



RESEARCH ARTICLE

VITAMIN D STATUS AMONG FEMALE STUDENTS IN FACULTY OF MEDICINE AND HEALTH SCIENCES UNIVERSITY OF ADEN- YEMEN

Dhekrah Saif Ali Shaif^{1,*} , Galal Mohammed Assakaf², and Iqbal Awadh³¹ Dept. of Biology Faculty of Science University of Aden, Yemen.² Dept. of Physiological Sciences, Faculty of Medicine and Health Sciences, University of Aden, Yemen.³ Dept. of Morphological Science, Faculty of Medicine and Health Sciences, University of Aden, Yemen.

*Corresponding author: Dhekrah Saif Ali Shaif; E-mail: dh343037esm@gmail.com

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Abstract

Vitamin D deficiency is not only associated with rickets and osteomalacia, but with several chronic diseases, such as cancer, ischemic heart disease and type 1 and 2 diabetes mellitus. Vitamin D deficiency is prevalent across all age groups in epidemic proportions. Worldwide, an estimated one billion people suffer from vitamin D deficiency. One of the major reasons for the worldwide spread of this disorder has been deficient awareness about the importance of vitamin D, its benefits on health, and prevention of deficiency state across different populations. This study aimed to investigate the prevalence of vitamin D deficiency among female medical students regarding the importance of vitamin D and to determine its correlates among female students in Aden, Yemen. A cross-sectional study was conducted with 70 adult female students aged 19-30 years enrolled in Faculty of Medicine and Health Sciences University of Aden in the period April to October 2019. A self-administered questionnaire was used to collect information for participants data such as age, place of residence (urban or rural), skin color (pigmentation) and applying of sun protection creams. Blood samples were taken to investigate serum 25-(OH)D3 level for all participants through laboratory examination using Roche Cobas e 411 Automatic Analyzer, after recruiting their sociodemographic, health and lifestyle. Serum 25-hydroxyvitamin D levels were classified as normal (>30 ng/ml), insufficiency (10-30 ng/ml) and deficiency (<10 ng/ml). The data statistically analyzed using SPSS version 24. The mean age (SD) of participants 22.4 ± 2.01 years. The prevalence of vitamin D deficiency among all participants was 34.3% while 65.7% had vitamin D insufficiency. Low concentrations of serum vitamin D is highly prevalent among female medical students. It is advisable to increase their consumption of foods rich in vitamin D. The incidence of VDD among growing girls is concerning and necessitates preventive intervention. Importantly, health strategy plan requires considerations of more promotion of safe sun exposure practice, sufficient vitamin D supplements and vitamin D fortification of foods.

Keywords: Deficiency, Insufficiency, Vitamin D, Prevalence, Osteomalacia.

1. Introduction

Vitamin D deficiency is a worldwide epidemic and yet, it is a problem that is largely unknown by majority of population [1], and may be the cause of morbidity, mortality and increased health care expenses through the related chronic illnesses [2]. Vitamin D is now being linked to decreasing the risk of many chronic diseases and conditions such as breast cancer, cardiovascular diseases, diabetes, bone health and depression [1]. Globally, it has been estimated that one billion people worldwide suffer from vitamin D deficiency [3]. Vitamin

D is essential for the maintenance of good health, produced in the skin of vertebrates after exposure to ultraviolet B light from the sun or artificial sources, and occurs naturally in fish and a few other foods and supplements. The ultraviolet light B (UV-B) is absorbed by skin leading to the transformation of 7 dehydroxycholesterol into vitamin D3 (cholecalciferol). It is biologically inert and must undergo two hydroxylations in the body for activation, the first occurs in the liver to 25-hydroxyvitamin D [25(OH)D], also known as calciferol [4]. The second occurs primarily in the kidney, yielding 1,25-dihydroxyvitamin D

[1,25(OH)2D], the biologically active form of vitamin D3 either in the kidneys or by monocyte-macrophages in the immune system. When synthesized by monocyte-macrophages, calciferol acts locally as a cytokine, defending the body against microbial invaders [5]. Vitamin D also known as the sunshine vitamin [6]. Sun exposure has been considered the main supplier of vitamin D to the human body, and the skin has the capacity to supply the body with approximately 80-100% of its vitamin D requirements [7,8]. A five to ten minute direct sunlight exposure of the arms and legs (0.5 minimal erythemal dose of UVB wavelength 290-315nm) will provide about 3000 IU of Vitamin D3 [1]. Widespread prevalence hypovitaminosis in all age groups including toddlers, school children, men, women, elderly, pregnant women and their neonates in both rural and urban areas has been documented [8], with the highest rates of severe deficiency found in the Middle East and South Asia [9]. Despite the plentiful sunlight yearly found in the Middle East (15°-36°N), it has one of the highest rates of vitamin D deficiency worldwide. The countries of the Middle East– Bahrain, Cyprus, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, Palestine, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates and Yemen have a high incidence of vitamin D deficiency and rickets [10,11]. Several research reports from other Gulf or Arab countries demonstrate a significant prevalence of vitamin D deficiency (VDD) particularly in women [12,13]. The higher prevalence of VDD in women compared to men is due to socio-economic and environmental factors [14]. Especially female adolescents are in danger to develop osteoporosis in their later life due to their risky behavior of physical inactivity, sun-avoidance behavior, low intake of dairy products and poor diets [15,16].

There are alarming levels of vitamin D deficiency in a sample of Yemeni women, according to studies carried out in Yemen conducted on pregnant women and children [17-20]. There is an urgent need for intervention programs to increase vitamin D concentrations of these women. In Aden there is no record available, and lack of research in this particular area of concern hence the magnitude of this problem is yet to be known. The present study aimed to detect the prevalence of hypovitaminosis D among female students in the Faculty of Medicine and Health Sciences, University of Aden in the period from April to October 2019, and aged 19-30 years. The study also aimed to determine risk factors that might influence vitamin D levels such as age, residence (urban/ rural housing), skin color (pigmentation) and applying protective sunscreen creams. Selection of young medical students in this study provided an opportunity of targeting a section of the general population that would also be future health providers in the community, therefore, this age group should be a primary target for vitamin D deficiency prevention.

2. Materials and Methods

A cross-sectional study was carried out on a sample of healthy female undergraduate students aged (19-30 years), randomly selected from Faculty of Medicine and Health Sciences University of Aden- Yemen, in the period from April to October 2019. Participants were recruited from lecturing halls at the Faculty of Medicine. Those who accepted to participate in the study were 120 students, they were requested to complete a brief questionnaire contained personal information such as age, weight, height, address, skin color and nationality. Candidates who had chronic disease (hepatic or renal) or taking medicines interfere with the metabolism of vitamin D were excluded.

Out of 120 candidates, only 70 were selected randomly according to inclusion and exclusion criteria, a written consent form was signed by each participant. The study was ethically approved by Ethical Scientific Research Committee University of Aden (Rec. 57- 2019).

2.1. Collection of data

The participants were sent to The National Center of Public Health Laboratories at Al-Gamhoria Teaching Hospital Aden. Samples of 3 ml venous blood were collected by the lab technician from each subject. Blood samples were allowed to coagulate; serum was separated by centrifugation and stored at -20 C° until assayed. Each tube was labeled by a sticker contains number and time of collection. Serum of 25(OH)D was examined using Automatic Analyzer (Roche Cobas e411 Analyzer Germany), the reference values of vitamin D according to The National Center of Public Health Laboratories: vitamin D deficiency <10ng/ml, vitamin D insufficiency 10-30ng/ml and normal>30 ng/ml. according to previous studies in the literature [1].

2.2. Data Analysis

Data was entered in SPSS Version 24. Percentage, frequency, mean, standard deviation and t-test were used. Association between vitamin D levels and other variables were examined by one-way analysis of variance.

3. Results

The participants in the study were 70 adult healthy females undergraduate students, their age 19-30 years old with a mean age 22.4 years and standard deviation 2.01. The mean BMI was 21.69 ± 4.18 as shown in Table 1.

In Table 2, Serum 25(OH)D levels revealed that 24(34.3%) subjects had deficiency levels of vitamin D (<10 ng/ml), while 46(65.7%) had insufficiency (10-30 ng/ml) and none of the subjects had normal levels. In association of the serum 25(OH)D levels with age groups shown in Table 3: students of age group (21-22years) showed highest deficiency level 11(15.7%) and highest insufficiency levels 27 (38.5%).

In Table 4: participants who live in rural areas n=9 showed a mean of serum vitamin D level higher than those live in urban n= 61; 13.24±3.73 ng/ml and 11.56±7.4ng/ml respectively, there was no significant association P= 0.238.

The relationship between skin color and mean levels of vitamin D was shown in Table 5: participants with white skin color (n=29) showed a mean of serum vitamin D level higher than those of dark skinned (n= 40) 12.28±5.1ng/ml and 11.4±3.37ng/ml respectively. The relationship between skin color and serum levels of vitamin D among the study population was insignificant, P= 0.632.

The relationship between using sun screen by participants and the mean serum levels of vitamin D was shown in Table 6: Those participants who always used sun screen were 5 (7.4%) had less mean level of vitamin D 11.45±1.129, while those subjects used sunscreens rarely 42(60%), had highest mean level of the vitamin 11.94±4.294. There was no significant differences between means serum vitamin D and application of sun protection creams P > 0.05.

Table 1. Participants’ characteristics

Variable	Mean ± SD	Range
Age (year)	22.4 ± 2.01	19 – 30
Weight (Kg)	53.79 ± 22.4	36 – 76
Height (m)	157.6 ± 5.29	1.47 – 1.69
BMI	21.69 ± 4.18	16 – 32

Table 2. Distribution of serum 25 (OH)D levels among participants

Participants	Vitamin D status			Total
	Deficiency < 10 ng/ml	Insufficiency 10 – 30 ng/ml	Normal >30 ng/ml	
Count (n)	24	46	00	70
Total %	34.3%	65.7%	00	100%

n= Participants

Table 3. Distribution of serum 25(OH)D3 with age groups of the participants

Age group(year)	N	Serum vitamin D level (ng/ml) (N%)		
		Deficiency < 10	Insufficiency 10- 30	Normal > 30
19-20	7	3(4.28%)	4(5.71%)	0
21 – 22	38	11(15.71%)	27(38.57%)	0
23 – 24	10	3(4.28%)	7(10%)	0
25 -26	13	6(8.57%)	7(10%)	0
27 – 28	1	0	1(1.4%)	0
29 – 30	1	1(1.4%)	0	0
Total	70	24(34.3%)	46(65.7%)	0

Table 4. Relationship between serum vitamin D level and place of residence (Rural- Urban)

Place of resident	n	Serum vitamin D Mean ±S D	P value
Urban	61	11.56 ±4.702	0.238
Rural	9	13.24 ±3.731	

n = number of participants

Table 5. Distribution of serum 25(OH)D3 and skin color among participants

Skin color	n	Serum vitamin D	p-value
		Mean ± SD ng/ml	
White	29	12.28 ±5.12	0.632
Dark	40	11.4 ± 3.37	
Others	1	9.58 ± 1	

n = number of participants

Table 6. Distribution of serum 25(OH)D3 and using sunscreen among participants

Use sunscreen	N0 (%)	Serum vitamin D Mean ±SD	P-value
Always	5(7.14%)	11.45 ± 1.129	0.922
Some times	23(32.86%)	11.54 ± 4.093	
Rarely	42(60%)	11.94 ± 4.294	

4. Discussion

The present study revealed the status of vitamin D among undergraduate females in Faculty of Medicine with prevalence of vitamin D either deficiency or insufficiency levels. There are growing evidences of vitamin D significance in human health; also, there are researches across the world to determine various health impacts due to its deficiency. In Yemen few studies dealt with the problem. The present study could add other values in this field. The characteristics of the study sample included 70 female students; their age ranged 19-30 years with mean of 22.4 years old. The study revealed that 24 (34.3%) participants were vitamin D deficient and 46(65.7%) where vitamin D insufficient, despite the city of Aden is almost sunny the whole year. The obtained results might be related to less sun exposure besides wearing long dress covering the whole body (Hegab). This finding was supported by previous data of numerous studies that recorded high prevalence of vitamin D deficiency and insufficiency among Middle Eastern population [21]. A study carried out in Saudi Arabia included 178 female medical students which showed 70.8% vitamin D deficient (<10 ng/ml) and 16.3% were vitamin D insufficient (10-30 ng/ml), while 12.0% had normal levels (>30ng/ml) [22]. Comparing our results with Iranian study conducted on 254 students (128 males and 126 females) at University of Shiraz, reported that

half-female students were vitamin D deficient and the other half were vitamin D insufficient [23].

A study was carried out on 103 medical students from University of Las Palmas de Gran Canaria Spain [24]. The results showed vitamin D deficiency was observed in 30% of students and 30% vitamin insufficiency which is inconsistent with our findings, that might be the differences in dressing styles and periods of sun exposure. Another study was done on medical students in Pakistan included 100 medical students and employee, where 70% of the subjects had vitamin D deficiency and 15% were reported as insufficient level of vitamin D, while 15% had normal range [25].

A Jordanian study found that prevalence of hypovitaminosis D was 60% in the study group as a whole, dress styles that covers the whole body has adverse effects on vitamin D levels, although Jordanians enjoy a plenty of sun shine, these data are suggestive of widespread hypovitaminosis D in Jordan [26]. While in a study in Tunisia showed hypovitaminosis D was highly prevalent in women 47.6% [27] which supports the present study.

The present study revealed a significant correlation between the levels of vitamin D and skin color, white skin participants had high levels of vitamin D than dark skinned. This explained that formation of vitamin D is related to skin pigment melanin, those people with dark skin (more melanin) require more time for sun exposure than those of white color (least melanin). The presence of melanin decreases UVB penetration, causes inadequate vitamin D synthesis. Our findings were similar to a study in Saudi Arabia conducted on residents, recorded that dark skin considered as one of the factors in the study [24,28]. Recent studies recorded that people of dark skin need 10-15 times more exposure of sun to produce vitamin D [29].

Sun exposure is the most efficient way to obtain the daily needs of vitamin D [30]. Yet the use of sun protection contains high sun protection factor (SPF) to prevent skin cancer, however, reducing UV-B absorption and reducing vitamin D synthesis by 92.5% [30]. This study showed no significant correlation between vitamin D levels and use of sun protection by the subjects in this study. It might be due to that products applied by participants were of low quality. The present study showed lower levels of vitamin D among female students live in urban areas than those live in rural houses, our results were consistent with previous reports [8,1]. Another study agrees with ours showed women living in urban areas has lower levels of vitamin D compared with rural women [31]. This might be due to the difference in hours of sun exposure during the day.

5. Conclusion and Recommendations

The present study concluded the following: Vitamin D deficiency and insufficiency is prevalent among female students in Faculty of Medicine University of Aden. Female dressing style and avoidance of sun exposure out doors are considered as strong risk factors for hypovitaminosis D.

Authors recommend more similar researches with expanded sample sizes including males.

Finally, it is time for health care professionals and health policy makers to establish an awareness programs about vitamin D importance among population in Aden.

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Researcher Information

ORCID 

Dhekrah Saif Ali Shaif: [0000-0002-9680-0330](https://orcid.org/0000-0002-9680-0330)

مقالة بحثية

مستوى فيتامين د لدى عينة من طالبات كلية الطب والعلوم الصحية جامعة عدن اليمن

ذكري سيف علي شانف^{1*}، جلال محمد السقاف² و إقبال عوض³

¹ قسم الأحياء، كلية العلوم، جامعة عدن، اليمن.
² قسم علوم وظائف الأعضاء، كلية الطب والعلوم الصحية، جامعة عدن، اليمن.
³ قسم العلوم المورفولوجية، كلية الطب والعلوم الصحية، جامعة عدن، اليمن.

* الباحث الممثل: ذكري سيف علي سيف، البريد الإلكتروني: dh343037esm@gmail.com

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المُلخَص

نقص فيتامين د يعتبر ظاهره واسعة الانتشار في العديد من دول العالم، الأمر الذي قد يكون سببا في ظهور الأمراض وزيادة الوفيات، حيث تم معرفة ارتباط فيتامين د بنقص احتمالية الإصابة بالعديد من الأمراض المزمنة كالسكري، صحة العظام، الاكتئاب، سرطان الثدي وأمراض القلب والأوعية الدموية. يتم تصنيع فيتامين د في الجلد بعد التعرض لأشعة الشمس والذي يمد الجسم بحوالي 80-100% من احتياج الجسم، كما يتواجد في بعض المأكولات كالأسمك الدهنية، الحليب ومشتقات الحليب والبرتقال. نقص فيتامين د يصيب كلا الجنسين ومن كل الأعمار، وقد أجريت هذه الدراسة على عينة من طالبات كلية الطب والعلوم الصحية جامعة عدن في الفترة من ابريل إلى أكتوبر 2019 وذلك لتحديد الوضع الحالي ومعدل مستويات فيتامين د في هذه الفئة من المجتمع في عدن وعلاقة بعض العوامل التي تؤثر على مستوى الفيتامين لدى الطالبات. بعد التعريف بموضوع البحث والهدف من الدراسة للراغبين في المشاركة في البحث، تم توزيع استبيان لعدد مئة وعشرون طالبة من مختلف المستويات الدراسية يضم معلومات عن العمر، الإقامة، (الحضر أو الريف)، لون البشرة، استخدام واقى شمسي، استخدام مكملات فيتامين د، أو استخدام علاجات لها تأثير على ايض فيتامين د أو المعاناة من أي من الأمراض المزمنة. تم اختيار عدد سبعين مشاركة عشوائيا من بين الطالبات المتقدمات ممن ينطبق عليهن معايير المشاركة في الدراسة، تتراوح أعمارهن (19-30) عاما، وبعد أخذ موافقة خطية من المشاركات، تم إرسالهن على دفعات إلى مختبر الصحة المركزي في مستشفى الجمهورية التعليمي وذلك لسحب عينات الدم لإجراء تحليل فيتامين د لكل المشاركات. أبرز نتائج هذه الدراسة بعد تحليلها إحصائيا أن معدلات فيتامين د لدى المشاركات في الدراسة بلغ 24 من إجمالي عدد عينات الدراسة أي 34.3% لديهم نقص فيتامين د، وان 46 عينة أي 65.7% لديهم مستوى غير كاف (دون المستوى الطبيعي) من الفيتامين. اظهرت النتائج بانه لا توجد علاقة ذات دلالة إحصائية بين معدل مستويات الفيتامين وكلا من المجموعات العمرية ومكان الإقامة (مدينه أو ريف). هناك علاقة الا انها ليست ذات أهمية إحصائية مع لون بشرة المشاركات. كذلك اظهرت نتائج البحث عدم وجود علاقة ذات دلالة إحصائية لمستويات فيتامين د. مع استخدام او عدم استخدام مستحضر واقى شمسي وقد يرجع ذلك الى عدم جودة المنتج المتوفر في السوق المحلية. استنتجت الدراسة أن نقص فيتامين د منتشر أ بين الطالبات في كلية الطب جامعة عدن ويرجع ذلك لعدد من العوامل منها عدم التعرض لأشعة الشمس المباشرة نظرا للباس المغطي لكامل الجسم، عدم تناول المكملات الغذائية المحتوية على فيتامين د. يوصي الباحث بإجراء مزيداً من الدراسات في المجتمع وإشراك الذكور مع زيادة حجم عينات الدراسة، كما يوصي الجهات ذات العلاقة بصحة المجتمع وصانعي القرار بتبني برامج توعية صحية بأهمية فيتامين د. لصحة الإنسان.

الكلمات المفتاحية: نقص، دون الطبيعي، فيتامين د، إنتشار، تلين العظام.

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