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OPEN ACCESS ORIGINAL ARTICLE

Estimation of Vitamin D levels Among Female Students at University of Sciences and Technology, Aden, Yemen. A Cross-sectional Analysis

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ABSTRACT

Background: Hypovitaminosis D is considered a major public health problem where it is estimated that more than one billion people are affected around the world. In Yemen, the vitamin D status among young females was not clear. **Objective:** This study aimed to state the level of vitamin D among female students at the University of Sciences and Technology and to determine the risk factors contributing to vitamin D status among those females. **Method:** An analytical cross-sectional study was conducted on 150 female students. **Results:** The total mean ± SD was 21.5 ± 2.7 years. The min-max of the total age was 18 years and 29 years. The overall prevalence of HVD among female students was 89.3% where 82.7% were insufficient and 6.7% were deficient. Symptoms such as muscle pain, bone pain, and hair loss of HVD were statistically associated with vitamin D status (p=0.001) in each. A statistically significant association was found among those who used sunscreen and did not take vitamin D supplements (p=0.001) in each. **Conclusion:** It can be concluded from this study that the prevalent rate of HVD among female college students in Aden, Yemen, was high and higher than most reported among females globally. The majority of female college students had VDI, while a few had VDD. Using sunscreen and not taking vitamin D supplements increase the risk of HVD.

Keywords: Vitamin D status, Hypovitaminosis D, Female, students, Vitamin D deficiency, vitamin D insufficiency

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INTRODUCTION

Vitamin D is one of the vitamins that is soluble in fat [1]. It is a prohormone that has vital roles in the safety of bones by maintaining the levels of calcium and phosphorous [2]. The majority of vitamin D is synthesized endogenously in our body during exposure to ultraviolet beta (UVB) from sunrays [3]. There are only a few foods that are rich with this vitamin [1]. There are two major forms: vitamin D2 (also referred to as "ergocalciferol"), which is obtained from plant origin [4, 5], and vitamin D3 (also referred to as cholecalciferol), which is largely synthesized in human skin from 7-dehydrocholesterol and food sources, mainly of animal origin.[6]

Vitamin D deficiency (VDD) is not unusual, and it affects different tissues of the human body, especially skeletal, but it is also associated with non-skeletal complications [7]. In fact, the defects in the metabolisms of bone may increase the risk of osteoporosis and other disorders among VDD patients. Autoimmune diseases such as diabetes, malignancies of blood and bone marrow, and diseases of the heart and blood vessels are non-skeletal complications of VDD [8]. Many factors related to religious habits and cultural traditions, seasonal variation, and lifestyle behaviors such as the application of sunscreen, wearing protective clothes and sleeves that cover most parts of the body, using an umbrella, avoiding sunlight exposure, and nutritional differences may contribute to VDD [9, 10]. In addition to consuming foods that contain little or no vitamin D, it may contribute to a deficiency of this vitamin [11,12].

Hypovitaminosis D (HVD) is considered a major public health problem where it is estimated that more than one billion people are affected around the world [13]. All life stages of individuals may be affected with VDD, including neonates, infants, children, adolescents, adults, and elderly of both males and females. The latter is either pregnant or not [14]. VDD is defined as 25-hydroxyvitamin D [25(OH)D] < 50 nmol/L, vitamin D insufficiency (VDI) is defined as [25(OH)D 51–74 nmol/L], and optimal or vitamin D sufficiency (VDS) is defined as [25(OH)D > 75 nmol/L]. [15]. Numerous endocrine and metabolic disorders are exacerbated by vitamin D deficiency. A lack of vitamin D increases the risk of adult fractures, causes growth retardation, and induces rickets. Numerous research have demonstrated a positive relationship between vitamin D insufficiency and obesity[16] .

It is one of the common problems in Middle Eastern countries [17]. In Yemen, the studies about vitamin D among females were scarce. The low vitamin D level was reported in more than 90% of pregnant women [18] and in 87.2% of general women [19]. Vitamin D status among young females, especially students, was not clear, so the study aimed to state the level of vitamin D among female students at the University of Sciences and Technology (UST) and to determine the risk factors contributing to vitamin D status among those females.

METHODS

This analytical cross-sectional study was conducted during a period from October 2022 to June 2023 on 150 female students who study at the University of Science and Technology, Aden, Yemen. The data was collected on a questionnaire that was predesigned previously for that purpose, and the information included age, marital status, and presence of pregnancy, as well as questions about the risk factors that contribute to vitamin D status and the suffering of some symptoms [17]. Five ml of whole blood specimen collected from each female, serum was separated, and vitamin D was measured in the serum by Cobas e411 analyzer.

Ethics approval and consent form

Ethical approval: The ethical approval of this study was obtained from the Ethics Committee of the College of Medicine and Health Science at the University of Science and Technology; MEC No. (MEC/AD065). Ethical approval was based on the standards of the Helsinki Declaration. The written consent form was obtained from each female student before performing any research procedure.

Data analysis

Analysis of the data was performed by using SPSS (Version 21), and p value ≤ 0.05 was considered statistically significant.

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RESULTS

Among the 150 female students, the total mean ± SD was 21.5 ± 2.7. The minimum-maximum (min-max) of the total age was 18 years and 29 years (Table 1). The overall prevalence of HVD among female students was 89.3%, of whom 82.7% were insufficient and only 6.7% were deficient. The highest percentages were shown among medical students (90.7%), singles (75%), and pregnant students (91.1%). According to the age group, the prevalence was high at 94.2% in age group 20–22, followed by 88.5% in age group < 20.

Table 2 reveals a high prevalence of hypovitaminosis D (89.3%) among female students at UST, Aden, with muscle pain, bone pain, and hair fall showing strong associations with deficiency (p = 0.001). Vitamin D supplementation and sunscreen use are significantly linked to HVD, as 97.6% of deficient students did not take supplements, and 100% of sunscreen users had deficiency (p = 0.001). However, no significant associations were found with age, marital status, specialization, pregnancy, BMI, milk consumption, multivitamin intake, or sun exposure (p > 0.05). These findings emphasize the importance of supplementation and balanced sun exposure in preventing vitamin D deficiency.

Table 1: The age and marital status distribution of female students in UST in Aden -Yemen.

Age groups/years	Single (n=135)		Married (n=15)		Total (n=150)	
	No.	%	No.	%	No.	%
< 20	54	88.5	7	11.5	61	40.6
20 – 22	46	88.5	6	11.5	52	34.7
≥23	35	94.6	2	5.4	37	24.7
Mean± SD	21.7±2.8		20.3±1.95		21.5±2.7	
Minimum	18		18		18	
Maximum	29		24		29	

Table 2: The variables associated with hypovitaminosis D of female students in UST in Aden -Yemen

Variables	HVD (n=134, 89.3%) HVD		VDS (n=16, 10.7%)		*p*
	No.	%	No.	%	
Marital status					
Single (n=135)	123 (91.1)		12 (8.9)		0.057
Married (n= 15)	11 (73.3)		4 (26.7)		
Age group years					
< 20 (n= 61)	54 (88.5)		7 (11.5)		0. 794
20 – 22 (n= 52)	49 (94.2)		3 (5.8)		0.265
≥23 (n= 37)	31 (83.8)		6 (16.2)		0.226
Specialization					
Medical (n=97)	88 (90.7)		9 (9.3)		0.581
Non-medical (n= 53)	46 (86.8)		7 (13.2)		
Pregnancy					

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Pregnant (n=12)	9 (75.0)	3 (25)	1.000
Non- pregnant (n= 3)	2 (66.7)	1 (33.3)	
Symptoms			
Muscle pain (n=106)	105 (99.1)	1 (0.9)	0.001
Bone pain (n= 102)	99 (97.1)	3 (2.9)	0.001
Hair fall (n= 116)	113 (97.4)	3 (2.6)	0.001
Risk factors			
Not Drinking milk (n=101)	91 (90.1)	10 (9.9)	0.779
Not taking multivitamins (n= 117)	108 (92.3)	9 (7.7)	0.49
Not taking vitamin D supplements (n= 127)	124 (97.6)	3 (2.4)	0.001
No Expose to sun (n=148)	133 (89.9)	15 (10.1)	0.203
Using sunscreen (n= 109)	109 (100.0)	0 (0.0)	0.001
Body mass index			
BMI (n= 18)	17 (94.4)	1 (5.6)	0.964

HVD: Hypovitaminosis D; VDS: vitamin D sufficiency

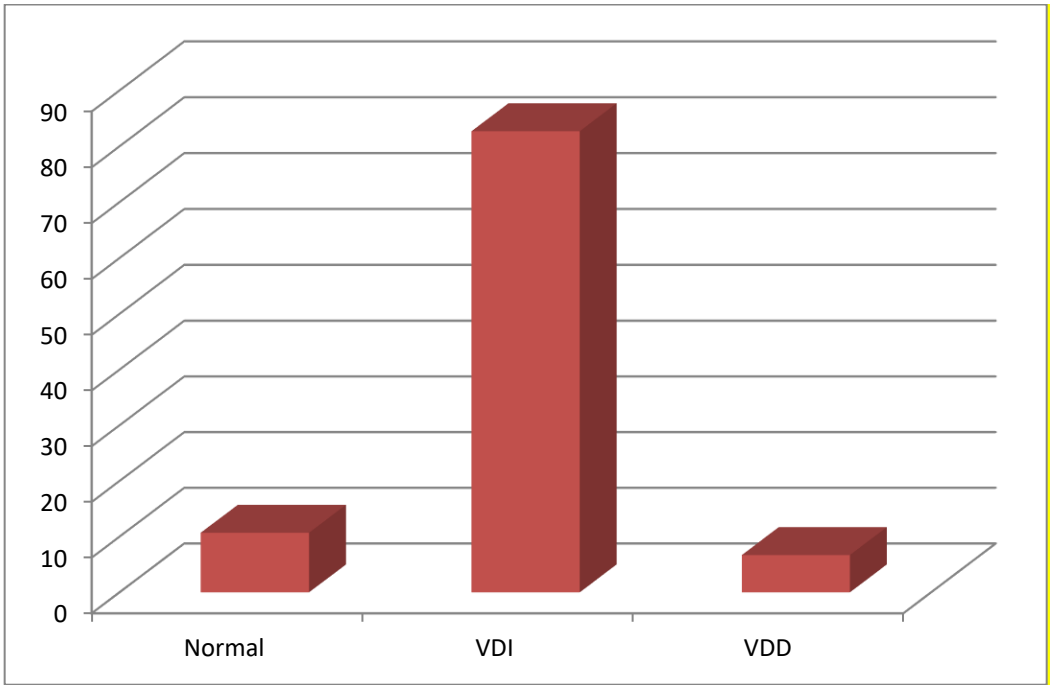

Figure 1: Vitamin D status among female students in Aden –Yemen. VDI: Vitamin D insufficiency; VDD: Vitamin D déficiency

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DISCUSSION

The current result was a higher overall prevalence of HVD than other studies carried out in Yemen (87.2%) [19], Saudi Arabia (82%), and 80.6% [17, 20] and in the United Arab Emirates (UAE) (42.5% and 47.92) [21, 22]. In addition, this data was not different from one recent study conducted among female' students at Aden University, which indicated that the prevalence of HVD ranged between 34.4% and 65.7% [23]. On the other hand, higher prevalent rates than current results were reported in Qatar (97.2%) [24] and in Iran (95.2%) [25]. Another study conducted in Yemen showed that more than 90% of females had HVD[18] .

Data reported by Alzaheb and Al-Amer showed that vitamin D insufficiency (VDI) was in 12.8% and VDD in 67.8% of female students [17]. AlQuaiz et al. reported the VDI and VDD were 64.0% and 19.4%, respectively [20]. A report from Yemen showed that VDI was 47.6% and VDD was 70.3% [26]. A study performed in Iran reported that 51.2% of female students had VDI and 44% of them were VDD [27], and in the UAE Showed 40% of females were VDI and 15.3% were VDD [28]. Vitamin D status among female college students in Qatar was recorded at 46.3% VDI and 50.7% VDD [24]. Nichols et al. showed that 96.8% of women had insufficient vitamin D and 60.3% had VDD [29]. The most notable differences between our study and others This might be attributed to clothing style and wearing Muslim-style clothing, where women's dress traditions cover most parts of the body and wearing hijab and burqa in Yemen and some other Arabic and Muslim countries, which participate in the prevention of exposure to the sun., thereby interfering with vitamin D synthesis.

Symptoms such as muscle pain, bone pain, and hair loss of HVD were statistically associated with vitamin D status (p=0.001) in each. Among HVD females, the percentage among those who had muscle pain was 105 (99.1%). A study performed in the UAE noted that muscle pain was present in 60.7% of participants [21]. Ninety-seven (97.1%) of females had bone pain in our data. Edis et al. reported that 60.7% of the studied group had bone pain [21]. According to those females who complained of hair falling in this data, 113 (97.4%) had HVD. Rasheed et al. reported that vitamin D is associated with hair loss in females.[30]

According to the risk factors for vitamin D status, this study found that 109 (100%) of the females who used sunscreen had HVD. Faghih et al. reported that 96.8% of females who used sunscreen had HVD [27]. Nimri reported that 35.42% of the students used sunscreen [22]. As regards vitamin D supplements, about 124 (97.6%) of female students in UST who had HVD were not taking vitamin D supplements. Al-Mansri et al. reported that 64% of females who had HVD never used vitamin D supplements [31]. The current two previous results were both statistically significant (p=0.001). The economical, geographical, and seasonal differences between countries might be the causes of variation in results. Finally, this result found no significant correlations between vitamin D status and BMI; it was in agreement with a study carried out in the UAE [32]. The absence of a relationship between BMI and 25-OHD levels in the present study may be attributed to the fact that most of the participants were in the normal BMI range and only a few cases were obese.

CONCLUSIONS

It can be concluded from this study that the prevalent rate of HVD among female UST students in UST, Aden–Yemen, was high and higher than most reported among females globally. The majority of female college students had VDI, while a few had VDD. Using sunscreen and not taking vitamin D supplements increases the risk of HVD.

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Conflict of interest

The authors declare that no conflict of interest.

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