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Original Research Article

Knowledge, attitude and practice regarding vitamin D supplementation among medical students and resident doctors at a tertiary centre: a cross-sectional study

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ABSTRACT

Background: Vitamin D is a vital micronutrient for proper bone formation. Knowledge about vitamin D is often insufficient among individuals, including healthcare professionals. We conducted a cross-sectional study to assess the knowledge, attitude, and practice of vitamin D supplementation among medical students and resident doctors in a tertiary care hospital.
Methods: A cross-sectional study was carried out using a structured, well tested, validated questionnaire, focussing on knowledge, attitude and practice on self-medication of vitamin D on 222 undergraduate (UG) medical students from first to fourth year, interns and resident doctors of different specialities at a tertiary care teaching centre in India. The data was analysed using Graph Pad Prism 8.4.2 software.
Results: There was no significant difference among pre-MBBS (Bachelor of Medicine and Bachelor of Surgery) and post-MBBS students' attitude and practice related to vitamin D. However, the knowledge about vitamin D supplementation differed significantly among post and pre-MBBS students ($p<0.05$).
Conclusions: In conclusion, it can be said that although medical students had a fair knowledge on some important aspects of vitamin D, their knowledge regarding symptoms of vitamin D toxicity and associated complications was moderate. Self-medication was very high (43%) among participants, a matter of grave concern. Practice related to vitamin D supplementation among participants was also not satisfactory. Knowledge of participants significantly increased upon completion of MBBS degree. However, there were gaps in the attitude and practice of vitamin D which did not seem to improve even in the post-MBBS students.

Keywords: Vitamin D, Self-medication, Medical students, Resident doctors

INTRODUCTION

Vitamin D is a vital micronutrient for mineral metabolism, essential for proper bone formation and preventing various bone manifestations. It facilitates intestinal absorption of calcium and phosphorus.[1,2] Beyond calcium metabolism, low vitamin D levels are linked to health conditions such as cardiovascular disorders, obesity, high blood pressure, diabetes, autoimmune diseases, depression, and certain malignancies.[3,4] Deficiency can cause rickets and increase the risk of lower respiratory tract infections in children.[1] Dietary sources include oily fish, egg yolk, and fortified dairy products, while the skin synthesizes 80-100% of daily requirements upon sufficient sunlight exposure.[4-6]

Vitamin D deficiency is globally prevalent, influenced by factors like limited sunlight exposure, sunscreen use, geographic location, air pollution, and poor diets.[5,7] In India, around 70-100% of the population is affected.[8] Plasma 25-hydroxyvitamin D [25(OH)D] levels are measured to assess vitamin D status. According to the US

Endocrine Society, levels <20 ng/ml are deficient, and levels 21-29 ng/ml are insufficient. The Institute of Medicine defines levels <12 ng/ml as "deficient," ≥20 ng/ml as "sufficient," and 12-20 ng/ml as "at risk for inadequacy".[9]

The Endocrine Society recommends 37.5-50 mcg (1,500-2,000 IU) of vitamin D daily for adults and at least 25 mcg (1,000 IU) for children to maintain optimal levels.10 However, excessive supplementation can cause vitamin D intoxication, leading to hypercalcemia and symptoms like muscle weakness, fatigue, headache, nausea, and bone pain. Long-term effects include irritability, increased thirst, high blood pressure, and cardiac arrhythmias.[11,12]

Knowledge about vitamin D is often insufficient among individuals, including healthcare professionals. This highlights the need for improved education and research, particularly for medical students and doctors, to promote better public understanding and practices.[6]

Hence, the present study was conducted with the objective of assessing the knowledge, attitude and practice of Vitamin D supplementation among medical students and resident doctors in a tertiary care hospital.

METHODS

An observational, cross-sectional study was conducted in a tertiary health care teaching centre of central India after approval from Institutional Ethics Committee (IEC approval No. 4097(a)). The study period lasted from 1st December 2023 to 1st February 2024.

Study participants were medical students belonging to 1st, 2nd, 3rd, and 4th year MBBS, interns, and resident doctors of different specialties who have consented to participate in the study. Participants meeting the inclusion criteria were briefed about the study. Informed consent was obtained from those willing to participate. A self-designed, semi-structured questionnaire was administered via Google Forms. The questionnaire, consisting of open- and close-ended questions regarding knowledge, attitude, and practice of vitamin D supplementation, was validated and pre-tested by 5 experts in the field before circulation.

Statistics

Sample size was calculated by taking absolute error or precision=5% and the prevalence of medical students having low knowledge about vitamin D supplementation as 15% from previous study sample size was calculated using PS software version 3.1.2 and a sample size of 230 was considered for this study.

Data analysis

Age was categorized into 3 ranges, and categorical variables were expressed as numbers and percentages. Statistical comparison between pre-MBBS (undergraduates) and post-MBBS (interns, residents) groups was performed using the Chi-square test via Graph Pad Prism 8.4.2 software, with significance value set at $p<0.05$.

RESULTS

A total of 222 completely filled questionnaires were included in the analysis and 8 incompletely filled questionnaires were rejected. The maximum number of participants were undergraduate students (50%) and the remaining were interns and residents (Table 1).

Majority of the participants (93.2%) were aware of the types of vitamin D, various symptoms of vitamin D deficiency (84.2%) and vitamin D toxicity (72.5%) (Table 2).

60.4% participants were aware of the recommended daily allowance of vitamin D. However, the awareness regarding the serum level of vitamin D in patients that need supplementation was less (44.4%). There was moderate awareness among the participants that vitamin D toxicity could occur due to excess supplementation of vitamin D (53.2%) (Table 2).

As far as the attitude regarding vitamin D supplementation is concerned, 43% of students thought that they should self-medicate vitamin D supplements of which, 22% were men and 20% were women. 94% felt that vitamin D deficiency can be managed through methods like sun exposure, fortified foods, and supplements.

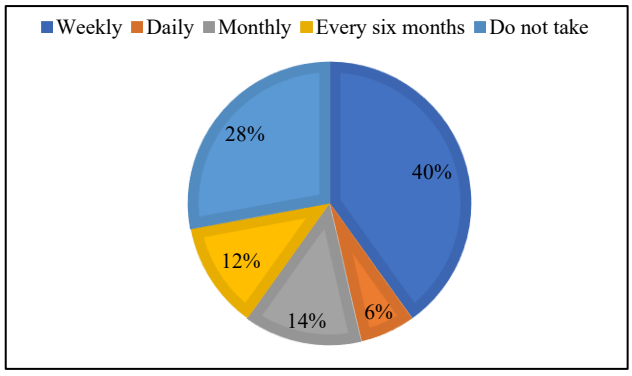

Figure 1: Attitude of participants regarding vitamin D and its supplementation- how often do you think you should take vitamin D supplements?.

Regarding practice related to vitamin D supplementation, 54.1% recommended vitamin D supplements to friends or relatives. However, practice regarding the same to patients (38.7%), healthy adults (15.7%) and patients of chronic illness (21.6%) without checking their serum vitamin D3 levels was less. Number of participants who have checked their serum vitamin D3 levels was 65.3% and only 12.2% have ever managed a patient of vitamin D toxicity (Table 3).

Table 1: Demographic characteristics of participants (n=222).

Demographics		N (%)
Age (in years)	18-20	70 (31.5)
	21-25	66 (29.7)
	26-30	86 (38.8)
Designation	UGs	111 (50)
	Interns	32 (14.4)
	JRs	59 (26.6)
	SRs	20 (9)
Sex	Men	103 (46.4)
	Women	119 (53.6)

Table 2: Knowledge of participants regarding vitamin D and its supplementation (n=222).

S. no.	Questions	N (%)	
		With correct answer	With incorrect answer
1.	Are you aware of the type of vitamin D?	207 (93.2)	15 (6.8)
2.	What according to you are the dietary sources of vitamin D?	155 (69.8)	67 (30.2)
3.	What according to you is the recommended daily allowance of vitamin D in adults?	134 (60.4)	88 (39.6)
4.	What is the main cause of vitamin D deficiency?	149 (67.1)	73 (32.8)
5.	Who according to you needs vitamin D supplementation?	159 (71.6)	63 (28.4)
6.	What are the various symptoms of vitamin D deficiency?	187 (84.2)	35 (15.8)
7.	What could be the symptoms of vitamin D toxicity?	161 (72.5)	61 (27.5)
8.	Vitamin D toxicity is seen at what critical serum level of vitamin D?	129 (58.1)	93 (41.9)
9.	What according to you is the serum level of vitamin D for which supplementation is needed?	98 (44.1)	124 (55.9)
10.	Vitamin D toxicity is a very rare complication of supplementation or treatment with vitamin D supplements and in fact it only affects people with genetically determined hypersensitivity to vitamin D. Do you agree?	118 (53.2)	104 (46.8)

Table 3: Practice of participants regarding vitamin D and its supplementation (n=222).

S. no.	Questions	Responses N (%)	
		Yes	No
1.	Do you recommend Vitamin D supplements to your Friends/Relatives?	120 (54.1)	102 (45.9)
2.	Do you recommend Vitamin D supplements to patients?	86 (38.7)	136 (61.3)
3.	Do you recommend Vitamin D supplements to healthy adults without checking their serum levels?	35 (15.7)	187 (84.3)
4.	Do you recommend Vitamin D supplementation to patients of chronic illnesses without checking their serum Vitamin D3 levels?	48 (21.6)	174 (78.4)
5.	Have you ever tested your 25 (OH) serum levels?	145 (65.3)	77 (34.7)
6.	Have you ever managed a patient of Vitamin D toxicity?	27 (12.2)	195 (87.8)

Table 4: Comparison of knowledge, attitude and practice among pre-MBBS and post-MBBS students (n=222).

S. no.	Questions	Pre-MBBS[a] (correct answers)	Post-MBBS[b] (correct answers)	P value
1.	Vitamin D toxicity is a very rare complication of supplementation or treatment with Vitamin D supplements and in fact it only affects people with genetically determined hypersensitivity to Vitamin D. Do you agree?	63 (28.4)	66 (29.7)	0.6832
2.	What according to you is the Recommended Daily Allowance of	59 (26.6)	86 (38.7)	0.0001*

Continued.

S. no.	Questions	Pre-MBBS[a] (correct answers)	Post-MBBS[b] (correct answers)	P value
	Vitamin D in adults?			
3.	After starting Vitamin D supplementation, when the serum levels should be reviewed?	45 (20.3)	78 (35.1)	<0.0001**
4.	According to you what should be dose of Vitamin D to be taken for the treatment of Vitamin D deficiency?	63 (28.4)	88 (39.6%)	0.0003*
5.	Do you think you should self-medicate vitamin D supplements?	62 (27.9) [answered "No"]	74 (33.3) [answered "No"]	0.0983
6.	Do you recommend Vitamin D supplements to healthy adults without checking their serum levels?	97 (43.7) [answered "No"]	101 (45.5) [answered "No"]	0.3873
7.	Do you recommend Vitamin D supplementation to patients of chronic illnesses without checking their serum levels?	95 (42.8) [answered "No"]	90 (40.5) [answered "No"]	0.3679
8.	Have you ever tested your 25(OH) serum levels?	79 (35.6) [Tested]	83 (37.4) [Tested]	0.5455
9.	Vitamin D toxicity is seen at what critical serum levels of Vitamin D?	49 (22.07)	69 (31.08)	0.0071*

Note: *-p<0.05, *-p<0.0001, a- MBBS undergraduate student; and b- interns, junior residents and senior residents.

Knowledge about vitamin D supplementation differed significantly in a comparison between post-MBBS and pre-MBBS students (p<0.05). No significant differences were observed in attitude and practice (Table 4).

DISCUSSION

The present study is one of the very few which aims at understanding the knowledge, attitude and practice of self-medication of vitamin D among medical students in India - a country marked by high deficiency of vitamin D across the entire population.[13-16]

The results of our study indicate that majority of the participants had a good level of knowledge about the type, the dietary sources of vitamin D and the symptoms of deficiency, which is encouraging and is similar to a study conducted among medical and dental students of Peshawar where the students showed a good knowledge about the dietary sources and type of vitamin D.[1] Similar findings were reported in studies conducted by Zhou, Yadav and Arora.[17-19] However, a few studies have shown a lack of knowledge in this regard.[20,21]

Institute of Medicine (IOM) recommends a daily intake of at least 600IU/d of Vitamin D for adults aged 19-50 years and higher amounts for older adults.[22] In our study, majority of the participants were aware of the recommended daily allowance (RDA) for adults. Knowledge regarding the same was significantly more among the interns and post-graduates as compared to undergraduates.

Majority of participants in our study were aware of the symptoms that develop due to vitamin D toxicity, that occurs due to excess intake of vitamin D above the prescribed therapeutic dose. Awareness regarding the same is very important because vitamin D toxicity may lead to serious health consequences like, nausea, vomiting, muscle weakness, pain, excessive urination, kidney stones, etc. In our study, around 53% participants agreed to the fact that-Vitamin D toxicity is a very rare complication of supplementation or treatment with vitamin D supplements and in fact it only affects people with genetically determined hypersensitivity to vitamin D. The findings were comparable to a study conducted on Polish doctors, where the level of awareness regarding the same statement was 60%.[7] However, there wasn't a significant difference in the awareness levels regarding this among pre- and post-MBBS students in our study (Table 4). According to a retrospective study conducted at an academic medical centre it was found that symptomatic vitamin D toxicity is rare, and elevated levels of serum 25(OH) D do not strongly correlate with the symptoms or total plasma/serum calcium levels.[23]

Most of our participants showed a good knowledge about the causes (67%) and symptoms of vitamin D deficiencies (72.5%). Similar findings were reported in a study performed in Rawalpindi Medical University, Pakistan.[24] The results were in contrast to a study conducted on Sri-Lankan healthcare undergraduates where knowledge score was only 31.3% and there was no significant difference in the knowledge in terms of academic year.[25]

In our study, as far as attitude towards Vitamin D self-medication is concerned, it was seen that 43% of the participants felt that they should self-medicate vitamin D and 40% of medical students felt that Vitamin D supplements should be take weekly (Figure 1).

There was no statistically significant difference between undergraduates and post MBBS participants regarding this.

In our study, it was good to know that majority participants were aware of the ways to manage vitamin D deficiency like sun exposure, fortified foods and supplements. Similar findings were reported in a survey on primary health-care physicians in Riyadh, Saudi Arabia.[10]

One more positive finding of our study was that, a good number of students (65%), had tested their serum vitamin D levels. A study conducted at a university of Pakistan reported that 72% of students had never tested their vitamin D levels.[20]

In our study, it was seen that very few participants (38%) recommended vitamin D supplements to patients, however almost 54% recommended it to friends and relatives. When the same was compared amongst pre and post MBBS participants there was no significant difference, as far as this practice was concerned.

In our study when post MBBS participants were compared with undergraduate students it was found that the knowledge about recommended daily allowance of vitamin D in adults, when to review the vitamin D levels after starting vitamin D supplementation, the dose of vitamin D to be taken for treating vitamin D deficiency and the critical serum level above which toxicity is seen was more in interns and post graduates as compared to the undergraduate students, and the difference was statistically significant. Similarly, a study conducted by Lhamo et al in Vardhman Mahavir Medical college, New Delhi, India also observed lack of awareness among undergraduates regarding the dose and duration of vitamin D supplementation for treatment of nutritional deficiency.[26]

Post-MBBS students generally demonstrated significantly better knowledge about Vitamin D, particularly regarding recommended dosing, monitoring practices, and toxicity levels. However, gaps remain in attitudes and practices-especially concerning indiscriminate supplementation and lack of personal testing-indicating that knowledge does not consistently translate into clinical behaviour. These findings stress the need for enhanced, practice-oriented educational strategies during medical training.

The findings of this study underscore the urgent need to enhance awareness about Vitamin D among medical students. Educating future healthcare professionals during their formative years not only improves their personal health choices but also shapes their clinical practice. When well-informed, these professionals are more likely to identify and address Vitamin D deficiencies-particularly among vulnerable populations-and to counsel patients effectively on appropriate supplementation, dietary sources, and safe sunlight exposure.

Targeted educational interventions at the undergraduate level are essential to bridge existing knowledge gaps, correct misconceptions, and discourage harmful practices such as unsupervised self-medication. Evidence suggests that patients are significantly more likely to heed advice about Vitamin D when it comes from trusted healthcare providers. Therefore, instilling a sound understanding of this essential nutrient among medical students has the potential to create a ripple effect, positively influencing public health outcomes.

This study also highlights a probable lack of awareness about Vitamin D within the broader community. Thus, public health strategies should include campaigns that address both under- and over-supplementation. Effective, evidence-based health promotion programs will be crucial in fostering healthier behaviours and reducing deficiency rates, particularly among at-risk populations. Future health promotion programs with effective educational interventions will help increase awareness about vitamin D, and encourage people to adopt healthier behaviours to reduce deficiency rates.

While the study's strengths lie in its focused research questions and relevance to both medical education and patient care, certain limitations must be acknowledged. The sample was restricted to a single healthcare institution in India, which may limit the generalizability of the findings. Additionally, a longitudinal follow-up of the participating students could have provided deeper insights into the long-term impact of educational interventions on their knowledge, attitudes, and practices regarding Vitamin D.

CONCLUSION

In conclusion, the study found good levels of knowledge about Vitamin D related aspects among medical students, while attitude and practice of the same were unsatisfactory. Thus, the research contributes valuable evidence supporting the integration of Vitamin D education into medical curricula, emphasizing its role not just in individual health, but in the broader context of preventive medicine and public health advocacy.

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