunlight, but recent data suggest that 50–90% of population is deficient in Vitamin D.[1-3]

Vitamin D known as the "sunshine hormone" has roles beyond the calcium-skeletal axis.[4,5] Five different biological sites including immune, pancreas, cardiovascular, muscle, and brain have Vitamin D receptors and are responsive to 1, 25$(OH)_2$D. Sunlight fulfills about 50–90% of body requirement of Vitamin D while dietary source of Vitamin D provides only 20% of the total requirement.

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Vitamin D status is measured through levels of 25-hydroxyvitamin D [25(OH)D], though what constitutes normal levels of this micronutrient remain a debate. While some experts are of the opinion that the lower limit of adequate 25(OH)D levels should be 30 ng/mL, still others recommend a lower limit of 40 ng/mL.[6] However, Lips[7] has classified Vitamin D levels as follows: Adequate (more than 20 ng/mL), mild insufficiency (<10–20 ng/mL), moderate deficiency (<5–10 ng/mL), and severe deficiency (<5 ng/mL; to convert ng/mL to nmol/L, multiply by 2.5).

As a group, female medical students are particularly vulnerable to Vitamin D deficiency due to maximum indoor stay. Hence, to have a better understanding of Vitamin D levels in young female population, we assessed the levels of serum 25(OH)D in healthy, female medical students of Government Medical College, Jammu.

MATERIALS AND METHODS

A cross-sectional study was conducted during February–March 2017, in the Department of Physiology, Government Medical College, Jammu, and included 100 female undergraduate students from all Profs of MBBS. The aim and procedure of the study were given wide publicity among the target population. Students willing to participate were asked to come in batches of 15 each to the Department of Physiology.

A written consent was taken from all the volunteering subjects. Ethical clearance was obtained from the Institutional Ethics Committee vide IEC/pharma/thesis/research/T18B/C/2016/294 dated July 10th 2016.

Each subject's record pertaining to any history of drug intake, any significant recent or past illness, and history of radiation exposure were noted after which a general physical examination was carried out.

Inclusion Criteria

Healthy female medical students consent to participate in the study.

Exclusion Criteria

Subjects not willing to give their consent, suffering from any chronic disease, having any contraindication to exposure to sunlight, taking hormone replacement therapy or medications that affect Vitamin D metabolism (e.g., phenytoin); those with a history of inflammatory bowel disease, small bowel surgery, and altered bone metabolism (hyperthyroidism, hyperparathyroidism, and Type 1 diabetes mellitus) were excluded from the study.

Serum Vitamin D Level

Measurement of serum 25(OH)D levels was done in the Biochemistry Laboratory of Govt. Medical College, Jammu. Abbott i 1000 SR autoanalyzer was used which is based on the principle of chemiluminescence microparticle assay. Criteria for defining levels of serum Vitamin D deficiency were as per Lips.[7]

Age

Age was recorded in years and months.

Body Mass Index (BMI)

Body weight was recorded to the nearest kilogram, height to the nearest centimeter and then BMI was calculated using the standard formula, wherein BMI of the subject = weight in kg divided by height in square meters.

Statistical Analysis

The data were analyzed using MS Excel and SPSS version 21.0. Data are reported as mean ± SD. Student's *t*-test (unpaired) was used to compare mean data of two groups while across the groups analysis was done using ANOVA. $P < 0.05$ was considered statistically significant.

RESULTS

Distribution of serum vitamin D levels in different BMI categories is shown in Tables 3-5.

Mean age, weight height, and BMI are shown in Table 1. There were more subjects in the age group of 20–21 years (40%), followed by 18–19 years (33%) and 22–23 years (22%). Least number of subjects (5%) was in the age group of 24–25 years [Table 2]. Categorization of Vitamin D levels in the subjects was done as per Lips.[7]

Mean value of serum Vitamin D in the 1st year of study indicated moderate deficiency level. Mean value was more in the 3rd year of study, followed by the 2nd year of study, prefinal year, and then final year; all indicating mild insufficiency of serum

Table 1: Baseline anthropometric measurements of the subjects (*n*=100)

Variable	Mean±SD	Range
Age (year)	20.4±1.71	18–25
Weight (kg)	55.94±7.78	44–87
Height (meter)	1.60±0.07	1.35–1.75
BMI (kg/m^2)	21.79±3.03	16.26–31.21

BMI: Body mass index

Table 2: Age-wise distribution of subjects according to serum Vitamin D levels

Age group (years)	Serum 25(OH)D levels (ng/mL) *n* (%)			
	<5	5–10	10–20	>20
18–19	0	17 (17.00)	16 (16.00)	0
20–21	0	12 (12.00)	27 (27.00)	1 (1.00)
22–23	0	11 (11.00)	11 (11.00)	0
24–25	0	2 (2.00)	3 (3.00)	0
Total	0	42 (42.00)	57 (57.00)	1 (1.00)

Table 3: BMI wise distribution of subjects according to serum Vitamin D levels

BMI (kg/m^2)	Serum 25(OH)D levels (ng/mL) *n* (%)		
	5–10	10–20	>20
<25	39 (39.00)	48 (48.00)	1 (1.00)
≥25	3 (3.00)	9 (9.00)	0
Total	42 (42.00)	57 (57.00)	1 (1.00)

BMI: Body mass index

Table 4: Comparison of mean values of serum Vitamin D according to BMI of subjects

BMI (kg/m^2)	Serum 25(OH)D Mean±SD (ng/mL)	Statistical inference (unpaired *t*-test)
<25 (*n*=88)	10.95±3.41	*t*=0.38; *P*=0.70 (not significant)
≥25 (*n*=12)	11.75±3.40	3

BMI: Body mass index

Table 5: Year wise distribution of female MBBS students according to serum Vitamin D levels

Year of study	Serum 25(OH)D levels (ng/mL) *n* (%)		
	5–10	10–20	>20
1	15 (15.00)	11 (11.00)	0
2	11 (11.00)	29 (29.00)	0
3	0	3 (3.00)	0
Prefinal	7 (7.00)	8 (8.00)	1 (1.00)
Final	9 (9.00)	6 (6.00)	0
Total	42 (42.00)	57 (57.00)	1 (1.00)

Table 6: Comparison of mean values of serum Vitamin D according to year of study

Year of study	Serum 25(OH)D Mean±SD (ng/mL)	Statistical inference (one-way ANOVA)
1 (*n*=26)	9.52±2.76	*F*=2.63; *P*=0.03 (significant)
2 (*n*=40)	11.82±3.22	
3 (*n*=3)	13.69±1.91	
Prefinal (*n*=16)	11.42±4.61	
Final (*n*=15)	10.37±2.75	

Vitamin D levels. Statistically difference among mean values across the year of study was significant ($P = 0.03$) [Table 6].

DISCUSSION

Vitamin D deficiency continues to be an unrecognized epidemic globally. 25(OH)D is a precursor of active hormone, 1,25-dihydroxyvitamin D (1,25[OH]$_2$D) and is the best indicator of total Vitamin D stores and its availability for biological functions. Female subjects were the focus of the current study since females in the 18–25 years age group are more likely to be deficient in Vitamin D.[8]

In the present study, occurrence of moderate deficiency of serum Vitamin D level was 17% in the age group of 18–19 years, 12% in the age group of 20–21 years, and 11% in the age group of 22–23 years. Mild insufficiency was recorded to be 27% in 20–21 years age group, 16% in 18–19 years, and 11% in 22–23 years age. Thus, our results indicate that with increase in the age of female students deficiency of Vitamin D is decreased.

Similar to our results, some studies done on the medical students and resident doctors in other parts of world have found a high prevalence of Vitamin D deficiency.[9,10]

In the present study, mean BMI was 21.79 ± 3.03 kg/m^2. Majority (88%) had normal BMI. Hasanato *et al*.[11] have also reported a similar range of BMI. Among obese students (12) in our study, 25% (3) had moderate deficiency, while the rest had mild insufficiency. Obesity and low vitamin D levels complement each other, with obesity being considered as a risk factor for low Vitamin D levels. In obese people, there is a suppressing effect of high quantity of subcutaneous fat on circulating Vitamin D.[12] Florez *et al*.,[13] Hypponen E and Power C (2007),[14] Looker *et al*.,[15] and Le Goaziou *et al*.[16] all have demonstrated that overweight or obesity and not participating in outdoor sports are risk factors for hypovitaminosis D.

Several factors are postulated for low Vitamin D levels in females including dietary habits, lack of sun exposure, sunscreen use, skin hyperpigmentation, poor dietary intake, breast feeding, pregnancy, and lactation, their longer indoor stay in the college as well as at home.[17]

The Institute of Medicine (US) Committee to Review Dietary Reference Intakes for Vitamin D and Calcium has recently recommended that serum 25(OH)D is adequate when it is higher than 50 nmol/L.[18] Clinical Vitamin D deficiency only occurs when serum 25(OH)D is lower than 25 nmol/L. The clinical picture includes muscle weakness, bone pain, and fractures, while in children joint swelling and deformation prevail. In patients with rickets and osteomalacia, serum 25(OH)D usually is <15 nmol/L or even below the detection limit.[19]

In our study, moderate deficiency was found to be present in 42% subjects, mild insufficiency in 57% subjects, and adequate serum Vitamin D levels in just 1%. At the same time, none of the subjects had severe Vitamin D deficiency. The present findings are consistent with the studies conducted by Hasanato *et al*.,[11] Al-Elq *et al*.,[12] Inam-ul-Haq *et al*.,[20] and Walia *et al*.[21] who reported that hypovitaminosis D was high among female medical students.

More students from the first Prof (26%) and the second Prof (40%) in the current study had moderate deficiency and mild insufficiency as compared to prefinal (15%) and final year (15%) students. Intragroup comparison showed significant ($P = 0.03$) difference among students of different years of academics. Mean serum Vitamin D level of the first Prof was moderately deficient (5–10 ng/mL), while the second, prefinal, and final year students had mildly insufficient (10–20.8 ng/mL) mean serum Vitamin D levels. In general, hypovitaminosis D has been reported in the literature as being more prevalent in females due to poor dietary habits, decreased exposure to sunlight and widespread use of sunscreens. Differences in the hormonal milieu between

genders also affect transport proteins and enzymes involved in Vitamin D metabolism.[12]

Studies have established that Vitamin D deficiency is prevalent in Indians despite a sunny climate almost throughout the year, irrespective of their age, group, and gender.[21]

Limitation of the study: We were unable to perform bone mineral density of the subjects due to lack of resources. Future study should include this parameter also.

CONCLUSION

This study shows that 99% of young, educated female students in the medical field have low Vitamin D levels, thus raising a great concern about their future health. This calls for an urgent action to prevent adverse consequences of low Vitamin D in young generation of this country.

REFERENCES

1. Zargar AH, Ahmad S, Masoodi SR, Wani AI, Bashir MI, Laway BA, *et al*. Vitamin D status in apparently healthy adults in Kashmir valley of Indian subcontinent. Postgrad Med J 2007;83:713-6.
2. Lodhey V. Vitamin D deficiency: Indian scenario. J Assoc Physicians India 2011;59:695-6.
3. Gunjaliya A, Patil R, Vaza J, Patel H, Maniyar A. Prevalence of Vitamin D deficiency in higher socioeconomical class of Ahmedabad, Gujarat, India. Int J Med Sci Public Health 2015;4:617-20.
4. Maestro B, Molero S, Bajo S, Dávila N, Calle C. Transcriptional activation of the human insulin receptor gene by 1,25-dihydroxyvitamin D3. Cell Biochem Funct 2002;20:227-312.
5. Romangnoli E, Pepe J, Piemonte S, Cipriani C, Minisola S. Value and limitations of assessing Vitamin D nutritional status and advised levels of Vitamin D supplementation. Euro J Endocrinol 2013;169:R59-69.
6. Holick MF. Vitamin D status: Measurement, interpretation and clinical application. Ann Epidemiol 2009;19:73-8.
7. Lips P. Which circulating level of 25-hydroxyvitamin D is appropriate? J Steroid Biochem Mol Biol 2004;89-90:611-4.
8. Gannage-Yared MH, Chemali R, Yaacoub N, Halaby G. Hypo-Vitaminosis D in a sunny country: Relation to lifestyle and bone markers. J Bone Miner Res 2000;15:1856-62.
9. Multani SK, Sarathi V, Shivane V, Bandgar TR, Menon PS, Shah NS. Study of bone mineral density in resident doctors working at a teaching hospital. J Postgrad Med 2010;56:65.
10. Gonzalez-Padilla E, Lopez AS, Gonzalez-Rodriguez E, García-Santana S, Mirallave-Pescador A, Groba Marco Mdel V, *et al*. High prevalence of hypovitaminosis D in medical students in Gran Canaria, Canary Islands (Spain). Endocrinol Nutr 2011;58:267-73.
11. Hasanato R, Al-Mehboob A, Al-Mutairi A, Al-Faraydi J, Al-Amari K, AL-Jurayyad R, *et al*. High prevalence of Vitamin D deficiency in healthy female medical students in central Saudi Arabia: Impact of nutritional and environmental factors. Acta Endocrinol 2015;11:257-61.
12. Al-Elq AH. The status of Vitamin D in medical students in the preclerkship years of a Saudi medical school. J Family Community Med 2012;19:100-4.
13. Florez H, Martinez R, Chacra W, Strickman-Stein N, Levis S. Outdoor exercise reduces the risk of hypovitaminosis D in the obese. J Steroid Biochem Mol Biol 2007;103:679-81.
14. Hypponen E, Power C. Hypovitaminosis D in British adults at age 45 y: Nationwide cohort study of dietary and lifestyle predictors. Am J Clin Nutr 2007;85:860-8.
15. Looker AC, Pfeiffer CM, Lacher DA, Schleicher RL, Picciano MF, Yetley EA. Serum 25-hydroxyvitamin D status of the US population: 1988-1994 compared with 2000-2004. Am J Clin Nutr 2008;88:1519-27.
16. Le Goaziou MF, Contardo G, Dupraz C, Martin A, Laville M, Schott-Pethelaz AM. Risk factors for Vitamin D deficiency in women aged 20-50 years consulting in general practice: A cross-sectional study. Eur J Gen Pract 2011;17:146-52.
17. Holick MF. Vitamin D deficiency. N Engl J Med 2007;357:266-81.
18. Ross AC, Manson JE, Abrams SA, Aloia JF, Brannon PM, Clinton SK, *et al*. The 2011 report on dietary reference intakes for calcium and Vitamin D from the institute of medicine: What clinicians need to know. J Clin Endocrinol Metab 2011;96:53-8.
19. Need AG, O'Loughlin PD, Morris HA, Coates PS, Horowitz M, Nordin BE. Vitamin D metabolites and calcium absorption in severe Vitamin D deficiency. J Bone Miner Res 2008;23:1859-63.
20. Inam-ul-Haq, Tariq N, Afzal M, Raiput AM. Vitamin D deficiency and its associated factors amongst college students. J Islamabad Med Dent Coll 2016;5:54-8.
21. Walia HK, Singh A, Kaur K, Sharma V, Bhartiya JP, Sah NK, *et al*. Vitamin D status in apparently healthy students of maharishi markandeshwar medical college and hospital, Kumarhatti, Solan. Sch J App Med Sci 2017;5:949-54.

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