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Assessment of Vitamin D Status in Medical Students in Jazan University-KSA

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Abstract

Background: The prevalence of vitamin D deficiency has recently been recognized in different parts of the world, even affecting healthy populations. The deficiency of vitamin D can lead to rickets in children and osteomalacia in adults. Few studies have been done to evaluate the status of vitamin D in the medical community. The primary aim of this study was to evaluate the prevalence of this condition among a group of medical students and identify risk factors associated with it, besides comparing vitamin D status between male and female subjects in medical students. **Materials and Methods:** This cross-sectional study was carried out in the Department of Medical Laboratory Science of Jazan University between February 2025 to April 2025 on male and female students in Jazan University, Jazan City. Hundred apparently healthy medical students between the age group of 18 - 23 years were recruited based on defined inclusion and exclusion criteria. A questionnaire form with details on age, weight, height, sun exposure, and consumption of milk. Approximately 5 mL of blood was extracted for the measurement of serum calcium, serum albumin, serum phosphorus, alkaline phosphatase, creatinine, fasting plasma glucose and vitamin D levels. Vitamin D deficiency was defined as serum 25-hydroxy vitamin D < 10 ng/mL, insufficiency as 10 - 30 ng/mL, and sufficiency as 31 - 100 ng/mL. Comparison between groups was done for statistical significance using an unpaired t-test. Significance was set at P < 0.05

for all comparisons. **Results:** The data from 50 male and 50 female students were analyzed. In 100% of the students, the prevalence of vitamin D deficiency in all students was 15%, 47% had vitamin D insufficiency, while 38% had sufficient vitamin D. The mean 25-hydroxy vitamin D level was 26.83 ± 12.60 nmol/L in males and 16.03 ± 8.28 nmol/L in females (P-value = 0.0001). Males had a statistically significantly higher body mass index as well as consumption of dairy products, while the consumption of seafood was significantly higher in females. There was no difference between the two groups in terms of exposure to the sun. **Conclusion:** The majority of subjects have Vitamin D deficiency insufficiency (47%) and relative deficiency (15%), while 38% had sufficient vitamin D. There is a lack of relationship between vitamin D insufficiency and dietary intake and long-term sun exposure. An urgent action has to be taken in order to prevent adverse consequences of low vitamin D and insufficiency in the young and healthy populations.

Keywords

Vitamin D Insufficiency, Medical Students, Sun Exposure

1. Introduction and Literature Review

Vitamin D deficiency is a widespread health issue that affects individuals of all ages, including university students. Although Vitamin D is naturally produced when the skin is exposed to sunlight, modern lifestyle habits—such as reduced sun exposure, increased time indoors, and insufficient dietary intake—have led to higher rates of deficiency, even in areas with abundant sunlight, such as Saudi Arabia. Vitamin D plays a vital role in maintaining the balance of calcium and phosphorus in the body, which is crucial for bone mineralization, skeletal development, and dental health. Beyond its effects on bones, recent studies have highlighted the significant connection between Vitamin D deficiency and various chronic health conditions. These include autoimmune diseases like multiple sclerosis and type 1 diabetes, cardiovascular conditions such as hypertension and heart failure, and even some cancers, including breast, colorectal, and prostate cancer. Additionally, low Vitamin D levels have been linked to psychological health issues such as depression, anxiety, and chronic fatigue, emphasizing the vitamin's importance in immune system regulation and overall mental well-being. Recent research provided new insights into the impact of Vitamin D deficiency. A 2022 study found that low Vitamin D levels increase the risk of developing type 2 diabetes by reducing insulin sensitivity and impairing pancreatic function [1]. In 2022, further studies showed that Vitamin D deficiency could worsen symptoms of depression, although more clinical trials are needed to establish a definitive causal relationship [2]. Additionally, a groundbreaking 2025 study in JAMA demonstrated that high-dose Vitamin D3 supplementation significantly decreased disease activity in multiple sclerosis patients, showcasing its potential in immune system modulation

[3]. During the COVID-19 pandemic, a meta-analysis in 2021 confirmed that individuals with low Vitamin D levels were at greater risk of experiencing severe symptoms and higher mortality rates [4]. Research also reveals that Vitamin D deficiency has specific associations with obesity and hypertension. A 2021 study highlighted that people with obesity tend to have lower Vitamin D levels, as excess body fat may store Vitamin D, making it less available for use by the body [5]. Furthermore, a 2023 study in the Hypertension Journal found that Vitamin D deficiency could contribute to the development of high blood pressure, and supplementation could potentially help lower blood pressure levels in those with significant deficiency [6]. In Saudi Arabia, a systematic review in 2024 revealed that around 81.1% of children and adolescents suffer from inadequate Vitamin D levels. This emphasizes the need for enhanced public health initiatives, including Vitamin D fortification, screening programs, and increased awareness, especially since the deficiency persists despite ample sunlight [7]. This study focuses on examining the prevalence of Vitamin D deficiency among medical students and understanding the factors contributing to it, such as diet, physical activity, sun exposure, body mass index, clothing habits, and the use of supplements. The research employs a combination of laboratory-based quantitative analysis of 25-hydroxyvitamin D [25(OH)D] levels and a descriptive survey covering health and lifestyle factors. The goal of this study is to provide a comprehensive understanding of Vitamin D deficiency within a population of medical students. It is hoped that the findings will not only raise awareness but also guide evidence-based health interventions. Moreover, the study aims to encourage institutions to adopt preventive strategies, such as awareness campaigns, supplementation programs, and regular screenings, to improve students' health, enhance their academic performance, and support their long-term well-being.

2. Materials and Methods

2.1. Study Area

This study was conducted in the Department of Medical Laboratory Science at Jazan University, located in the southwestern region of Saudi Arabia. The university is based in Jazan City, an area characterized by a hot and humid climate, which may affect vitamin D synthesis through sunlight exposure.

2.2. Study Subjects

The study population consisted of apparently healthy male and female medical students enrolled at Jazan University. Participants were selected from different academic years, and their ages ranged between 18 and 23 years.

2.3. Inclusion Criteria

Participants included in the study were full-time medical students aged between 18 and 23 years, in good general health, and willing to provide written and verbal informed consent.

2.4. Exclusion Criteria

Students were excluded if they had a history of chronic diseases, metabolic bone disorders, were taking vitamin D supplements within the last three months, or were on medications known to affect bone metabolism.

2.5. Study Design

This research was designed as a descriptive cross-sectional study and was conducted over a period of three months, from February 2025 to April 2025. The main objective was to evaluate the vitamin D status among university students and identify contributing lifestyle factors.

2.6. Sample Size

A total of 100 medical students were included in the study, with an equal distribution of 50 males and 50 females. Convenience sampling was used to select the participants.

2.7. Methods

Data were collected using a structured and validated questionnaire. The questionnaire included information on age, gender, height, weight, sunlight exposure (duration per day), physical activity, and dietary intake, especially milk and dairy products.

Height and weight were measured using standardized instruments, and body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters.

Approximately 5 mL of venous blood was drawn from each participant using aseptic techniques. The samples were processed and analyzed in the university's central laboratory to measure serum 25-hydroxyvitamin D (25(OH)D), calcium, phosphorus, albumin, alkaline phosphatase, creatinine, and fasting plasma glucose. Biochemical analyses were conducted using fully automated analyzers, following manufacturer protocols and standard laboratory procedures. Vitamin D levels were classified as deficient (<10 ng/mL), insufficient (10 - 30 ng/mL), or sufficient (31 - 100 ng/mL).

2.8. Statistical Analysis

Statistical analysis was performed using SPSS software version 23. Descriptive statistics were used to summarize participant characteristics. Continuous variables were expressed as mean ± standard deviation, and categorical variables were presented as frequencies and percentages. Independent t-tests were used to compare means between male and female students. A P-value less than 0.05 was considered statistically significant.

3. Result

Data from 100 (50 male, 50 female) apparently healthy medical students aged between 18 and 23years studying at faculty of nursing and health science in Jazan University were analyzed. In this study, 47% of participants showed an insufficient level of vitamin D, while 8% had deficient vitamin D (Table 1). Our study was revealed that 50% of the students had 5 to 15 minutes duration of exposure to sun, 19% had exposure of 15 - 30 minutes/day, 18% had exposure of more than 30 minute while (13%) reported less than 5 minute /day sun exposure (Table 2). This study revealed that most of the students (51%) had at least one milk serving per day, 15% had two milk servings per day, while 34% did not take milk (Table 3). The mean age for all the students was 19.54 years. Males had a significantly higher BMI (24.96 ± 6.09 vs. 22.91 ± 4.79, P-value = 0.009) and a higher consumption of dairy products (1.56 ± 1.03 vs. 1.21 ± 0.87 cups/day, P-value = 0.027), although the duration of their exposure to the sun was not significantly longer (1.95 ± 0.87 vs. 1.74 ± 0.76 h/day, P-value = 0.077) (Table 4). In addition to significantly lower 25OHD levels, females had significantly lower calcium levels, albumin levels, phosphorus levels, and alkaline phosphatase (7.42 ± 4.24 vs. 5.84 ± 2.54, P-value = 0.002) compared with males (Table 4).

In this study, 30% of students had taken vitamin D supplements, 25% of the students reported a history of multivitamin consumption, and 12% had a history of omega-3 fatty acids consumption (Table 5).

Table 1. Vitamin D status in participants.

Vitamin D	Deficient	Insufficient	Sufficient
	<10 ng/mL	10 - 30 ng/mL	31 - 100 ng/mL
Male (50)	4 (8%)	17 (34%)	19 (38%)
Female (50)	11(22%)	30 (60%)	19 (38%)
Total (100)	15 (15%)	47 (47%)	38(38%)

Table 2. Duration of sun exposure.

Duration (min/day)	No.	Percentage (%)	Gender
Less than 5	13	13%	Female: 8 (61.5%) Male: 5 (38.5%)
5 - 15	50	50%	Female: 26 (52%) Male: 24 (48%)
15 - 30	19	19%	Female: 10 (52.6%) Male: 5 (47.4%)
More than 30	18	18%	Female: 9 (50%) Male: 9 (50%)

Table 3. Quantity of milk servings per day.

Quantity	No.	Percentage (%)
Nil	34	34%
1	51	51%
2	15	15%

Table 4. Clinical data, biochemical data and vitamin D status for both male and female.

Characteristic	Male	Female	P Value
Age (year)	19.76 ± 1.67	19.39 ± 1.61	0.073
BMI (kg/m^2)	24.96 ± 6.09	22.91 ± 4.79	0.008
Sun exposure (h/day)	1.95 ± 0.88	1.74 ± 0.76	0.077
Dairy products (cups/day)	1.56 ± 1.03	1.21 ± 0.87	0.027
S. calcium (2.20 - 2.56 mmol/L)	2.36 ± 0.08	2.27 ± 0.08	0.001
S. phosphorus (0.8 - 1.60 mmol/L)	1.27 ± 0.17	1.22 ± 0.13	0.02
S. albumin (35.0 - 48.0 g/L)	48.6 ± 3.4	46.0 ± 3.2	0.001
Alkaline phosphatase (43 - 277 U/L)	94.59 ± 28.28	72.92 ± 21.57	0.001
Fasting plasma glucose (70 - 100 mg/dL)	107.59 ± 38.18	111.69 ± 42.3	0.024
Serum creatinine (0.5 - 1.1 mg/dL)	0.75 ± 0.18	0.8 ± 0.17	0.034
eGFR	107.53 ± 23.82	112.64 ± 26.17	0.032
25OHD (ng/mL)	26.83 ± 12.60	16.03 ± 8.28	0.001
Sufficient (31 - 100 ng/mL)	19%	19%	
Insufficient (25OHD 19 - 30 ng/mL)	34%	60%	
Deficient (25OHD < 10 ng/mL)	8%	22%	

Table 5. Vitamin D supplement, multi-vitamin and omega-3 fatty acid consumption within students.

Drug	Number of participants	Percentage (%)
Vitamin D supplement	Male: 13 Female: 17	30%
Multi-vitamins	Male: 13 Female: 12	25%
Omega-3 fatty acid	Male: 6 Female: 6	12%

4. Discussion

Vitamin D deficiency continues to be an unrecognized epidemic in many populations around the world. It has been reported in healthy children, young adults, middle-aged adults, and the elderly, and is common among both males and females. Moreover, it is prevalent even in populations living in sun-rich regions, such as Saudi Arabia. In this study, we found that the majority of participants had either vitamin D insufficiency (47%) or deficiency (15%), while only 38% had sufficient levels (**Table 1**).

The average daily exposure for both males and females was approximately 15 minutes, which is inadequate for maintaining optimal vitamin D levels. This finding corroborates the work of Ahmad *et al.* (2022), who highlighted that brief periods of sun exposure—particularly when skin exposure is minimal or during non-peak sunlight hours—are generally insufficient for adequate vitamin D synthesis [8]. Additionally, 50% of the participants reported sun exposure of 5 to 15 minutes per day, while 13% indicated exposure of less than 5 minutes daily. Such limited sun exposure, despite the region's abundant sunlight, significantly contributes to the observed vitamin D deficiency (**Table 2**).

Dietary habits also influenced the findings. Male students reported a higher milk consumption (1.42 ± 0.97 cups/day) compared to their female counterparts (1.28 ± 0.78 cups/day), which may have positively impacted their vitamin D levels. Nevertheless, it is noteworthy that 34% of the students did not consume any milk (**Table 3**). These results reflect a concerning trend in vitamin D status among young, healthy adults. In general, hypovitaminosis D has been reported in the literature as being more prevalent in women. Several factors have been suggested to explain low vitamin D levels in females, including reduced dietary intake, less exposure to sunlight, and cultural practices that limit skin exposure.

Our findings indicated that female students exhibited significantly lower levels of 25-hydroxy vitamin D (16.03 ± 8.28 ng/mL) compared to their male counterparts (26.83 ± 12.60 ng/mL) (**Table 4**), this observation aligns with the research conducted by Huang *et al.* (2023), which noted that women tend to have reduced vitamin D levels due to lifestyle choices and clothing practices that limit sun exposure, even in regions with ample sunlight [7]. While our study did not reveal a statistically significant difference in sun exposure between genders ($P = 0.071$) (**Table 4**) [7]. Another alarming observation is that merely 30% of the students indicated they used vitamin D supplements. Within this group, 25% used Multi-vitamin tablets and 12% had a history of omega-3 fatty acid (**Table 5**). Given the high rates of deficiency and insufficiency, particularly among medical students, the low prevalence of supplement usage highlights a significant gap in health awareness and preventive measures. In addition to vitamin D levels, biochemical indicators such as calcium, albumin, phosphorus, and alkaline phosphatase were also found to be significantly lower in females. Since vitamin D is crucial for regulating calcium and phosphorus balance as well as for bone health, these deficiencies underscore the clinical ramifications of vitamin D insufficiency. Overall, these findings underscore the urgent need for enhanced awareness and targeted interventions. Tackling vitamin D deficiency in young adults—especially among women—necessitates comprehensive strategies that include health education, regular screening, dietary enhancements, and the encouragement of safe sun exposure practices. Universities and healthcare organizations should actively engage in promoting supplementation and educating future healthcare professionals about the significance of maintaining optimal vitamin D levels.

5. Conclusion

Vitamin D deficiency and insufficiency are prevalent among medical students at Jazan University. Despite the availability of natural sunlight, the majority of participants failed to achieve adequate vitamin D levels, with female students being particularly affected, likely due to lifestyle and dietary influences. These results are consistent with recent studies and underscore the necessity for proactive public health initiatives, including enhanced education, regular testing, and supplementation programs. It is crucial to address this issue among future healthcare professionals, as they will play a vital role in promoting and exemplifying healthy behaviors within the community.

Limitations of the Study

Low sample size due to the difficulty of collecting blood from medical students.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix

Questionnaire

Name
Gender
Age (year)
Level of education (third - eight)
Weight (kg)
Height (cm)
BMI (kg/m^2)
History of HT
Smoking status
Never
Former
Current
Has a family history of dyslipidemia
Has a family history of diabetes
Physical activity
On average, how much sun exposure have you had in the past week?
Less than 5 min/day
5 - 15 min/day
15 - 30 min/day
More than 30 min/day.
How many servings of milk do you get daily?
Do you take multivitamins?
If yes, how many multivitamin tablets do you take daily?
Do you take vitamin D supplements or calcium with vitamin D?
Do you take omega-3 fatty acids (fish oil)?