

**Knowledge and Attitude towards Vitamin D among Saudi Female university students at Princess Nourah University**

**Short Title:** Knowledge and Attitude towards Vitamin D

**ABSTRACT:**

**Aims:** The purpose of this study was to assess the knowledge and attitude towards vitamin D and sunlight exposure among female university students.

**Study design:** Cross Sectional study design.

**Place and Duration of Study:** The study was conducted among 500 female Saudi students in Princess Nourah Bint Abdulrahman University (PNU).

**Methodology:** A self-administered questionnaire was used to assess the knowledge about vitamin D sources, health benefits and effects of vitamin D deficiency and assessing the attitude towards vitamin D and sunlight exposure.

**Results:** The present study recognized that health college students (52.7%) had better knowledge than non-health college students (47.3%). Although PNU students had good knowledge about vitamin D, only 6.0% of them knew the current recommended daily dose. Female students showed good behavior and attitude in terms of high frequency of sunlight exposure daily (34.8%).

Educational institutions were the main sources of information about vitamin D (43%). Hot weather (54.8%) and fear of pigmentation (51.2) were the main reasons for limited sunlight exposure among students.

**Conclusion:** There was a good level of knowledge (52.2%) about vitamin D sources, benefits and effects of vitamin D deficiency among female students. In fact, health college students had better

knowledge about vitamin D than non-health college students. Hot weather (54.8%) and fear of pigmentation (51.2%) were the main barriers to sunlight exposure.

*Keywords: Vitamin D; knowledge; Attitude; Practice; University students.*

## **1. INTRODUCTION**

Vitamin D is an essential vitamin for human body and is crucial for bone health. Its main function is to reserve calcium and phosphorus homeostasis in order to promote skeletal mineralization and to maintain cell growth, differentiation, metabolic activities, and neuromuscular function [1].

The major source of vitamin D is sunlight exposure. The human body mainly relies on endogenous production of vitamin D upon exposure to UV light. Food is considered a minor source of vitamin D. It is found naturally in few foods as seafood, fortified milk, dairy products as well as mushrooms [2].

Vitamin D deficiency is recognized as a major public health problem. It is estimated that about one billion people suffers from vitamin D deficiency worldwide [3]. The prevalence of vitamin D deficiency is about 41.6% in the United States [4]. It is also highly prevalent in the Middle East [5].

Despite that the gulf countries are sunny throughout the year; these countries have increased prevalence of vitamin D deficiency [6]. Vitamin D deficiency is a common health disease in Saudi Arabia [7]. The prevalence of vitamin D deficiency among females in Saudi Arabia is ranged from 30-80% [2]. Several factors have been attributed to vitamin D deficiency in Saudi Arabia. The indoor lifestyle due to extreme hot weather limits their exposure to sunlight. Also, the cultural traditions and the conservative clothing style might contribute towards low vitamin D levels in Saudis.

Previous studies revealed that risk factors for vitamin D deficiency included female sex, socioeconomic status, and conservative style of dress, frequent pregnancies and urban living [8].

Vitamin D deficiency has been known to increase the risk of musculoskeletal disorders such as osteoporosis, osteomalacia and rickets. Several studies have shown that there is association between vitamin D deficiency and other major diseases such as cancer, multiple sclerosis, diabetes and cardiovascular disease [9, 10].

Previous studies conducted in Saudi Arabia have shown poor knowledge and awareness towards vitamin D [2, 11]. Vitamin D is a preventable disease. However, little is known about knowledge and attitude towards vitamin D among Saudi female university students. To the best of our knowledge, few studies were conducted about the awareness and attitude towards vitamin D in Saudi universities. Hence, the aim of this study was to assess the level of knowledge, awareness and attitude towards vitamin D and sun exposure among Saudi female university students at Princess Nourah Bint Abdulrahman University.

## **2. METHODOLOGY:**

A cross sectional questionnaire-based study was conducted among 500 Saudi female students at Princess Nourah University during 2018-2019. Convenient sampling technique was used in the study. **The sample size was calculated to be 384 but while collecting sample we reached 500.** The data were collected using a closed ended, self-administered, validated questionnaire adopted from previous studies [2, 11-14].

The questionnaire consisted of 44 questions and includes three parts: The first part included 8 questions assessing the sociodemographic characteristics. The second part included 28 questions assessing knowledge and awareness about vitamin D sources, health benefits and effects of vitamin D deficiency. The third part included 8 questions assessing the attitude towards vitamin D and sun exposure. Verbal consent was obtained from all the recruited participants.

The data were analyzed by SPSS **(Ver 26)**. Analysis of quantitative data was done by t-test. Association of qualitative variables was done by chi-square test. P-value of less than 0.05 was considered as statistically significant. Why was these methods (cross sectional questionnaire and anylysis using SPSS) used?

### 3. RESULTS AND DISCUSSION

A total of 500 female students aged (18-25years) participated in the study. The majority of students were aged more than 20 years (52.6%). Health college students (52.6%) were more compared to non-health college (47%). Around 29.2% female students were in the preparatory year followed by first-year (20.4%), while the minority were in 4th year and above (13.4%). Most of the students were single (94.8%) and living in a villa (87.8%). The majority of the students (43.6%) had high average monthly income of more than 15000 SR. Majority of the student's parents had high educational qualification that is university degree or higher (Table 1).

**Table 1: Sociodemographic characteristics of the respondents (N = 500)**

Characteristics	Frequency(N)	Percentage (%)
<b>Age</b>		
less than 20	235	47.0%
+20	263	52.6%
<b>College</b>		
Health	263	52.6%
non health	235	47.0%
<b>Year</b>		
preparatory year	146	29.2%
1st year	102	20.4%
2nd year	93	18.6%
3rd year	83	16.6%

4th year or above	67	13.4%
<b>Marital status</b>		
Single	474	94.8%
Married	26	5.2%
<b>Housing</b>		
Villa	439	87.8%
Apartment	60	12.0%
<b>Family monthly income</b>		
2000-5000 SR	34	6.8%
6000-10000 SR	109	21.8%
11000-15000 SR	132	26.4%
more than 15000 SR	218	43.6%
<b>Parent education qualification</b>		
<b>Father</b>		
Uneducated	23	4.6%
Up to high school	172	34.4%
University or higher	302	60.4%
<b>Mother</b>		
Uneducated	50	10.0%
Up to high school	191	38.2%

University or higher	257	51.4%
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Majority of the students (98%) answered correctly that sun is the main source of vitamin D, in addition to Vitamin D supplements (92.2%), fatty fish (56.8%), milk (43.4%) and eggs (34.6%), all were also correctly chosen as various sources of vitamin D (Table 2).

**Table 2: Knowledge and awareness about vitamin D**

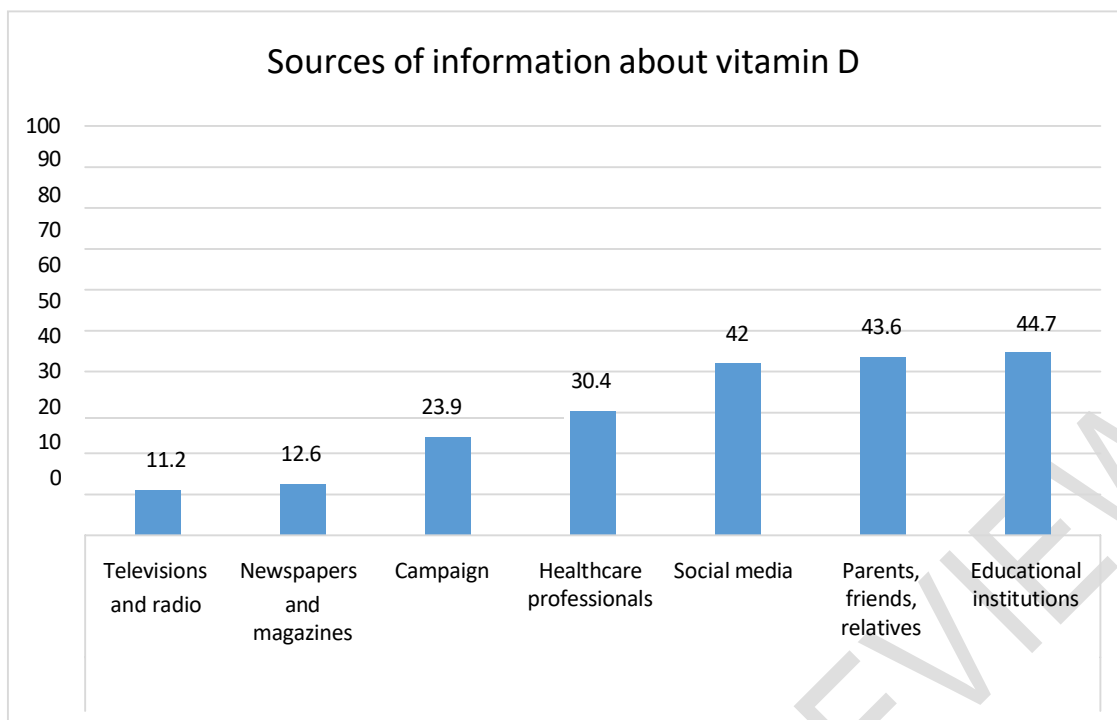
Item	Frequency	Percentage
<b>What are the various sources of vitamin D?</b>		
Sun	490	98.0%
Water	276	55.2%
Vitamin D supplement	461	92.2%
Fatty fish	284	56.8%
Fruits	281	56.2%
Eggs	173	34.6%
Milk	217	43.4%
Vegetables	173	34.6%
<b>Benefits of vitamin D?</b>		
healthy bones	469	93.8%
prevention of osteomalacia	407	81.4%
prevention of general weakness	442	88.4%

prevention of rickets	251	50.2%
prevention of vision problems	151	30.2%
prevention of osteoporosis	425	85.0%
prevention of chronic diseases	206	41.2%
<b>Medical problems caused by vit D deficiency?</b>		
Cardiovascular diseases	59	11.8%
diabetes	65	13.0%
depression	379	75.8%
hypercholesterolemia	137	27.4%
Cancer	43	8.6%
bone pain	420	84.0%
<b>main source of vitamin D?</b>	<b>456</b>	<b>91.2%</b>
<b>Mineral depends on vit D for its absorption?</b>	<b>294</b>	<b>58.8%</b>
<b>main cause of vitamin D deficiency?</b>		
Malnutrition	101	20.2%
Lack of sun exposure	366	73.2%
Pregnancy	5	1.0%
Others	15	3.0%
<b>Vit D deficiency more dangerous in which category?</b>	<b>138</b>	<b>27.6%</b>
<b>How much time is needed to spend in the sun?</b>		

Less than 10 minutes	66	13.2%
*10 - 20 minutes	385	77%
One hour	35	7.0%
Two hours	9	1.8%
Exposure to the sun does not affect vitamin D levels	5	1.0%
<b>best time of the day for sunlight exposure?</b>	160	32.0%
<b>current recommended daily amount of vit. D in adults?</b>	30	6.0%

Regarding the functions of vitamin D, the majority of the students were aware about vitamin D involvement in bone health (93.8%). Followed by prevention of general weakness (88.4%), osteomalacia (81.4%), osteoporosis (85%) and rickets (50.2%). Moreover, the majority claimed that bone pain is the main problem caused by vitamin d deficiency (84%). 58.8% of the students recognized the relationship between vitamin D and calcium. 73.2% of students stated that lack of sun exposure was the main cause of vitamin D deficiency. About 27.6% of the students considered vitamin D deficiency as more harmful in infants than any other age group. Most of the students (77 %) were aware about the correct time needed to spend in the sun (10-20 min). 32% of the participants assumed that the best time for sunlight exposure to get the maximum vitamin D is between 9-11 am, which is correct. Unfortunately, only (6 %) of the students were aware about the recommended daily dose of vitamin D in adults.

Regarding the source of information of vitamin D, educational institutions was the main source of information among students (44.7%), followed by information gained from their parents and friends (43.6%), The least source of information was TV and radio (11.2%) (Figure 1).



**Figure 1: Sources of information about vitamin D.**

A cut off 60% knowledge score (16 correct answers) was used to define a good and poor knowledge among students. The majority of students had good knowledge score (52.7%). There was a statistically significant difference in knowledge score ( $p = 0.036$ ). The health science college students have better knowledge score (64.6%) than those who attend non-health science colleges (35.4%), the  $p$ -value was ( $<0.01$ ). The Preparatory year students of health science college had the highest knowledge score (31%) compared to students of other years with a statistically significant difference ( $p$ -value  $<0.01$ ). There was no statistically significant difference regarding the marital status. Students with high socioeconomic status (those living in villa) had a better knowledge score compared to other students with a  $p$ -value of 0.005. Students having higher family income had a good impact on their knowledge (47.9%) compared to the others, but there was no significant difference statistically. There was considerable difference in knowledge score among students who had an educated mothers (Bachelor's degree or more) compared to the daughters of mothers having high-school degree and less, with a  $P$ -value of 0.004.

Students who received information about vitamin D from educational institution had a good knowledge score (54%) compared to those who received information from other sources (Table 3).

**Table 3: Factors affecting the knowledge regarding vitamin D**

<b>item</b>	<b>Good Knowledg e</b>	<b>Poor Knowledg e</b>	<b>P value</b>
<b>Age</b>			
Less than 20	111 (42.7)	124 (52.1)	<b>0.036</b>
+20	149 (57.3)	114 (47.9)	
<b>College</b>			
Health	168 (64.6)	95 (39.9)	<b>&lt;0.01</b>
Non-Health	92 (35.4)	143 (60.1)	
<b>Year</b>			
Preparatory	80 (31.0)	66 (28.3)	<b>&lt;0.01</b>
1 <sup>st</sup> year	42 (16.3)	60 (25.8)	
2 <sup>nd</sup> year	40 (15.5)	53 (22.7)	

3 <sup>rd</sup> year	60 (23.3)	23 (9.9)	
4 <sup>th</sup> year or above	36 (14.0)	31 (13.3)	
<b>Marital status</b>			
Single	250 (95.8)	224 (93.7)	0.300
Married	11 (4.2)	15 (6.3)	
<b>Housing</b>			
Villa	239(91.9)	200(83.7)	0.005
Apartment	21(8.1)	39(16.3)	
<b>Family Income</b>			
2000-5000 SR	13(5.0)	21(9.0)	0.123
6000-10000 SR	59(22.8)	50(21.4)	
11000-15000 SR	63(24.3)	69(29.5)	
more than 15000 SR	124(47.9)	94(40.2)	
<b>Parent education qualification</b>			
<b>Father</b>			

Uneducated	12(4.6)	11(4.6)	0.634
Up to high school	85(32.7)	87(36.7)	
University or higher	163(62.7)	139(58.6)	
<b>Mother</b>			
Uneducated	18(6.9)	32(13.5)	0.044
Up to high school	101(38.7)	90(38.0)	
University or higher	142(54.4)	115(48.5)	
<b>Source of info. about vit.</b>			
<b>D</b>			
<b>Healthcare professionals</b>	91(34.9)	54(23)	
<b>Educational institutions</b>	141(54)	75(31.5)	
<b>Parents, friends, relatives</b>	108(41.4)	100(42.4)	
<b>Newspapers and magazines</b>	41(15.7)	21(8.8)	
<b>Social media</b>	106(40.6)	97(40.8)	
<b>Televisions and radio</b>	29(11.2)	26(10.9)	
<b>Campaign</b>	66(25.3)	50(21)	

The majority of the participants (63.6%) have been tested for vitamin D. Around 34.8% of them were exposed to sunlight every day. The majority (38.2%) were exposed to the sun for a less than 5 minutes per day and only 9.6% were exposed for 15-30 min daily. Fortunately, 82.6% students were willing to test for vitamin D and 88% were willing to take vitamin D supplements if they have vitamin D deficiency. Hot weather (54.8%) and fear of pigmentation (51.2%) were the main barriers for sunlight exposure among the students.

Regarding the practice and attitude toward vitamin D and sunlight exposure, most of the students aged 20 years and above had good practice (54.6%), while the minority who aged less than 20 years had poor practice (57.4%), though not statistically significant difference. Health college students had a better practice (53.3%) compared to non-health science colleges (46.7%) with no statistically significant difference. Most of the students from the preparatory year had a good practice (27.5%) followed by 1st year students (20.3%). In addition, 95% single students had good practice, with no statistically significant difference. Students who lives in villa had a better practice (88.7%) compared to those who lives in apartment (11.3%) with no statistically significance difference. Students who had a high family monthly income had a good practice (45.1%) compared to the others. Regarding the parent education qualification, there was a statistically significant difference in practice among students whose parent had university degree or higher compared to less educated parents (p value 0.027 for fathers, p value 0.032 for mothers). Students who knew about vitamin D from educational institution had a good practice (44.7%), followed by those who received information from parents, friends and relatives (43.6%). While the minority who got their information from TV and radio, only 11.2% of them had good practice towards vitamin D. In addition, over 54% students who had good knowledge about vitamin D have good practice and attitude towards vitamin D and sunlight exposure compared to those having poor knowledge (Table 4).

**Table 4: Factors affecting the practice towards vitamin D**

Item	Good Practice	Poor Practice	P value

<b>Age</b>			
Less than 20	198 (45.4)	27 (57.4)	0.116
+20	238 (54.6)	20 (42.6)	
<b>College</b>			
Health	232 (53.3)	21 (43.8)	0.207
Non-Health	203 (46.7)	27 (56.3)	
<b>Year</b>			
Preparatory	118 (27.5)	18 (38.3)	0.080
1 <sup>st</sup> year	87 (20.3)	13 (27.7)	
2 <sup>nd</sup> year	84 (19.6)	9 (19.1)	
3 <sup>rd</sup> year	81 (18.9)	2 (4.3)	
4 <sup>th</sup> year or above	59 (13.8)	5 (10.6)	
<b>Marital status</b>			
Single	414 (95)	44 (91.7)	0.338
Married	22 (5)	4 (8.3)	
<b>Housing</b>			
Villa	386(88.7)	40(83.3)	0.271

Apartment	49(11.3)	8(16.7)	
<b><i>Family Income</i></b>			
2000-5000 SR	29(6.7)	5(10.9)	0.682
6000-10000 SR	99(22.9)	9(19.6)	
11000-15000 SR	109(25.2)	13(28.3)	
more than 15000 SR	195(45.1)	19(41.3)	
<b>Parent education qualification</b>			
<b><i>Father</i></b>			
Uneducated	21(4.8)	2(4.2)	0.027
Up to high school	142(32.7)	25(52.1)	
University or higher	271(62.4)	21(43.8)	
<b><i>Mother</i></b>			
Uneducated	40(9.2)	10(20.8)	0.032
Up to high school	172(39.5)	14(29.2)	
University or higher	223(51.3)	24(50.0)	
<b>Source of info. about</b>			

<b>vit. D</b>			
<b>Healthcare professionals</b>	132(30.4)	10(21.3)	
<b>Educational institutions</b>	195(44.7)	16(33.3)	
<b>Parents, friends, relatives</b>	190(43.6)	17(35.4)	
<b>Newspapers and magazines</b>	55(12.6)	5(10.4)	
<b>Social media</b>	183(42)	15(31.3)	
<b>Televisions and radio</b>	49(11.2)	5(10.6)	
<b>Campaign</b>	104(23.9)	8(16.7)	
<b>Knowledge category</b>	<b>Good practice</b>	<b>Poor practice</b>	<b>Total</b>
<b>Good knowledge</b>	238(54.6)	17(35.4)	255(52.7)
<b>Poor knowledge</b>	198(45.4)	31(64.6)	229(47.3)

This study assessed the knowledge and awareness about vitamin D and attitude of Saudi female towards sunlight exposure. Till now, there is a lack of studies in Saudi Arabia assessing the knowledge, awareness,

attitude and behavior about vitamin D among university female students. There is increased prevalence of vitamin D deficiency in Saudi Arabia. Large meta-analysis in Saudi Arabia showed that 63.5% of population have deficiency of vitamin D [15], therefore, awareness about source and role of vitamin D is required.

The present study showed that 52.7% students had good knowledge about vitamin D. The study revealed that 98% students recognized the importance of exposure to sunlight and the intake of vitamin D supplements (92.2%) as major sources of vitamin D. These results are higher than a study conducted among Omani female university students [12] which revealed that 90.6% and 84.1% participants recognized sun and vitamin D supplements as the main sources of vitamin D, respectively. Another important finding of the current study was that 77% PNU students answered correctly about time of sun exposure required to get enough vitamin D (which is 10-20 min), while a study in Malaysia [13] reported that only 11.9% students were aware about the correct time needed for sunlight exposure for vitamin D synthesis.

However, current results showed that there was limited knowledge regarding recommended daily intake of vitamin D. The unawareness about the correct dose was a huge concern considering that most of the participants were willing to take supplements. Only 6% students were aware that 600 IU is the correct dose. The percentage is lower compared to a study done among university students in Malaysia [13], where the percentage was 11%, which is considered also low.

Regarding the source of information about vitamin D, Media and healthcare professionals are playing a very minimal role in raising health awareness in the female university students of PNU. Most of the respondents have heard about vitamin D by educational institutions (43%) and around 40% did not received any information. In contrast, study done by Vu et al [16] revealed that 40% got their knowledge from media.

The study results indicated that 38.2% students were exposed for less than 5 minutes per day. On the other hand, 40.5% Omani university students [12] reported that they spent 2-4 hour/day under the sun. Avoidance of sunlight exposure is reported in different population, such as Australia and China [16, 17]. In the current study, 54.8% students reported that the constant hot temperature in Saudi Arabia was the main factor keeping them away from sunlight. Moreover, the indoor lifestyle (50%) and fear of pigmentation (51.2%) were also reported as barriers for sunlight exposure. The current result is consistent with a study carried out in Kuwait [18] demonstrating that hot weather and limited outdoor activity are the main reasons preventing people from

getting exposed to sunlight which led to inadequate amount of vitamin D level among residents. Is there any activity by health students that keep them indoor than any other student.

#### **4. CONCLUSION**

There was a good level of knowledge (52.2%) about vitamin D sources, benefits and effects of vitamin D deficiency among female students at Princess Nourah University. Health college students have better knowledge about vitamin D than non-health college students. Hot weather and fear of pigmentation were the main barriers to sunlight exposure.

#### **CONSENT (WHERE EVER APPLICABLE)**

All authors declare that 'written informed consent was obtained from the participants for publication.

#### **ETHICAL APPROVAL (WHERE EVER APPLICABLE)**

This study was approved by the Ethical Review Committee of Princess Nourah University (approval no. 18-0329) on 10 December 2018. Confidentiality was ensured and the data were used only for the research purpose.

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