Original Research Article

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 NourahBint Abdulrahman University (PNU).

Methodology:A self-administered (Under method section below, you stated interviewer administered) questionnaire was used to assess the knowledge aboutvitamin D sources, health benefits and effects of vitamin D deficiency and assessing the attitudetowards 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~~contributed~~ 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 NourahBint Abdulrahman University.

2. METHODOLOGY:

A cross sectional questionnaire-based study was conducted among 500 (how was this sample arrived at)Saudi femalestudents at Princess Nourah University during 2018-2019. Convenient sampling technique was used in thestudy. The data were collected using a closed ended, interviewer based(abstract above states self administered), validatedquestionnaire 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 andawareness about vitamin D sources, health benefits and effects ofvitamin D deficiency. The third part included 8 questions assessing the attitude towards vitamin D and sunexposure. Verbal consent was obtained from all the recruited participants.

The data were analyzed by SPSS (what version). Analysis of quantitative data was done by t-test. Association ofqualitative variables was done by chi-square test. P-value of less than 0.05 was considered asstatistically 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 20years (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 theminority were in 4th year and above (13.4%). Most of the students were single (94.8%) and livingin a villa (87.8%). The majority of the students (43.6%) had high average monthly income of morethan 15000 SR. Majority of the student's parents had high educational qualification that is universitydegree or higher (Table 1).

Table1:Sociodemographiccharacteristicsoftherespondents(N= 500)

Characteristics	**Frequency(N)**	**Percentage(%)**
Age		
lessthan20	235	47.0%
+20	263	52.6%
College		
Health	263	52.6%
nonhealth	235	47.0%
Year		
preparatoryyear	146	29.2%
1styear	102	20.4%
2ndyear	93	18.6%
3rdyear	83	16.6%
4thyearorabove	67	13.4%

Maritalstatus		
Single	474	94.8%
Married	26	5.2%
Housing		
Villa	439	87.8%
Apartment	60	12.0%
Familymonthlyincome		
2000-5000SR	34	6.8%
6000-10000SR	109	21.8%
11000-15000SR	132	26.4%
morethan15000SR	218	43.6%
Parenteducationqualification		
Father		
Uneducated	23	4.6%
Uptohighschool	172	34.4%
Universityorhigher	302	60.4%
Mother		
Uneducated	50	10.0%
Uptohighschool	191	38.2%
Universityorhigher	257	51.4%

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

Table2:KnowledgeandawarenessaboutvitaminD

Item	**Frequency**	**Percentage**
Whatarethevarioussourcesofvitamin D?		
Sun	490	98.0%
Water	276	55.2%
VitaminDsupplement	461	92.2%
Fattyfish	284	56.8%
Fruits	281	56.2%
Eggs	173	34.6%
Milk	217	43.4%
Vegetables	173	34.6%
BenefitsofvitaminD?		
healthybones	469	93.8%
preventionofosteomalacia	407	81.4%
preventionofgeneralweakness	442	88.4%
preventionofrickets	251	50.2%

preventionofvisionproblems	151	30.2%
preventionofosteoporosis	425	85.0%
preventionofchronicdiseases	206	41.2%
MedicalproblemscausedbyvitD deficiency?		
Cardiovasculardiseases	59	11.8%
diabetes	65	13.0%
depression	379	75.8%
hypercholesterolemia	137	27.4%
Cancer	43	8.6%
bone pain	420	84.0%
mainsourceofvitaminD?	**456**	91.2%
MineraldependsonvitDforits absorption?	**294**	58.8%
maincauseofvitaminDdeficiency?		
Malnutrition	101	20.2%
Lackofsunexposure	366	73.2%
Pregnancy	5	1.0%
Others	15	3.0%
VitDdeficiencymoredangerousin which category?	**138**	27.6%
Howmuchtimeisneededtospendin the sun?		
Lessthan10minutes	66	13.2%

∗10-20minutes	385	77%
Onehour	35	7.0%
Twohours	9	1.8%
Exposuretothesundoesnotaffect vitaminDlevels	5	1.0%
besttimeofthedayforsunlight exposure?	160	32.0%
currentrecommendeddailyamountof vit. D in adults?	**30**	6.0%

Regarding the functions of vitamin D, the majority of the students were aware about vitamin Dinvolvement 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 claimedthat 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% ofstudents 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 agegroup. 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 maximumvitamin D is between 9-11 am, which is correct. Unfortunately, only (6 %) of the students wereaware about the recommended daily dose of vitamin D in adults.

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

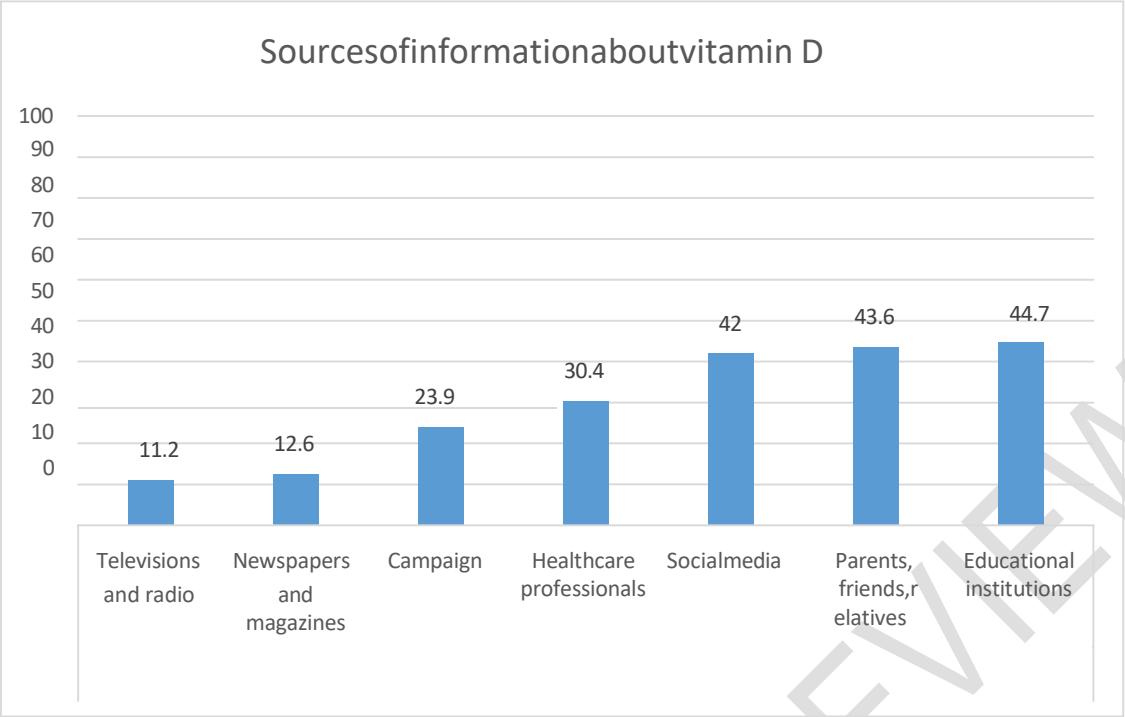

Figure1: SourcesofinformationaboutvitaminD.

A cut off 60% knowledge score (16 correct answers) was used to define a good and poor knowledge amongstudents. The majority of students had good knowledge score (52.7%). There was a statisticallysignificant difference in knowledge score (p 0.036). The health science college students have betterknowledge score (64.6%) than those who attend non-health science colleges (35.4%), the p-valuewas (<0.01). The Preparatory year students of health science college had the highest knowledgescore (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 scorecompared to other students with a p-value of 0.005. Students having higher family income hada good impact on their knowledge (47.9%) compared to the others, but there was no significantdifference statistically. There was considerable difference in knowledge score among students whohad an educated mothers (Bachelor's degree or more) compared to the daughters of mothers havinghigh-school degree and less, with a P-value of 0.004.

Students who received information about vitamin D from educational institution had a goodknowledge score (54%) compared to those who received information from other sources (Table3).

Table3:FactorsaffectingtheknowledgeregardingvitaminD

item	GoodKnowledge	PoorKnowledge	P value
Age			
Lessthan 20	111 (42.7)	124 (52.1)	**0.036**
+20	149 (57.3)	114 (47.9)	
College			
Health	168 (64.6)	95 (39.9)	**<0.01**
Non-Health	92 (35.4)	143 (60.1)	
Year			
Preparatory	80 (31.0)	66 (28.3)	**<0.01**
1st year	42 (16.3)	60 (25.8)	
2nd year	40 (15.5)	53 (22.7)	
3rd year	60 (23.3)	23 (9.9)	

4th yearorabove	36 (14.0)	31 (13.3)	
Maritalstatus			
Single	250 (95.8)	224 (93.7)	0.300
Married	11 (4.2)	15 (6.3)	
Housing			
Villa	239(91.9)	200(83.7)	**0.005**
Apartment	21(8.1)	39(16.3)	
FamilyIncome			
2000-5000SR	13(5.0)	21(9.0)	0.123
6000-10000SR	59(22.8)	50(21.4)	
11000-15000SR	63(24.3)	69(29.5)	
morethan15000SR	124(47.9)	94(40.2)	
Parenteducation qualification			
Father			
Uneducated	12(4.6)	11(4.6)	0.634

Uptohighschool	85(32.7)	87(36.7)	
Universityorhigher	163(62.7)	139(58.6)	
Mother			
Uneducated	18(6.9)	32(13.5)	0.044
Uptohighschool	101(38.7)	90(38.0)	
Universityorhigher	142(54.4)	115(48.5)	
Sourceofinfo.aboutvit.D			
Healthcareprofessionals	91(34.9)	54(23)	
Educationalinstitutions	141(54)	75(31.5)	
Parents,friends,relatives	108(41.4)	100(42.4)	
Newspapersandmagazines	41(15.7)	21(8.8)	
Socialmedia	106(40.6)	97(40.8)	
Televisionsandradio	29(11.2)	26(10.9)	
Campaign	66(25.3)	50(21)	

The majorityof the participants (63.6%) have been tested for vitamin D. Around 34.8% of them were exposed to sunlightevery day. The majority (38.2%) were exposed to the sun for a less than 5 minutes per day and only9.6% were exposed for 15-30 min daily. Fortunately, 82.6% students were willing to test forvitamin 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 sunlightexposure among the students.

Regarding the practice and attitude toward vitamin D and sunlight exposure, most of the studentsaged 20 years and above had good practice (54.6%), while the minority who aged less than20 years had poor practice (57.4%), though not statistically significant difference. Healthcollege 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 yearhad 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 livesin villa had a better practice (88.7%) compared to those who lives in apartment (11.3%) with nostatistically significance difference. Students who had a high family monthly income had a goodpractice (45.1%) compared to the others. Regarding the parent education qualification, there wasa statistically significant difference in practice among students whose parent had university degreeor 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%). Whilethe minority who got their information from TV and radio, only 11.2% of them had good practicetowards vitamin D. In addition, over 54% students who had good knowledge about vitamin Dhave good practice and attitude towards vitamin D and sunlight exposure compared to those havingpoor knowledge (Table 4).

Table4:FactorsaffectingthepracticetowardsvitaminD

Item	**GoodPractice**	**PoorPractice**	**P value**
Age			
Lessthan 20	198 (45.4)	27 (57.4)	0.116
+20	238 (54.6)	20 (42.6)	

College			
Health	232 (53.3)	21 (43.8)	0.207
Non-Health	203 (46.7)	27 (56.3)	
Year			
Preparatory	118 (27.5)	18 (38.3)	0.080
1st year	87 (20.3)	13 (27.7)	
2nd year	84 (19.6)	9 (19.1)	
3rd year	81 (18.9)	2 (4.3)	
4th yearorabove	59 (13.8)	5 (10.6)	
Maritalstatus			
Single	414(95)	44 (91.7)	0.338
Married	22 (5)	4 (8.3)	
Housing			
Villa	386(88.7)	40(83.3)	0.271
Apartment	49(11.3)	8(16.7)	
FamilyIncome			
2000-5000SR	29(6.7)	5(10.9)	0.682

6000-10000SR	99(22.9)	9(19.6)	
11000-15000SR	109(25.2)	13(28.3)	
morethan15000SR	195(45.1)	19(41.3)	
Parenteducationqualification			
Father			
Uneducated	21(4.8)	2(4.2)	
Uptohighschool	142(32.7)	25(52.1)	**0.027**
Universityorhigher	271(62.4)	21(43.8)	
Mother			
Uneducated	40(9.2)	10(20.8)	
Uptohighschool	172(39.5)	14(29.2)	**0.032**
Universityorhigher	223(51.3)	24(50.0)	
Sourceofinfo.aboutvit.D			
Healthcareprofessionals	132(30.4)	10(21.3)	
Educationalinstitutions	195(44.7)	16(33.3)	

Parents,friends,relatives	190(43.6)	17(35.4)	
Newspapersandmagazines	55(12.6)	5(10.4)	
Socialmedia	183(42)	15(31.3)	
Televisionsandradio	49(11.2)	5(10.6)	
Campaign	104(23.9)	8(16.7)	
Knowledgecategory	**Goodpractice**	**Poorpractice**	**Total**
Goodknowledge	238(54.6)	17(35.4)	255(52.7)
Poorknowledge	198(45.4)	31(64.6)	229(47.3)

This study assessed the knowledge and awareness about vitamin D and attitude of Saudi femaletowards 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 femalestudents. 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. Thestudy revealed that 98% students recognized the importance of exposure to sunlight and theintake of vitamin D supplements (92.2%) as major sources of vitamin D. These results are higherthan 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 vitaminD, respectively. Another important finding of the current study was that 77% PNU studentsanswered correctly about time of sun exposure required to get enough vitamin D (which is 10-20min), while a study in Malaysia [13] reported that only 11.9% students were aware about the correcttime needed for sunlight exposure for vitamin D synthesis.

However, current results showed that there was limited knowledge regarding recommended dailyintake 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 600IU is the correct dose. The percentage is lower compared to a study done among university studentsin Malaysia [13], where the percentage was 11%, which is considered also low.

Regarding the source of information about vitamin D, Media and healthcare professionals areplaying 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 theirknowledge 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/dayunder the sun. Avoidance of sunlight exposure is reported in different population, such as Australiaand China [16,17]. In the current study, 54.8%students reported that the constant hot temperature inSaudi 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 limitedoutdoor activity are the main reasons preventing people from getting exposed to sunlight whichled 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 effectsof vitamin D deficiency among female students at Princess Nourah University. Healthcollege 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 (WHEREEVER APPLICABLE)

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

ETHICAL APPROVAL (WHEREEVER 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 wereused only for the research purpose.

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