

The Prevalence of Vitamin D Deficiency among Saudi Females in King Abdu Aziz University Jeddah, Saudi Arabia

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Abstract: Vitamin D deficiency is highly prevalent in Middle Eastern countries. Saudi Arabia is one of the countries that showed a higher incidence of vitamin D deficiency. The objective of the present study was to measure the prevalence of vitamin D levels and to find the factors associated with vitamin D deficiency, as well as identifying the potential risk factors among female university (students and employees) in Jeddah, Saudi Arabia. This cross-sectional study was conducted on 343 Females University aged between 18 to 65 years. Sociodemographic factor was determined and blood sample was collected to assess serum 25-hydroxy vitamin D concentration. The current study finds that prevalence of vitamin D deficiency was 52.2% in the sample. Participants aged 18-29 years had a higher percentage 80.4% of sever vitamin D deficiency. There were a significant difference and positive correlation in the levels of vitamin D according to age ($p = 0.000$, $r = 0.21$). Vitamin D levels were significantly associated and correlated with students and employees ($p = 0.003$, $r = 0.201$). Multiple logistic regression showed that younger age (OR= 2.920, [95% CI = 1.050-8.076], $P = 0.003$) and students (OR= 2.753, [95% CI = 1.520-4.986], $P = 0.001$) were independent predictors for vitamin D deficiency. In conclusion, this study finds a high level of sever vitamin D deficiency was prevalent in female university samples at Jeddah city. It also finds that age and students are risk factors for vitamin D deficiency.

Key words: Vitamin D Deficiency • Age • Education Level • Jeddah • Saudi Arabia

INTRODUCTION

Vitamin D is an important fat- soluble vitamin. It is produced endogenous in the skin by exposing to ultraviolet B radiation or can be taken from exogenous sources such as food items and vitamin D supplements [1, 2]. The major function of vitamin D is to maintain normal blood levels of calcium and phosphorus to improve healthy bones [3]. The relation between vitamin D deficiency and skeletal health has been clearly examined. However, various recent studies have been correlated the low level of vitamin D with nonskeletal diseases such as autoimmune diseases, diabetes mellitus, cardiovascular diseases and cancer of breast, colon and lung [4, 5].

Vitamin D deficiency is highly prevalent all over the world. The prevalence is growing fast about one billion people have low vitamin D deficiency [6]. Saudi Arabia is one of the countries that indicated a significantly higher

prevalence of vitamin D deficiency particularly, among young women [7]. A systematic review on the prevalence of vitamin D deficiency was done in Saudi Arabia from 2011 to 2016. They found that 81.0% of populations have vitamin D deficiency [8].

The aim of the study was to determine the prevalence of vitamin D deficiency in young Saudi females at Jeddah city and to exam the effect of age and education level on vitamin D levels. As well as, identify the potential risk factors.

MATERIALS AND METHODS

This study was approved by king Abdul Aziz University and supported by University Medical Services Center in Jeddah city. We conducted random samples of 343 Saudi females, ages among 18-65 years old from King Abdul Aziz University. Data was collected through an interviewer administered questionnaire that included age.

Participants were classified into three groups according to their age groups (18-29, 30-44, 45-69) years old. In addition, Participants were classified into two groups' students and employees.

Then Blood samples were collected in heparin anticoagulant vacuum tubes from participants in medical services center in females' campus. After that, the blood tubes were transferred to the laboratory at University Medical Services Center to measure serum 25-hydroxy vitamin D concentration. The 25-hydroxyvitamin D levels were determined using a UniCel DxI 800 Access Immunoassay System. Moreover, we divided the level of serum 25-hydroxyvitamin D into clinically relevant groups: Severely deficient 25- hydroxyvitamin D (defined as < 25 nmol/L) 25- hydroxyvitamin D deficient (defined as >25<50 nmol/L), 25-hydroxyvitamin D insufficient (defined as ≥50<80 nmol/L) and sufficient 25-hydroxyvitamin D (defined as ≥80nmol/L).

Statistical analysis was carried out using statistical package for social sciences computer software (SPSS for windows, version 23.0, SPSS Inc 2015). The prevalence of vitamin D level was presented as percentages (%). The differences in the means of age according to vitamin D levels was examined using one-way analysis of variance (ANOVA) and the relationship between vitamin D levels and education level was examined using chi-square test. Multiple logistic regression analysis was done to calculate the adjusted odds ratio to determine the potential risk factor in the sample. In all statistical tests we used, If P-value less than or equal to 0.05 were considered significant. The interval confidence we used was 95%.

RESULTS

Prevalence of vitamin D: Table (1) illustrates the overall prevalence of vitamin D levels in the study. Out of 343 participants, 52.2% of them had vitamin D deficiency. While 32.4% of participants had severe vitamin D deficiency. Nevertheless, 11.7% and 3.8% of participants showed insufficient and sufficient vitamin D respectively.

Vitamin D Levels and Age: Table (2) shows the distribution percentages of vitamin D levels according to the age. Regarding the vitamin D levels, Participants of age 18 to 29 years had a higher percentage (80.4%) of severe vitamin D deficiency than other age groups. Moreover, participants of age 18-29 years old had a higher percentage (72.3%) of vitamin D deficiency comparable with other age groups.

In Table (3) the mean of age in different levels of vitamin D had a significant difference with values ($p=0.000$), ($df=340$) and weak positive correlation ($R=0.21$). In addition, participants in age group 18-29 years were three times more at risk to develop vitamin D deficiency than other age groups (Table 4).

The Association Between Vitamin D Levels in Students and Employees. Group of severe vitamin D deficiency and group of vitamin D deficiency were detected with higher percentage in student than employees. Whereas, sufficient vitamin D was presented with higher percentage in employees than students as shown in Table (6) vitamin D has a significant relationship with student and employees, with values ($P= 0.003$), ($df= 3$) and weak positive correlation ($R= 0.201$). Furthermore, students were three times more at risk to suffer from vitamin D deficiency than employees (Table 7).

Table 1: The prevalence of vitamin D levels

Vitamin D levels	Frequency	Percent
Sever Deficient	111	32.4%
Deficient	179	52.2%
Insufficient	40	11.7%
Sufficient	13	3.8%
Total	343	100%

Table 2: Distribution percentage of vitamin D level according to ages

Vitamin D levels	18-29 years	30-44 years	45-69 years	Total
Sever vitamin D	80.4%	15.2%	4.5%	100%
Deficient vitamin D	72.3%	21.5%	6.2%	100%
Insufficient vitamin D	55.0%	32.5%	12.5%	100%
Sufficient vitamin D	42.9%	50.0%	7.1%	100%

Table 3: The relation between vitamin D levels and age

Age	N	Mean ± S.D	df	P-value
18-29	246	32.02	340	0.000
30-44	75	44.77		
45-69	22	41.00		
Total		35.39		

Table 4: Multivariate logistic regression analysis of age associated with vitamin D levels

Age	Odds ratio	95% CI	P-value
18-29	2.920	1.050-8.076	0.003
30-44	1.031	0.354-3.003	
45-69		Reference	

Table 5: Distribution percentage of vitamin D levels according to students and employees

Vitamin D	Students	Employees	Total
Sever vitamin D	75.0%	25.0%	100%
Deficient vitamin D	72.3%	27.7%	100%
Sufficient vitamin D	35.7%	64.3%	100%

Table 6: The relation between vitamin D levels among student and employees

Crosstab				
Count	Sever vitamin D	Deficient vitamin D	Insufficient vitamin D	Sufficient vitamin D
Students	84	128	22	5
Employees	28	49	18	9
Total	112	177	40	14
Chi-Square Test				
	Value	df	Asymp. Sig. (2-sided)	
Pearson Chi-Square	13.808	3	.003	
Likelihood Ratio	12.798	3	.005	
Linear-by-Linear Association	10.622	1	.001	
N of Valid Cases	343			
Symmetric Measures				
	Value	Approx.Sig.		
Nominal by Nominal	Phi	.201	.003	
N of Valid Cases	343			

Table 7: Multivariate logistic regression analysis of students and employees associated with vitamin D levels

Variables	Odds ratio	95%CI	P-value
Students	2.753	1.520-4.986	0.001
Employees	-	Reference	

DISCUSSION

Vitamin D deficiency is widespread and becomes a global pandemic with over one billion people being affected [9].

The aim of the present study was to determine the prevalence of vitamin D deficiency among female from 18 to 65 years old in Jeddah city and to find its association among students, employees and age. The result of this study demonstrated that vitamin D deficiency is indeed a health problem in Jeddah, which is the second largest city in the country located in the western region. The finding of this research indicates that the prevalence of vitamin D deficiency was reported highest percentage and lowest percentage of vitamin D sufficiency in the sample. These results are in agreement with a study used a sample of the adolescent in western region concludes that vitamin D deficiency had a higher prevalence in adolescent females in Jeddah city and probably in Saudi Arabia [10]. Additionally, AL-Daghri *et al.* [11] found that vitamin D deficiency is extremely common in the population of Saudi Arabia particularly in Adolescent females. This was confirmed with, AL-Suwadia *et al.* [12] which concluded that Vitamin D deficiency is popular in healthy Saudi adults, especially in females and in the younger age groups. Furthermore, Kanan *et al.* [13] found that vitamin D deficiency was high among Saudi females. The prevalence of vitamin D deficiency in the kingdom of Saudi Arabia is rising unexpectedly in every age [14]

In general, there are several possible explanations for a higher prevalence of vitamin D deficiency. One of the explanations is avoiding of being exposed to the sunlight for cosmetic reasons. Another explanation suggests that lack of outdoor activities might be attributed to the hot weather in Saudi Arabia almost all over the year.

The second objective of the present study was to find out the association between vitamin D level and age. The most obvious finding from the analysis was that younger age groups had the highest percentage of sever vitamin D deficiency and vitamin D deficiency comparable with other age. The mean of age in the different level of vitamin D was highly significant and there was a significant positive correlation. Another important finding was that participants in younger age groups were at risk of acquiring vitamin D deficiency than other age groups. These findings are in the range of the findings from previous studies. Al-Shaikh *et al.* [15] reported that younger age groups had a higher mean of vitamin D deficiency compared to the older groups. Similarly, AL-Mogbel [16] showed that younger women have more vitamin D deficiency than older women. Furthermore, Hussain *et al.* [17] concluded that vitamin D deficiency was higher among adolescent as compared to other age groups. Additionally, consistent with our findings, AL-Othman *et al.* [18] showed that age was the most significant predictor affecting vitamin D level.

In general, these findings suggested that raising awareness of the importance of vitamin D should be enhanced to prevent an increase in vitamin D deficiency. Thus, it can also be suggested that vitamin D supplements should be encouraged for all Saudi females because the natural sources of vitamin D are quite limited.

Education level was another factor identified in this study. The most obvious finding to emerge from the analysis was that students had the highest percentage of low level of vitamin D deficiency and severe vitamin D deficiency. On the other hand, employees had the highest percentage of sufficient vitamin D. Another important finding was that a significant relationship and weak positive correlation between vitamin D level and education level. Furthermore, students were three times more at risk to develop vitamin D deficiency than employees. The present findings were also consistent with, Kaddam *et al.* [19] who concluded that the prevalence of vitamin D deficiency was 49.5% in student and 44% for employees. In addition, AL-Zaheb and AL-Amer [20] reported that a high level of hypovitaminosis D was found in healthy female university student. Moreover, Abdelkarem *et al.* [21] found a higher prevalence of vitamin D deficiency in Saudi female students attending University and severe hypovitaminosis D has been observed in more than 52% in Saudi women.

There are some explanations for these results. One of them was the dietary habits of students that comprise of mainly fast food, which lack vitamin D. other explanation was that students spend most of their time indoors with less sun exposure.

CONCLUSIONS

In conclusion, the available data indicates that vitamin D deficiency is highly prevalent in Saudi females especially in young age. It also, finds that age and student are independent risk factors for vitamin D deficiency.

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