

25-Hydroxyvitamin D levels among healthy Saudi Arabian women

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ABSTRACT

الأهداف: قياس معدل 25 هيدروكسي فيتامين (د) (25OHD) لدى السيدات السعوديات الأصحاء بالمنطقة الشرقية.

الطريقة: أجريت دراسة عشوائية خلال الفترة ما بين فبراير 2008م وحتى مايو 2008م، بمستشفى الملك فهد الجامعي - الخبر - المملكة العربية السعودية، شملت الدراسة 200 سيدة سعودية، في المجموعة الأولى: 100 سيدة تراوحت أعمارهن ما بين 25-35 عاماً، وفي المجموعة الثانية: 100 سيدة أعمارهن 50 عاماً فما فوق. جميعهن خضعن للفحص السريري، فحوصات مخبرية، صورة كاملة للدم، نسبة الكالسيوم، الفوسفور، الكالين فوسفاتيس، هرمون جار الدرقية، ومعدل 25 هيدروكسي فيتامين (د) (25OHD). تم جمع معلومات حول نمط الحياة وأسلوب التغذية من خلال الاستبيان. فيتامين (د) أُعتبر ناقصاً عند المعدل اقل من (50nmol/L)، وغير كافي عندما يكون المعدل ما بين ($52-72\text{nmol/L}$)، وطبيعي حينما يكون (75nmol/L).

النتائج: في المجموعة الأولى، حوالي 70% من السيدات كان معدل 25 هيدروكسي فيتامين (د) (25OHD) طبيعياً، وفي المجموعة الثانية: 45% منهن كان معدل 25 هيدروكسي فيتامين (د) (25OHD) طبيعياً. معدل الكالين فوسفاتيس وهرمون جار الدرقية كانا مرتفعين عند النساء ذوات المعدل المنخفض من فيتامين (د). التعرض لأشعة الشمس واستخدام مشتقات الحليب كان منخفضاً.

خاتمة: كانت نسبة نقص فيتامين (د) لدى السيدات السعوديات الأصحاء اللاتي تراوحت أعمارهن ما بين 25-35 عاماً 30%، وبنسبة 55% لدى السيدات السعوديات من 50 عاماً فما فوق. بينت هذه الدراسة أن نقص فيتامين (د) شائع بين السيدات الصغيرات بالسن والسيدات في سن اليأس. يجب بذل الكثير من الجهد لتشجيع السيدات على التعرض الكافي لأشعة الشمس، وزيادة استهلاك المنتجات المحتوية والمضاف لها فيتامين (د) للمحافظة على صحة الهيكل العظمي.

Objective: To assess the serum level of 25 hydroxyvitamin D (25OHD) among healthy Saudi Arabian women living in the eastern province.

Methods: A cross-sectional randomized study was conducted between February 1st 2008 and May 31st 2008 at the King Fahd University Hospital, Al-Khobar, Kingdom of Saudi Arabia in 200 Saudi women between 25-35 years (group 1) and women of ≥ 50 years (group 2). Clinical examination, laboratory tests, a complete blood picture, serum calcium, phosphorous, alkaline phosphatase, parathormone, and the serum levels of 25OHD levels were carried out. Data on lifestyle, dietary, and demographic questionnaires were collected. Vitamin D was defined as deficient with serum level $< 50\text{nmol/L}$, insufficient between $52-72\text{nmol/L}$, and normal as 75nmol/L .

Results: In group 1, 70% of women had normal 25OHD, and in women of group 2, 45% had normal levels of 25OHD. Alkaline phosphatase and parathormone levels were significantly higher in women with low vitamin D levels. Sun exposure and consumption of dairy products were minimal.

Conclusions: Vitamin D deficiency among healthy young Saudi women of 25-35 years was 30% and 55% in women of ≥ 50 years. This study indicates that hypovitaminosis D is common in young and postmenopausal women. Efforts are require to augment and encouraged women for adequate exposure to sunlight and increased intake of fortified vitamin D products to maintain skeletal health.

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Vitamin D is essential for life as it is the most important biological regulators of calcium metabolism. Vitamin D deficiency is prevalent around the world.¹ It was surprising for many authorities that even in the developed countries, in the healthy population vitamin D deficiency was highly prevalent.² Studies between 1982 and 1992 have shown that vitamin D levels in ethnic Saudi citizens was lower than rest of the world.³ Al-Faraj and Al-Mutairi⁴ reported a prevalence of low vitamin D levels in 83% of patients presenting with backache. Recent association of vitamin D and osteoporosis has brought vitamin D in the limelight again. One of the most important causes of osteoporosis, apart from estrogen lack, is low levels of vitamin D.⁵ Heaney⁶ and Lips et al⁷ concluded that adequate vitamin D can prevent osteoporosis related hip fractures. The important sources of vitamin D are through exposure to sunlight, fish products, and fortified dairy and non dairy products with vitamin D3. In the last 25 years, the dietary habits of the children and the adults in the Kingdom of Saudi Arabia have changed tremendously,⁸⁻¹⁰ and at present fortification of dairy products is too low to prevent vitamin D deficiency. Keeping the gravity of the situation, this study was carried out to assess serum 25 hydroxy vitamin D (25OHD) levels in healthy Saudi Arabian young women between 25-35 years and women over the age of 50 years.

Methods. Twenty-five hydroxyvitamin D level was measured in 200 random Saudi Arabian women, 100 in the age group of 25-35 years (group 1) and 100 over the age of 50 years (group 2), between February 1st 2008 and May 31st 2008 at King Fahd University Hospital, Al-Khobar, Kingdom of Saudi Arabia. We excluded women who had chronic diseases that may affect vitamin D status. An informed verbal consent was obtained from all the candidates. The study was approved by the Ethics and Research Committee of the College of Medicine, King Faisal University, Dammam, and King Fahd University Hospital, Al-Khobar, Kingdom of Saudi Arabia. Demographic data such as age and gender, in addition to information on sunlight exposure for the sake of obtaining vitamin D, and the frequency and amount of dairy product consumption were obtained through a questionnaire. Blood samples were taken from all subjects in the morning in the status of fasting. Serum calcium, serum phosphorous, alkaline phosphatase, and parathyroid hormone levels were determined according to the standard laboratory procedures. Serum level of 25OHD was measured by radioimmunoassay using Wallac1470 Gamma Counter (Wallac Inc, Gaithersburg, MD, USA). The 25OHD is considered to be normal if the level is ≥ 75 nmol/L, insufficient if the level is between 52-72 nmol/L, and deficient ≤ 50 nmol/L.¹¹

The data was entered in the database and analyzed using the Statistical Package for Social Sciences (SPSS) version 14.0, Chicago, Illinois. Data was expressed as mean \pm standard deviation (SD). Statistical significance differences between groups were determined with Student's t-test and *p* values of 0.05 using confidence interval (CI) of 95% were considered as significant.

Results. The data of women in group 1 are shown in Table 1. Seventy women in this group had normal 25OHD (group A), 19 were insufficient (group B) and 11 were deficient (group C). There were no significant differences between the serum and phosphorus levels between the 3 groups. Even though the serum alkaline phosphatase level was within normal range between the 3 groups however, it was significantly higher in group C, when compared to group A ($p=0.01$ 95% CI-16.9). The level of parathormone was significantly higher in the deficient group when compared to normal and insufficient groups ($p=0.001$ and 0.003 with 95% CI -1.015). In women with ≥ 50 years, 55 women were found to be with low vitamin D levels. Table 2 shows that the average age between the 3 groups was not significant. The levels of serum calcium, phosphorus, and alkaline phosphatase were within normal range and statistically not significant among the 3 groups. Serum parathormone level was normal in the 3 groups, and was significantly higher in group B and C ($p=0.001$ with 95% CI - 10.61 and 22.1). Table 3 shows the exposure to sun and consumption of dairy products. Ten percent of women between 25-35 years had exposure to sunlight, and 24% were consuming dairy products of 250 ml daily, fortified with vitamin D3 of 400 IU/liter of milk products. In women ≥ 50 10% gave history of regular sun exposure, and 36% consumed dairy products.

Discussion. In the last 15 years, the long overdue importance of vitamin D has been realized, and studies have been conducted in various countries to assess the deficiency and insufficiency of 25OHD. This study shows that 30% of young women had low levels of vitamin D, and in women ≥ 50 years the prevalence was 55%. These figures are higher as compared with that reported over a decade ago.³ It appears that the prevalence of low vitamin D levels is on the rise due to changing food habits of the population, and this leads to a decrease in the intake of vitamin D. With plenty

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Table 1 - Data of healthy women ≤35 years (N=100).

Parameter	(Group A) normal vitamin D Levels ≥75nmol/L	(Group B) 25OHD insufficiency (21-29ng/ml)	(Group C) 25OHD deficient <50ng/ml	P-value between groups A and B	P-value between groups A and C	P-value between groups B and C
Number	70	19	11			
Age (years)	29.8 ± 3.83	28.05 ± 3.13	23.9 ± 1.8	0.1	0.2	0.1
Calcium level (8.5-10.5mg/dl)	9.16 ± 0.53	8.99 ± 0.54	8.91 ± 0.45	0.4	0.2	0.1
Phosphorus (2.5-4.9 mg/dl)	3.74 ± 0.62	3.6 ± 0.41	3.49 ± 0.52	0.2	0.1	0.1
Alkaline phosphatase (50-140 IU/L)	79.02 ± 26.5	109 ± 56.1	140.4 ± 74.5	0.01	0.01	0.1
Parathormone (1.3-7.6 Pmol)	7.27 ± 4.4	7.67 ± 2.54	14.11 ± 9.7	0.1	0.003	0.01
25 hydroxyvitamin D3 Level	97.5 ± 7.5	65.5 ± 2.2	32.8 ± 0.08	0.01	0.001	0.001

25OHD - 25 hydroxyvitamin D

Table 2 - Data of women ≥50 years (N=100).

Parameter	(Group A) normal vitamin D levels >30ng/ml	(Group B) 25OHD insufficiency (21-29ng/ml)	(Group C) 25OHD deficient <20ng/ml	P-value between groups A and B	P-value between groups A and C	P-value between groups B and C
Number	45	36	19			
Age in years	56.13 ± 4.9	55.76 ± 6.9	56.3 ± 6.7	0.1	0.1	0.1
Calcium Level (8.5-10.5mg/dl)	9.2 ± 0.5	9.32 ± 0.56	9.5 ± 0.23	0.2	0.1	0.1
Phosphorus (2.5-4.9mg/dl)	3.99 ± 0.53	3.9 ± 0.5	3.86 ± 0.61	0.1	0.1	0.2
Alkaline phosphatase (50-140IU/L)	81.06 ± 23.6	85.75 ± 21.4	110.2 ± 23.1	0.1	0.4	0.2
Parathormone (1.3-7.6Pmol)	6.54 ± 3.6	8.21 ± 2.83	10.21 ± 2.9	0.02	0.001	0.01
25 hydroxyvitamin D3 Level	92.8 ± 5.2	61.5 ± 2.31	32.4 ± 2.61	0.001	0.001	0.01

25OHD - 25 Hydroxyvitamin D

Table 3 - Sun exposure and dairy consumption in all women.

Parameter	25-35 Years			≥ 50 years		
	(Group A) normal vitamin D levels >30ng/ml	(Group B) 25OHD insufficiency (21-29ng/ml)	(Group C) 25OHD deficient <20ng/ml	(Group A) normal vitamin D levels >30ng/ml	(Group B) 25OHD insufficiency (21-29ng/ml)	(Group C) 25OHD deficient <20ng/ml
Number of patients	70	19	11	45	36	19
Sun exposure (10 minutes/Day)	5	2	3	2	5	5
Dairy products consumption (250ml/day)	12	7	5	20	9	7

25OHD - 25 Hydroxyvitamin D

of sunlight in Saudi Arabia, it was never anticipated that people will suffer from Vitamin D deficiency, until proven otherwise. Saudi Arabian citizens are not alone in the deficiency of vitamin D levels. The reported prevalence of low vitamin D levels around the world is between 50-54%.^{12,13} In our postmenopausal women, with an average age of 59 years, the prevalence was 55%. This indicates the prevalence of vitamin D deficiency among Saudi postmenopausal women is similar to that reported in the western world. Very low vitamin D levels have been reported from the Arab world, such as Lebanon, Iran, Jordan, and Turkey.¹⁴⁻¹⁶ Islam et al¹⁷ reported a prevalence of low vitamin D in 39% of the university students, whereas Kocjan et al¹⁸ found that

the prevalence of hypovitaminosis D was 30.5%. In our healthy volunteers, the prevalence of low vitamin D level was 30%. For a long time, the use of the veil in the Arab world has been blamed for low vitamin D levels among women.¹⁹⁻²¹ Reports suggest that covering the face with the veil may not be the real cause. Gannagé-Yared et al¹⁴ found there were other factors, which were responsible for low vitamin D levels than the veil itself. Recently, Islam et al²² compared vitamin D levels in veiled and nonveiled women in Bangladesh and did not find any significant differences in the levels. In this study, even though all our women were veiled, their vitamin D levels were similar to that reported from the western countries. Holick¹¹ concluded that for an amount of

1000IU of cholecalciferol, 15 minutes of exposure of arms and legs or hand, face, and arms to sunlight are required. We believe that covering the face by a veil is not the cause of hypovitaminosis D, however, the overall non exposure to the sun and a diet deficient in vitamin D is the cause. There are some limitations of this study. We have taken only one sample of vitamin D for analysis, and secondly there could have been dietary influence in the intake of vitamin D.

In conclusion, this study shows that 30% of young Saudi women have low vitamin D levels even though they appear apparently healthy. Secondly, in the postmenopausal women the prevalence was 55%. We suggest that, we as physicians should push for adequate fortification of dairy and non dairy products. Further, studies are needed to find any other reasons why women of ≥ 50 years have increased prevalence of low vitamin D levels. Until then, special efforts are needed to encourage in increasing the intake of vitamin D in women of ≥ 50 years.

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Ethical Consent

All manuscripts reporting the results of experimental investigations involving human subjects should include a statement confirming that informed consent was obtained from each subject or subject's guardian, after receiving approval of the experimental protocol by a local human ethics committee, or institutional review board. When reporting experiments on animals, authors should indicate whether the institutional and national guide for the care and use of laboratory animals was followed.