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Assessing Medical Students' Knowledge and Attitudes Towards Vitamin D Supplementation in Musculoskeletal Disorders

Munazzah Meraj[1], **Mukhry Pasham**[2], **Sidra Faisal**[2], **Arsalan Ahmed**[2], **Syed Murtaza Ali Shah**[3], **Peraha Wagan**[2]

Correspondence
Munazzah Meraj
drmunazzah@pumhs.edu.pk

Affiliations
1 Associate Professor, Institute of Physiotherapy & Rehabilitation Sciences (IPRS), Peoples University of Medical and Health Sciences for Women, Nawabshah, Pakistan
2 Lecturer, Institute of Physiotherapy & Rehabilitation Sciences (IPRS), Peoples University of Medical and Health Sciences for Women, Nawabshah, Pakistan
3 Assistant Professor, Institute of Physiotherapy & Rehabilitation Sciences (IPRS), Peoples University of Medical and Health Sciences for Women, Nawabshah, Pakistan

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Vitamin D, musculoskeletal disorders, medical education, supplementation, knowledge gaps, student survey, cross-sectional study, clinical guidelines.

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ABSTRACT

Background: Vitamin D is crucial for musculoskeletal health, but gaps in knowledge and supplementation practices persist among medical students, who will become future healthcare providers.

Objective: This study aimed to assess the knowledge and attitudes of medical students towards vitamin D supplementation in musculoskeletal disorders.

Methods: A cross-sectional survey was conducted from June to September 2024, involving 245 physiotherapy students at PUMHSW. Data were collected using an online questionnaire covering demographics, knowledge of vitamin D, attitudes towards supplementation, and personal practices. Descriptive statistics, chi-square tests, and multivariate regression analysis were performed using SPSS 25.

Results: A total of 93.87% of students recognized vitamin D's role in bone health, but only 33.06% knew its role in muscle function. Regular supplementation was reported by 9.8%, while 44.9% used it occasionally. Barriers included lack of knowledge (71.3%) and clinical guidelines (47.5%). Formal education positively impacted knowledge and supplementation practices ($p = 0.031$).

Conclusion: Medical students showed good awareness of vitamin D's role in bone health, but gaps exist in broader knowledge and practical supplementation. Enhanced education is needed to address these deficiencies.

INTRODUCTION

Vitamin D is a vital nutrient with essential roles in maintaining bone health, regulating calcium levels, and supporting overall musculoskeletal function. Its deficiency is a widespread public health issue affecting individuals of various age groups and across geographical regions. The most significant source of vitamin D is ultraviolet radiation from sunlight, although dietary sources and supplementation also contribute to its intake. Deficiency in vitamin D can result from several factors, including limited exposure to sunlight, darker skin pigmentation, obesity, and aging. Moreover, environmental and cultural factors, such as indoor occupations and geographic location, can exacerbate this deficiency, particularly in regions with lower sunlight exposure like the United Kingdom (5). Apart from its well-established role in calcium metabolism and bone health, vitamin D has been implicated in muscle function and immune regulation, both critical for preventing and managing musculoskeletal disorders like osteoporosis and osteomalacia (6).

Despite the widespread prevalence of vitamin D deficiency, there remain significant gaps in public awareness about its health benefits and the risks associated with inadequate intake. Studies conducted across diverse populations have consistently highlighted these gaps, even in groups generally expected to have higher health literacy, such as university students. For instance, a survey of university students in the UK revealed that while many understood the role of vitamin D in bone health, there was considerable confusion about its broader physiological benefits and appropriate dosage levels (7). These findings suggest that even among well-educated populations, misconceptions about vitamin D supplementation and intake persist, necessitating enhanced educational efforts both in medical curricula and public health messaging (8).

This gap in knowledge is particularly concerning for medical students, who will eventually take on roles as healthcare providers responsible for educating patients on preventive health measures. Given the critical role that vitamin D plays in managing musculoskeletal health, it is imperative that medical students are equipped with accurate knowledge and attitudes toward vitamin D supplementation to ensure they can effectively combat deficiency in their future practice (9). A study assessing the knowledge and attitudes of Saudi medical students highlighted similar deficiencies, with many students lacking adequate understanding of vitamin D's role beyond bone health and showing low rates of supplementation, particularly in populations more prone to deficiency, such as females with limited sun exposure (14).

This research was conducted to address the knowledge and attitude gaps among medical students at the Institute of Physiotherapy and Rehabilitation Sciences, PUMHSW, Nawabshah, specifically concerning vitamin D supplementation in musculoskeletal disorders. By evaluating their awareness, practices, and perceptions regarding vitamin D, the study aims to provide insights that could inform future educational strategies aimed at enhancing the preparedness of healthcare providers.

Additionally, it seeks to underscore the importance of integrating comprehensive education on vitamin D into medical curricula, not only to improve student knowledge but also to ultimately enhance patient outcomes by addressing a significant public health issue. The findings from this study will offer valuable perspectives on where improvements are needed to ensure that future physicians are well-equipped to deal with vitamin D deficiency in clinical settings.

MATERIAL AND METHODS

This cross-sectional study was conducted to assess the knowledge, attitudes, and practices of medical students at the Institute of Physiotherapy & Rehabilitation Sciences (IPRS), PUMHSW, Nawabshah, regarding vitamin D deficiency and supplementation in musculoskeletal disorders. The study took place between June 2024 and September 2024 and included all enrolled physiotherapy students across the first to final years of study. Participants were recruited using a convenience sampling method, with a total sample size of 245 students responding to an online questionnaire distributed through social media platforms. Participation in the study was voluntary, and informed consent was obtained from all participants before their inclusion in the study.

Data collection was performed using a self-administered questionnaire, which was developed based on previously validated studies with additional items tailored to this research focus. The questionnaire was structured into sections covering demographic information, knowledge of vitamin D's roles in health, attitudes toward supplementation, and personal practices related to vitamin D use. The demographic section collected data on age, gender, and year of study, while the knowledge section included questions about vitamin D's functions in bone, muscle, and immune health, as well as its association with specific musculoskeletal conditions such as rickets and osteoporosis. Attitudes toward supplementation were assessed through questions about the participants' confidence in recommending vitamin D and their perceived barriers to supplementation, such as a lack of clinical guidelines or knowledge.

Ethical approval for the study was obtained from the PUMHSW Ethical Review Committee. The study followed the principles outlined in the Declaration of Helsinki to ensure the ethical treatment of all participants. Confidentiality was maintained throughout the study, and participants were given the right to withdraw from the study at any time without any penalty.

Data were analyzed using SPSS version 25. Descriptive statistics were calculated for all variables to provide an overview of participants' knowledge, attitudes, and practices. Categorical variables were presented as frequencies and percentages, while continuous variables were summarized using means and standard deviations. The relationship between demographic variables and knowledge, attitudes, and practices was assessed using chi-square tests for categorical data and independent t-tests for continuous data. A multivariate regression analysis was performed to identify significant predictors of vitamin D knowledge and supplementation practices, with a significance level set at $p < 0.05$.

This methodology provided a comprehensive assessment of medical students' knowledge and attitudes toward vitamin D, allowing for the identification of gaps in education that could inform future curriculum development and public health initiatives aimed at improving vitamin D supplementation practices in clinical settings.

RESULTS

A total of 245 medical students participated in the study, with a response rate of 100%. The majority of students were between the ages of 20-22 years (46.12%), while 28.16% were under 20, and 25.71% were aged 23-25. Most participants (69.38%) had no prior clinical experience in musculoskeletal disorders, while 30.5% had some clinical exposure.

Additionally, 71.42% of students reported receiving formal education on vitamin D. These demographic characteristics are summarized in Table 1.

Chi-square analysis showed no statistically significant association between age groups and prior clinical experience or education on vitamin D ($p > 0.05$).

Table 1: Demographic Characteristics, Clinical Experience, and Vitamin D Education

Category	Percentage (%)	Number (n)	p-value
Age			
Under 20	28.16	69	0.237
20-22	46.12	113	
23-25	25.71	63	
Previous clinical experience			
Yes	30.5	75	0.161
No	69.38	170	
Received formal education on vitamin D			
Yes	71.42	175	0.092
No	28.58	70	

Regarding vitamin D supplementation practices, only 9.8% of the students reported regular supplementation, 44.9% used supplements occasionally, and 45.3% did not use supplements at all. A statistically significant association was found between students who had received formal education on vitamin D and regular

Table 2: Vitamin D Supplementation Practices

Category	Percentage (%)	Number (n)	p-value
Personal use of vitamin D supplements			
Regular use	9.8	24	0.031*
Occasional use	44.9	110	
No use	45.3	111	

supplementation (p = 0.031), indicating that education positively influenced regular use. Table 2 outlines the supplementation practices in detail. Most participants (93.87%) recognized the role of vitamin D in bone health, with fewer acknowledging its role in muscle (33.06%) and immune function (33.46%). The association between vitamin D deficiency and conditions such as rickets (75.1%) and osteoporosis (75.39%) was well recognized. However, 43.8% of participants were unsure of the recommended daily allowance (RDA) of vitamin D, and only 36.3% correctly identified the recommended intake of 600-800 IU. There was a statistically significant difference between students with formal education on vitamin D and those correctly identifying the RDA (p = 0.017). Table 3 summarizes the knowledge areas.

Table 3: Knowledge of Vitamin D Roles and Associated Conditions

Knowledge Area	Percentage (%)	Number (n)	p-value
Role of Vitamin D			
Bone health	93.87	230	0.061
Muscle function	33.06	81	0.046*
Immune function	33.46	82	0.052
Cardiovascular health	15.91	39	0.074
Conditions associated with deficiency			
Rickets	75.1	184	0.038*
Osteoporosis	75.39	182	0.049*

In terms of attitudes and confidence, 85% of students expressed confidence in recommending vitamin D supplementation, with 41.22% feeling very confident and 42.85% confident. Most participants (96.32%) supported the need for increased emphasis on vitamin D education in the medical curriculum. Barriers to regular supplementation included a lack of clinical guidelines (47.5%) and a lack of knowledge (71.3%). Students who felt confident recommending supplementation were more likely to support additional education in the curriculum (p = 0.015). These findings are detailed in Table 4.

Table 4: Attitudes and Confidence in Vitamin D Supplementation

Attitude/Confidence	Percentage (%)	Number (n)	p-value
Believe supplementation is necessary	86.12	211	0.078
Very confident in recommending supplements	41.22	104	0.012*
Confident in recommending supplements	42.85	105	
Support more education on vitamin D	96.32	236	0.015*

Overall, the results indicated that while medical students had a solid understanding of vitamin D's role in bone health, there were significant gaps in knowledge regarding muscle and immune function, as well as proper dosage recommendations. Statistically significant associations were found between formal education on vitamin D and both regular supplementation practices and correct identification of the RDA, emphasizing the positive impact of education on students' knowledge and practices.

DISCUSSION

The findings of this study highlighted a strong foundational understanding of the role of vitamin D in bone health among medical students, with nearly all participants recognizing its significance in musculoskeletal function. However, there were notable gaps in knowledge concerning its broader roles in muscle and immune function, as well as uncertainty regarding the recommended daily allowance. These results are consistent with previous studies, such as Christie and Mason's research, which similarly reported that students, particularly in Saudi Arabia, demonstrated good awareness of vitamin D's role in bone health but lacked a deeper understanding of its other physiological functions (13). The current study reinforces these gaps, particularly the limited awareness of vitamin D's involvement in muscle and immune health, an area that requires further educational emphasis in the medical curriculum.

In addition to knowledge gaps, the study revealed a significant proportion of students were unsure of the recommended daily dosage of vitamin D, with only 36.3% correctly identifying the appropriate intake of 600-800 IU. This mirrors findings from O'Connor et al. in the UK, where similar confusion was noted about vitamin D dosage among the general population (7). The lack of knowledge regarding dosage is a critical issue, as incorrect understanding of the recommended levels could lead to either deficiency or

toxicity, undermining the effectiveness of clinical interventions. Improving knowledge about dosage and supplementation is essential for future healthcare providers, as they will be responsible for guiding patients on appropriate vitamin D intake to prevent deficiency-related complications.

Despite these knowledge deficits, the attitudes of the students towards vitamin D supplementation were generally positive. A large majority expressed confidence in recommending supplements, with 85% indicating they felt capable of advising patients on the topic. This is a promising finding, as confidence in clinical recommendations is a key factor in effective patient education and intervention. However, this confidence was not always matched by practice, with only 9.8% of students reporting regular vitamin D supplementation. The discrepancy between confidence and actual practices may stem from the barriers identified in the study, such as a lack of clinical guidelines and insufficient knowledge, which were reported by 47.5% and 71.3% of participants, respectively. These findings are in line with the results of Alkindy et al., who also found that while students were generally aware of the benefits of vitamin D, practical barriers, including access to clear clinical guidelines, hindered regular supplementation (9).

The study's strengths include a robust sample size of 245 students from multiple academic years, providing a representative overview of the knowledge, attitudes, and practices among future healthcare providers in the field of physiotherapy. Furthermore, the use of a validated questionnaire, combined with tailored items specific to vitamin D and musculoskeletal health, allowed for a comprehensive assessment of student understanding. The multivariate regression analysis provided additional insight into the predictors of knowledge and supplementation practices, identifying formal education on vitamin D as a significant factor influencing both knowledge and supplementation habits.

However, there were limitations in the study that must be acknowledged. The cross-sectional design limited the ability to infer causality between formal education and improvements in vitamin D knowledge or practices. Additionally, the self-reported nature of the data could have introduced response bias, with students potentially overestimating their confidence in recommending supplements or underreporting knowledge gaps. Future studies should consider longitudinal designs that track changes in knowledge and attitudes over time, particularly following targeted educational interventions. Another limitation was the exclusion of students who did not complete the survey, which may have introduced selection bias, as those with less interest or knowledge in vitamin D may have been less likely to participate fully.

Based on these findings, several recommendations can be made. First, it is imperative to strengthen the education on vitamin D in medical curricula, with a particular focus on its broader physiological roles beyond bone health and the appropriate dosage levels. This could be achieved through formal lectures, clinical guidelines, and integrated patient case studies that emphasize the practical application of supplementation in clinical settings. Additionally, public health campaigns targeting both medical professionals and the general public should address the widespread gaps in knowledge and barriers to supplementation, particularly in regions where vitamin D deficiency is prevalent. By improving the understanding of vitamin D among medical students, healthcare providers will be better equipped to guide patients and reduce the incidence of deficiency-related musculoskeletal disorders in the general population.

CONCLUSION

In conclusion, while the medical students demonstrated a good understanding of the basic role of vitamin D in bone health, significant gaps in knowledge remain, particularly regarding its roles in muscle and immune function, and the correct daily dosage. Addressing these gaps through enhanced education and clinical training is essential to ensure that future healthcare providers are well-prepared to manage vitamin D deficiency in clinical practice. The findings of this study contribute to the growing body of evidence highlighting the need for improved education on vitamin D and offer valuable insights into how medical curricula can be adapted to better prepare students for their roles as future clinicians.

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