

A HEALTH SURVEY TO ASSESS KNOWLEDGE ON VITAMIN D DEFICIENCY AMONG SAUDI FEMALE STUDENTS

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Background: Vitamin D deficiency has been recognized as a worldwide pandemic.^{1,2,3,4} In spite of adequate sunlight in the Kingdom of Saudi Arabia, vitamin D deficiency still remains a major problem among most of the females. Recent studies conducted in Saudi Arabia, reported that 81% of female population is suffering from vitamin D deficiency.^{8,9} Hence this study was undertaken to assess the knowledge of female Saudi students on different causes leading to vitamin D deficiency.

Methods: A cross sectional survey was conducted, in Princess Nourah Bint Abdul Rahman University of Riyadh. Samples were selected using a non-probability convenience technique.

Results: 8.6% of students were aware of the right time during the day when sun exposure is recommended. 30% of students knew that milk is a good source for vitamin D, while a negligible number of people knew other vitamin D rich dietary sources, like; fatty fish, egg yolk, beef liver, cod liver oil and cheese.

Regarding symptomatology of vitamin D deficiency, for widening of wrist joints, delayed eruption of teeth, delayed standing, pain in joints and bones, the 'yes' responses were 31%, 30%, 40% and 30% respectively. Eighty three percentage of the girls used strong sunblock cream (≥ 15 F) while going outside.

Conclusion: Knowledge of Saudi female students on food sources rich in vitamin D and the role of sun exposure in synthesis of this vitamin, is poor. Effective health education programs should be encouraged at public level, to create awareness on this major health issue.

Keywords: Vitamin D; Deficiency; Health Survey.

INTRODUCTION

During the last decade, vitamin D deficiency has become an increasingly interesting area of research in the medical field and it has been acknowledged as a global pandemic by the masses.^{1,2,3,4} This became evident as numerous recent studies showed that vitamin D plays a role outside of its conventional calcium and bone metabolism. Low vitamin D has been associated with diseases such as cancers, autoimmune diseases, hypertension, and infectious diseases.⁵

Ideally levels of vitamin D in blood should be more than 25 nanogram/milliliter. If blood level ranges between 15-25 ng/mL, the condition is labelled as vitamin D insufficiency. Vitamin D deficiency is when this figure falls below 15ng/mL, this condition is associated with highly elevated serum levels of parathyroid hormone; which in turn increases the risk of bone fractures due to an increase turnover of calcium from the bones.^{6,7}

Despite adequate sun light in the Kingdom of Saudi Arabia, vitamin D deficiency is prevalent in adults, especially women. Two recent studies conducted in Saudi Arabia reported 81% prevalence among female population.^{8,9} Lack of knowledge on proper sunlight exposure and the diet adequate in the vitamin, was found out to be the major contributor.^{10,11}

For many decades, it was considered that vitamin D deficiency affects musculoskeletal system alone, and could lead to rickets among children and osteomalacia among adults. But recent studies have proved that its deficiency affects other body organ systems as well, as its deficiency could lead to numerous types of cancers^{4,12,13}, coronary heart disease¹⁴, type 1 and 2 diabetes mellitus^{15,16,17}, hypertension, Alzheimer's and mental disorders⁴.

Causes of this worldwide deficiency in children and adults¹⁸ is multifactorial, such as intake of diet insufficient in vitamin D and calcium^{19,20}, inadequate exposure to UVB (ultraviolet B) sunlight²¹, the degree of skin pigmentation¹⁸ and overuse of sunblock creams^{20,22,23,24}.

However it should be noted that diet low in calcium can also ultimately results in low vitamin D level²⁰.

Ultraviolet B rays are the natural source of vitamin D. It is recommended that face, arms and hands, should be exposed for 15 to 30 minutes, twice weekly, between 10:00am and 3:00pm. This should be done without the application of sunblock cream.²⁵

This study was designed with the following objectives:

1. Assess the knowledge of female students on different food sources rich in this vitamin and on the importance of exposure to sunlight.
2. Assess the knowledge of female students on signs and symptoms of vitamin D deficiency.

SUBJECTS AND METHODS

Students from five different non-health science colleges of Princess Nourah Bint Abdul Rahman University were selected. Students belonging to health science colleges were not interviewed as their prior medical knowledge could act as confounder.

Calculation on sample size, was done using the latest prevalence of vitamin D deficiency in Saudi females, which is 81%^{8,9} (along with a CI of 95% and the desired precision of $\pm 5\%$).

A closed-ended questionnaire consisting of 29 different questions was distributed among 20 students as a pretesting. Hundred students were selected from each five different non health science colleges using a non-probability convenience sampling technique. The students approached belonged to the College of Arts and Design, College of Foreign Language, College of Economics, College of Business Administration and College of Computer Sciences. Finally, a cross sectional survey was done to collect a sample of 500 students.

Specific questions were on different food sources rich in vitamin D, duration of sunlight exposure required by the body, the normal range of vitamin D in the blood, different causes, signs and symptoms of its deficiency, and personal information of each respondent on her vitamin D status.

Statistical analysis was done by using SPSS (Statistical Package for Social Sciences, Chicago, IL, USA) version 20.

Descriptive and inferential analysis was done. For checking association between different qualitative data, Chi-Square test was applied keeping the level of significance $p \leq 0.05$.

RESULTS

Table no.1: Knowledge on Vitamin D of the respondent

Variable	N=500	Percentage
Have you heard about Vitamin D?		
Yes	496	99.2
No	004	00.8
Source of information on Vitamin D		
Family & friends	291	58
University	016	3
Health Magazines	094	19
Media	095	19.2
Not heard before (Not applicable)	004	0.8
Normal range of Vitamin D in human body (ng/mL)		
< 12	056	11
< 20	244	49
20 - 50	163	32.6
> 50	037	7.4
Best time for exposure to sun light		
Before 10 am	395	79
From 10 am to 12 pm	50	10
From 10 am to 3 pm	43	8.6
Do not know	12	2.4

Table no.1 shows the knowledge of the respondents on normal range of Vitamin D and the best time for sun exposure. Most of the students (99.2%) have heard about Vitamin D from their family and friends (58%). Normal range of Vitamin D in the human body is between 20-50 ng/mL, as answered by 32.6%. Before 10 am is the best time for exposure to sun, as answered by 79% of students. Only 8.6% of students knew that it is from 10 am till 3 pm.

Figure No. 1: Knowledge of the respondents on different food sources rich in Vitamin D

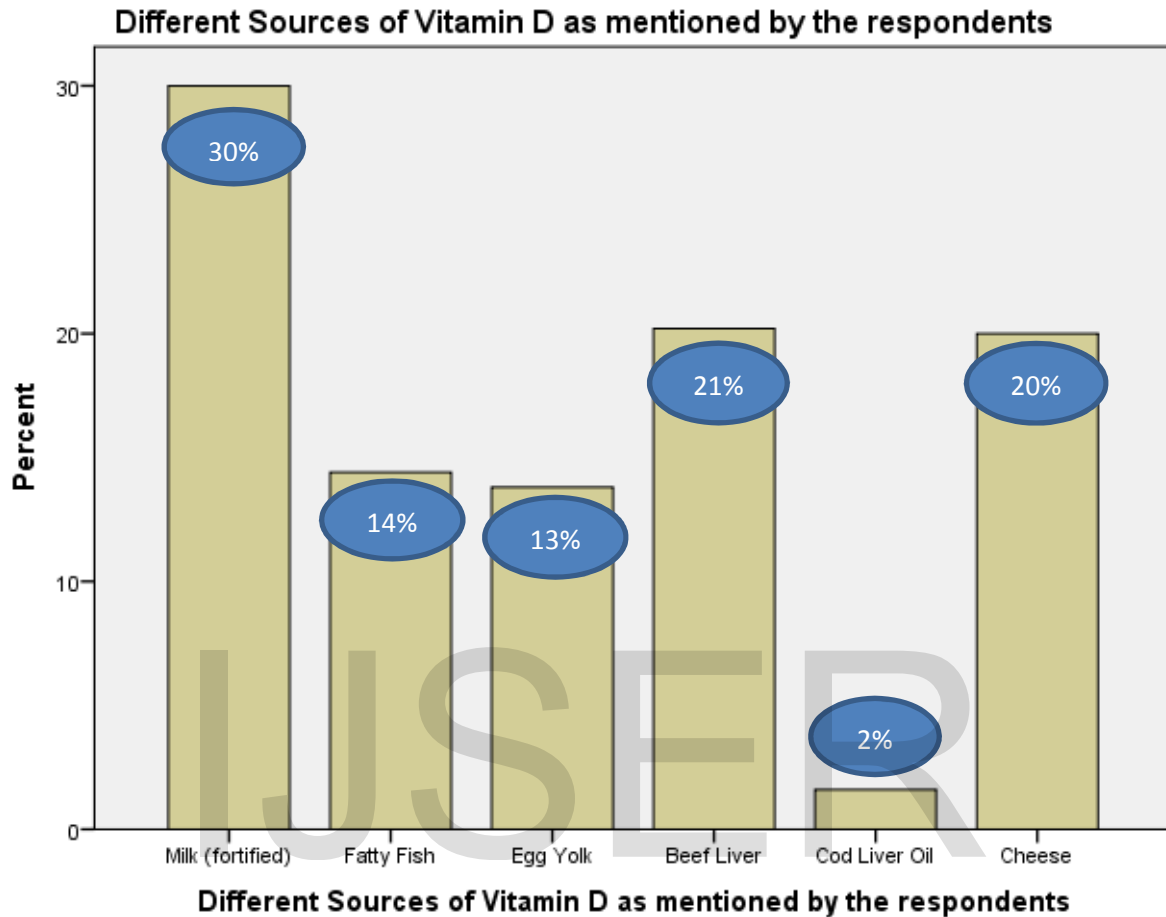


Figure no.1 highlights the food items rich in Vitamin D as answered by the students. Thirty percentage of the students marked fortified milk, while 21% marked beef liver. For cheese, fatty fish and egg yolk, the percentages are 20, 14 and 13 respectively. Just 2% knew that cod liver oil is also one of the sources of Vitamin D.

Table No. 2: Knowledge on Vitamin D deficiency

Variable	N=500	Percentage
Condition of Vitamin D deficiency		
Major health problem	402	80.4
Minor health problem	046	9.2
Not a health problem	012	2.4
Don't know	040	8
Causes of Vitamin D deficiency		
Lack of exposure to sunlight	17	3.4
Wearing Hijab	42	8.4
Genetic disorder	116	23.2
Inadequate intake of diet rich in Vitamin D	85	17
Respiratory Infections	32	6.4
Do not know	208	41.6
People at risk		
Children	50	10
Teenagers	42	8.4
Old people	48	9.6
Males	05	1
Females	05	1
Pregnant & breast feeding mother	50	10
People with dark skin	200	40
Overweight People	100	20
Symptoms of Vitamin D deficiency (respondents had the choice to mark more than one option)		
Pain in joints and bones	150	30
Alopecia	375	75
Depression	290	58
Widened wrist joint	154	31
Delayed eruption of teeth	150	30
Delayed standing in children	200	40
Deformed knee joint among children	192	38

Table no.2 shows that 23.2% considered Vitamin D deficiency secondary to some genetic disorder, while 17% considered inadequate intake of diet to be the cause. A very small percentage (3.4%) considered lack of exposure to sunlight as the cause. Forty percentage of the students labeled people with dark skin to be the risky group while 20% considered overweight people to be at risk. Just 10% knew that children, pregnant and lactating mothers could be the risky group. Thirty percentage of the students knew that in its deficiency there is pain in joints and bones, 75% and 30% marked alopecia and delayed eruption of teeth as one the symptoms. For widening of the wrist joint and deformed knee joint among growing children, the yes responses were just 31% and 38% respectively. Whereas 40% recognized delayed standing among growing children as one of the symptoms.

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Table No. 3: Personal information regarding Vitamin D

Variable	N=500	Percentage
Exposure time to outdoor/sun		
Less than 15 minutes	84	17
15minutes to 30 minutes	117	23
1 hour to 3 hours	225	45
4 hours to 7 hours	60	12
8 hours to 10 hours	14	3
Body parts exposed to sun		
Face and hands	333	67
Face, hands and arms	117	23
Face, hands, arms and legs	50	10
Strength of sunblock cream that you apply		
Below SPF 15	50	10
Between SPF 15-30	325	65
Between SPF 30-50	100	20
SPF+50	015	03
Do not apply	010	02
Have you ever had your Vitamin D test		
Yes	215	43
No	285	57
Result of your test (among those who were tested, n=215)		
Normal	35	16
Insufficiency	92	43
Deficiency	88	41

Table no. 3 shows personal information of the respondents on Vitamin D. It shows that most of the students (17% + 23% = 40%) exposed themselves to sunlight for just 30 minutes. Sixty percentage expose just their face and hands to sun. Sunblock cream of strength SPF 15-30 was used popularly by 65%, while SPF 30-50 and +50 were used by 20 and 03% respectively. A large percentage of (57%) students were not tested for Vitamin D. Among those who were tested (215/500 or 43%), just 16% (35/215) had normal levels of vitamin D in their blood, while 43% (92/215) were insufficient and 41% (88/215) were deficient in Vitamin D.

Table No. 4: Association of different monthly family income of the respondents, with the knowledge of food sources for Vitamin D

Food Items	Monthly Family Income (SR)	p-value
Fortified Milk	< 10,000 to < 50,000	0.58
Fatty Fish		0.99
Egg Yolk		0.44
Beef Liver		0.42
Cheese		0.55
Cod Liver Oil		0.08

In table no. 4, cross tabulation is done to build a relationship between the monthly family incomes of the respondents along with their knowledge on vitamin D rich food items. As the p value for all the mentioned food items came out to be more than 0.05, it interprets that there is no association of the socioeconomic status with the knowledge on vitamin D rich foods.

Table No. 5: Association of different monthly family income of the respondents, with the different signs/symptoms of Vitamin D deficiency

Signs/Symptoms	Monthly Family Income (SR)	p-value
Bones and joints pain	< 10,000 to < 50,000	0.67
Alopecia		0.42
Depression		0.38
Broadening of wrist joint		0.07
Delayed eruption of teeth		0.54
Delayed standing		0.43

In table no. 5, cross tabulation is done between monthly family income of the respondents, with different signs and symptoms of Vitamin D deficiency. As the p value for all the

mentioned signs and symptoms came out to be more than 0.05, it demonstrates that there is no association of the socioeconomic status with the knowledge on signs and symptoms of Vitamin D deficiency. All have the same level of knowledge whether right or wrong for signs and symptoms of Vitamin D deficiency.

DISCUSSION

There is lack of proper knowledge on vitamin D among Saudi female students of non-health science colleges as half of the students are not even aware of its existence. Though the media is active in displaying and distributing information on different health issues, but it should focus on Vitamin D deficiency adequately as it seems to be a hidden, submerged portion of the iceberg.

Only 32.6% were aware of the normal range of vitamin D in blood and those were the ones who were diagnosed as either being insufficient or deficient in the vitamin.

Surprisingly, the recommended time for sun exposure was known by just 8.6% of the respondents, this finding is similar with the results of international studies conducted in Australia²⁷, where lack of awareness on proper timings for sun exposure was found.

About 80-99% of vitamin D requirement is fulfilled by the sunlight exposure.²⁶ Lack of proper sun exposure is identified as the main cause of vitamin D deficiency; as proven by our study and many similar international studies^{26,27,28,29}.

Over the years, Saudi lifestyle has changed owing to the warm climate of the area. Also for cosmetic reasons, there is an increase in the use of sunblock creams and most of the time females tend to stay indoors during the daytime, as founded in numerous literature.^{4,30} Our study also revealed that more than 50% of the girls use strong sunblock cream in spite of covering their whole body while going out. During the last many decades, health campaigns have promoted the use of sunscreen with high skin protection factor (SPF) for prevention against skin cancer^{31,32}, the use of sun protection products prevents UV-B rays from being absorbed by the skin, however their overuse seems to result in vitamin D deficiency³³.

The relationship between wearing of veil and vitamin D deficiency has been debatable. According to Siddique and colleagues, covering the body while going outdoors, limits sun exposure and hence can cause vitamin D deficiency^{11,34}. Similar results were found in another study done in Arab-American women who wear veil³⁵. Contrary to these findings, many other studies done in Saudi Arabia and in the west, reported that although veil minimizes sun exposure but it is not a major contributory factor for vitamin D deficiency^{33,36}. In the West, comparative studies have reported that there is no difference in vitamin D blood levels between veiled and non-veiled women, furthermore it is reported that covering the face with the veil is not the real cause, Gannage-Yared et al, found that there are many other factors responsible for low vitamin D levels than the veil itself, such as overuse of sunblock creams and inadequate exposure to sunlight³⁷.

In many international studies, it has been reported that sunlight exposure lasting 15-30 minutes between 10 am to 3 pm, for at least twice weekly, is sufficient to result in adequate

vitamin D levels in the blood^{4,27,38,39}. It is recommended that women should expose their face, hands, arms and legs to sunlight while sitting in open places of their houses, and limit the use of sunblock creams.

Respondents' knowledge on the food items rich in vitamin D and the symptoms of its deficiency, is also very poor as found in our study, similar findings were revealed by other studies done in Saudi Arabia^{9,10,11}. In addition, majority of physicians working in the Ministry of Health (MOH), in primary health care centers of Jeddah, Saudi Arabia, rated their nutritional knowledge on Vitamin D as "poor".⁴⁰

Hence it is recommended that health awareness programs should be implemented by the ministry of health on media, in women's parks, shopping malls, etc.; focusing on the ways by which they can alter their diet and lifestyle.

In Saudi Arabia, indoor lifestyle whether influenced by climate or culture, also acts as a predisposing factor. Women should be educated to visit parks during the day time, take fortified food rich in vitamin D and do not overuse sunblock creams. Currently, bread and milk are being fortified in Saudi Arabia⁴, as rice is a staple food, so it should also be fortified.

CONCLUSION

It is concluded that main reasons of vitamin D deficiency among Saudi females are; lack of awareness on foods rich in Vitamin D, overuse of sunblock creams and inadequate body exposure to sunlight.

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