

## Attitudes and Behavior Towards Sunlight Exposure and Knowledge About Vitamin D Among Omani Female University Students

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### Abstract

The present study was carried out to assess the knowledge, awareness, and basic concepts about vitamin D along with attitudes and behavior practice towards sunlight exposure among Omani female students. A cross sectional study with 309 respondents was conducted among female students studying in A'Sharqiyah University, Ibra, Sultanate of Oman. A pre-designed and self-administered questionnaire was distributed to all students in order to collect the information regarding their knowledge, behavior and attitude about vitamin D and sun exposure. The present study observed that 90.5% students were aware of Vitamin D and majority of them (90.6%) indicated sunlight as the most important source of vitamin D. Among all the participants, 73.5% and 69.9% have also chosen incorrect responses for fruits and vegetables, respectively, as important sources of vitamin D. Despite having more knowledge about vitamin D, awareness and basic concepts in terms of current recommended daily dose was very low (6.8%) and most of the students were not aware of the quantity of their vitamin D supplement intake (61.5%). Only 25.2 % reported valid response regarding the exposure to sunlight time needed to get enough vitamin D. Female students showed negative behavior and attitude in terms of low frequency of sunlight exposure (> 3 times/week, 23.0%) and use of sunscreen products and ointments (53.7%). Educational institutions were among one of the important sources of information about vitamin D (73.8%). The major findings of this study demonstrated the ignorance, lack of consistency and confusion between knowledge, awareness and attitude among female students. Moreover, a negative approach toward exposure to sunlight may prevent the students from obtaining beneficial effects from sunlight and could predispose them towards vitamin D deficiency or insufficiency status. Media and primary health care centers should play a vital role in creating more awareness and knowledge about the Vitamin D in female population.

**Keywords:** Attitude; Behavior; Knowledge; Vitamin D; Oman

### Abbreviations

25(OH)D: 25, hydroxy vitamin D; GCC: Gulf Cooperation Council

### Introduction

The increased prevalence of vitamin D deficiency worldwide is proving a major global public health problem [1,2]. The GCC (gulf cooperation council) countries are no exception. However, it is quite surprising that despite the availability of enough sunshine throughout the year (15°36°N), these countries are moving towards increased prevalence of vitamin D deficiency in all ages and gender with each passing year. Several studies have been reported from different parts of many GCC countries regarding vitamin D status. Studies from different

parts of Saudi Arabia had shown the high prevalence of vitamin D deficiency in males, females, adolescents, adults and children [3]. About 90% of the Qatari population is shown to have insufficient levels of serum vitamin D [4]. The countries such as Turkey, Iran, Bangladesh and Tunisia have also exhibited a high prevalence of vitamin D deficiency [5-8]. Studies in Oman have reported high prevalence of vitamin D deficiency (87.5%) in healthy Omanis [9]. The lack of exposure to sunlight is one of the main causes for vitamin D deficiency [10-12]. Moreover, the independent predictable factors in most of the studies demonstrating low level of vitamin D or its high prevalence were inadequate vitamin D intake, female gender, cultural aspects (wearing the veil), winter season, and age [13-15]. An important and common observation in most of the studies observed that females were found to be independent predictor of vitamin D deficiency and insufficiency. For instance, 25(OH)D levels were found to be significantly lower in healthy and childbearing age Omani females (< 50 nmol/L as the cut-off for deficiency) as compared to males [16]. Few other surveys showed alarmingly low level of vitamin D (< 27.0 nmol/L) in Omani non-pregnant (child bearing age) and pregnant women [17]. Similarly, a high prevalence of vitamin D deficiency among Saudi females of different age groups has been reported [18,19]. Recently, Nora al Faris showed high prevalence of vitamin D deficiency in Saudi pregnant women [20]. Similar results were reported from recent studies in UAE showing a very high prevalence of vitamin D deficiency (93.3%) in patients attending general hospital in Dubai [21] with females showing higher percentage of deficiency as compared to males [22].

Based on above evidences, we can postulate that females are more prone to vitamin D deficiency as compared to males. The major causative agents such as lack of sun exposure and inadequate dietary intake are very well known but the factors such as knowledge and attitude that influences these risk factors should also be taken into account. There are studies from different parts of the world showing that knowledge, attitude and behavior plays an important role in influencing the major risk factors leading to vitamin D deficiency or insufficiency. A survey from china revealed considerable ignorance about basic knowledge of vitamin D in females [23]. Another study from India exhibited a lack of uniformity between knowledge and attitude about vitamin D in young students [24]. Saudi female students also showed lack of knowledge about vitamin D and its deficiency [25]. Although, there are many studies in Oman regarding vitamin D status in females but till date there is no such study that explains the basic knowledge, attitude and behavior of Omani female students about vitamin D. To bridge this gap, the present study observes the basic knowledge, behavior and attitude of Omani female University students about vitamin D.

## Materials and Methods

### Study population

A cross sectional study was conducted among 320 female students pursuing diploma and graduation courses at the college of applied sciences, Department of Human Nutrition and Food Sciences, A'Sharqiyah University, Sultanate of Oman. A self-administered questionnaire was provided to the volunteers to assess the basic knowledge, awareness, attitudes, and behavior towards vitamin D and sunlight exposure. The study was carried out in the month of October 2016-January 2017 in the university. The study procedures were conducted following the approval and Guideline of Ethical Committee of A'Sharqiyah University. Only 309 students out of 320 responded to all parts of the questionnaire and were included in the final analysis.

### Questionnaire Pattern

The questionnaires consisted of four parts including close ended multiple choice questions, in which part A showed socio-demographic characteristics of the respondent, part B was about knowledge regarding major sources of vitamin D, part C consisted of questions assessing the awareness and basic concepts of vitamin D such as source of primary information about vitamin D, functions and benefits of vitamin D, relation between vitamin D and C, daily recommended dosage of vitamin D, the average time of sun exposure required to get enough of vitamin D and part D asked questions about attitude and behavior towards sunlight such as time spent outdoor in the sun, frequency of sunlight exposure, preference to any specific season for sunlight exposure, style of clothing, and use of sunscreen.

## Data Analysis

The collected data were analyzed using Statistical Package of Social Science Version 20. Descriptive statistics was used to characterize the study population. Frequency tables were constructed and presented as percentages.

## Results

The socio-demographic characteristics of the respondents are presented in Table 1. A total of 309 students (16 - 30 yr. of age) participated in the present study. The majority of the students were 21 - 25 yr. (51.8%) and 16 - 20 yr. (45.3%) with only (2.9%) representing 25 - 30 yr. of age. The percentage of female students in bachelor course were more (82.2%) than diploma (17.8%) and most of them were single (86.7%). Although most of the parents education level was elementary (39.5%), fathers were educated to a higher level than mothers (23.6 vs 15.5 %, respectively). The average monthly income was OMR 300 - 500 (35.9%), followed by OMR 600-1000 (28.2%).

Characteristics	Frequency (N)	Percentage (%)
<b>Age (year)</b>		
16 - 20	140	45.3
21 - 25	160	51.8
26 - 30	9	2.9
<b>Housing</b>		
Villa	129	41.7
Apartment	56	18.1
Public house	124	40.1
<b>Education</b>		
Diploma	55	17.8
Bachelor	254	82.2
<b>Marital status</b>		
Single	268	86.7
Married	41	13.3
<b>Parent education qualification</b>		
<b>Father</b>		
Uneducated (can read only)	38	12.3
Elementary (can read and write)	119	38.5
Primary	36	11.7
Secondary	43	13.9
Higher	73	23.6
<b>Mother</b>		
Uneducated (can read only)	37	12.0
Elementary (can read and write)	122	39.5
Primary	59	19.1
Secondary	43	13.9
Higher	48	15.5
<b>Family income/month</b>		
< 300 OMR	73	23.6
300 - 500 OMR	111	35.9
600 - 1000 OMR	87	28.2
1100 - 2000 OMR	25	8.1
> 2000 OMR	13	4.2

**Table 1:** Socio - demographic characteristics of the respondents (N = 309).

## Knowledge about Vitamin D sources

Majority of the students (90.6%) responded correctly opting sunlight as the most important source of vitamin D. As they were allowed to choose multiple options, fatty fish (66.3%), milk and dairy products (61.2%), and cod liver oil (44.3%) were also among the correct re-

sponses among other important sources of vitamin D. Among all the participants, 73.5% and 69.9% have also chosen incorrect responses for fruits and vegetables, respectively, as important sources of vitamin D.

Variables	Frequency	Percentage
Fruits	216	69.9
Vegetables	227	73.5
*Fatty Fish	205	66.3
*Sun	280	90.6
*Milk and dairy products	189	61.2
*Mushroom	126	40.8
*Cod liver oil	137	44.3
Water	73	23.6
*Vitamin D supplements	260	84.1
Other sources	85	27.5
Don't know	45	14.6

**Table 2:** Knowledge about vitamin D sources.

*\*indicates correct response*

**Awareness**

Table 3 represents awareness and basic concepts of the study participants about vitamin D. Almost 90% of the participants reported that they have heard about vitamin D. The main source of information about vitamin D was educational institutions (73.8%). The other options as reported by students included media (39.2%), primary health care centers (29.4%) and parents/friends/relatives (24.3%). Most of the study participants (82.8%) were aware of the role of vitamin D in bone and its involvement among many other diseases such as osteoporosis, osteomalacia, and rickets. About (85.4%) students reported correctly a “yes” response about the relationship between vitamin D and C. When asked about the sun exposure time needed to get enough vitamin D, only 25.2% were aware of the correct answer (10-20 min), with 38.5% unaware, followed by some of them opting for 1 hour (15.5%), while others thought it to be less than 10 min (12%).

	Frequency	Percentage
<b>Have you ever heard of vitamin D?</b>	278	90.0
<b>Where have you heard/learnt about vitamin D?</b>		
Primary health care centers, physician, medical professionals.	91	29.4
Educational institutions (school, college, university)	228	73.8
Media (newspaper, magazine, T.V, internet websites)	121	39.2
Parents, friends, relatives.	75	24.3
<b>Do you know the functions and benefits of vitamin D?</b>		
Healthy bones	256	82.8
Prevention of rickets	138	44.7
Prevention of osteomalacia	137	44.3
Prevention of osteoporosis	149	48.2
Prevention of general weakness	152	49.2
Prevention of chronic diseases	108	35.0
Any other benefits	78	25.2
<b>Is there any relation between vitamin D and calcium?</b>	264	85.4
<b>How much time do you need to spend in the sun to get enough vitamin D?</b>		
<10 min	37	12.0
*10-20min	78	25.2
1hr	48	15.5
2 hr	27	8.7
Don't know	119	38.5
<b>Do you know the current recommended dose for vitamin D in adults?</b>		
200 IU	27	8.7
*600 IU	21	6.8
800 IU	28	9.1
1000 IU	27	8.7
1500 IU	15	4.9
Don't know	191	61.8
<b>What is your daily vitamin D intake?</b>		
I take multivitamin	49	15.8
I take but don't know the quantity	190	61.5
I don't take vitamin D supplements	70	22.6

**Table 3:** Awareness and Basic concepts of the respondents about role of vitamin D.

*\*indicates correct response*

The question about daily recommended dose showed that only (6.8%) of the study participants knew the correct answer (600 IU) while a majority of respondents (61.8%) were unaware. The use of vitamin D supplements is high among respondents, but surprisingly, most of them don't know the quantity of their intake (61.5%), while 22.6% don't use any vitamin D or multi vitamin supplements.

**Attitude and Behavior**

Based on the results represented in Table 4, about 72.2% respondents like sun exposure and 23.9% spent 5 - 8 hours outdoor per day. However, the frequency of their direct sun exposure was 1 - 3 times per week (39.8%), followed by < 2 times/day (37.2%) with least percentage spending >3 times/week (23.0%). Among all participants, 54.7% prefers some specific season for sunlight exposure. When asked about the clothing and dressing pattern, 48.9% responded that they cover their whole body during direct sun exposure with majority of the participants using sunscreen and ointments 53.7%.

Questions	Frequency	Percentage
Do you like sun exposure?	223	72.2
How much time do you spent outdoor per day?		
< 2 hrs	110	35.6
2 - 4 hrs	125	40.5
5-8hrs	74	23.9
What is the frequency of your sunlight exposure?		
< 2 times/day	115	37.2
1 - 3 times/week	123	39.8
> 3 times/week	71	23.0
Do you prefer any specific season for sunlight exposure?	169	54.7
Do you usually cover the whole body during sun exposure (including hand and face)?	151	48.9
Do you use sunscreen products or ointments while in direct sun?	166	53.7

**Table 4:** Attitudes and behavior of the respondents towards sunlight exposure.

**Discussion**

This study highlights a very significant issue of current knowledge, awareness and understanding about vitamin D and behavior pattern of Omani female student population toward sunlight exposure. Till date, this is the first Omani study to observe the knowledge, awareness, attitude and behavior about vitamin D among university female student. Due to increased prevalence of vitamin D deficiency in this country, a need exists to inform the general population about the source, use and role of vitamin D in daily life.

**Knowledge**

In the present study, most of the students (90.6%) responded a valid answer regarding sun as a major source of vitamin D. The present findings are higher in percentage but consistent with study performed in Indian and Malaysian students showing majority of study participants with valid responses for the same question (53.3, and 69.2% respectively) [24,26].

**Awareness**

Almost 90% of the students in the present study reported that they have heard about vitamin D. This is also in accordance with the

above-mentioned studies showing high percentages (98 and 99.5%, respectively) for the same question asked [24,26]. Despite having good knowledge about sun as a source of vitamin D, most of the students did not answer correctly about daily recommended dose (which is 600 IU) and time of sun exposure required to get enough vitamin D (which is 10 - 20 min). Moreover, the ignorance in the quantity of intake while taking vitamin D supplement is a major concern. All the above-mentioned lack of awareness corresponds to one of the study performed by Christie., *et al.* [25] showing limited knowledge of female students (20 and 25 years) about vitamin D and its deficiency. Another important finding of this study indicates the minimal role played by media and health care centers in developing health awareness in the society and general population. Our observation is consistent with many such studies from different part of the world demonstrating the lack of nutritional knowledge in health care professionals [27,28]. Study performed by Al-Numair., *et al.* in Saudi Arabia demonstrated that 75% of the physicians rated themselves as “poor” in having nutritional knowledge [29].

### Attitude and Behavior

Although majority of the students reported good awareness regarding exposure of sunlight as a major source of vitamin D and their high interest for sun exposure (72.2%), they exhibited low sun exposure frequency and high use of sunscreen and ointments. A possible reason for this attitude and behavior can be justified by a rapid socio-economic growth of gulf countries including Oman that affected their traditional lifestyle behavior. Moreover, the reduction in outdoor time due to rise in office-based work has reduced the frequency of sunlight exposure. In addition, a fear of dark complexion or sunburn prompts females to use sunscreen and ointments as a measure to avoid deleterious effects of sun exposure [30]. In most of the Middle East countries, indoor lifestyle plays a major role in predisposing the adults and children towards vitamin D deficiency [31]. Avoidance and restriction of sunlight exposure has been reported as a major cause of vitamin D deficiency especially in females in Saudi Arabia [32]. A recent survey from Saudi Arabia demonstrated higher prevalence and use of sunscreen especially in females [33]. Another study in Vietnam reported the same pattern regarding sun exposure and use of sunscreen [34]. Our result is in agreement with a study performed in Kuwait (males and females) exhibiting negative approach towards sunlight exposure by regular use of sunscreens, and adopting other sun protective measures in their daily life leading towards inadequate amount of vitamin D level [35].

### Limitations

It is important to consider some limitations before interpreting the results from this study. Firstly, since the participants were recruited only from one university, the results cannot be applied or generalized for whole Omani female students. Secondly, the sample size is not large enough to be taken as a representative of whole young Omani female population.

### Conclusion and Future Prospects

In the present study, majority of the students have heard about vitamin D and possess good knowledge in a way they identified sun exposure as the main source of vitamin D. However, lack of consistency between knowledge, and attitude and negative approach toward sunlight exposure, especially in girls was observed in this study, which needs to be taken into account for future investigations. Media and health care centers need to play active role in increasing the awareness in female students. Activities like organizing campaigns, workshop, conferences and more health awareness programs should be undertaken to increase their knowledge and awareness regarding vitamin D and sunlight. These programs should aim to emphasize more about importance of outdoors activities and recommended daily intake of vitamin D to improve the status of this important vitamin.

### Conflict of Interest

The author(s) declare that they have no competing interests.

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