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Prevalence of Vitamin D Deficiency Among Women of Reproductive Age: A Multi Centric Study in Tehran

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Abstract

Background and Objectives: The aim of this study was to determine the prevalence of vitamin D deficiency among Iranian women of reproductive age.
Methods: In this multicentric cross-sectional study, 300 women aged 15 - 45 years referring to Tehran branch of Islamic Azad university hospitals from 2013 to 2015 were recruited. The collected data included the demographic characteristics of the participants, including age, body mass index (BMI), parity, and serum level of vitamin D. Serum levels of 25-dihydroxy vitamin D were measured by radioimmunoassay. Vitamin D was defined as deficient < 20 nmol/L, mild $\geq$ 25 nmol/L, moderate 12.5 - 25 nmol/L and severe $\leq$ 12.5 nmol/L. Statistical analysis was performed, using Excel software.
Results: Among the 300 patients, 257 cases had vitamin D deficiency; among whom, 122 cases had severe, 96 had moderate and 38 had mild deficiency.
Conclusions: According to the results of this study, only 14.8% of the study population had normal serum vitamin D levels, indicating that the majority of Iranian women in the reproductive age have vitamin D deficiency.

Keywords: Vitamin D Deficiency, Iranian Women, Serum 25 (OH) D Levels, Prevalence

1. Background

Vitamin D (25-hydroxy) is a fat-soluble vitamin that can be absorbed through skin or by oral intake. It helps the body absorb calcium and phosphorus from the intestine and inhibits the release of PTH, resulting in maintaining healthy bones in the body, whereas chronic and severe vitamin D deficiency leads to decreased bone mineralization (1, 2). New evidence have suggested the association of vitamin D deficiency with increased risk of Type 1 diabetes disease, multiple sclerosis, rheumatoid arthritis, hypertension, cardiovascular diseases and cancer, and several studies also indicate the effective role of vitamin D supplementation in improving bone health and reducing all-cause mortality (3-6).

Although there is no consensus on the cut-point, serum concentrations less than 20 ng/mL is mostly defined as vitamin D deficiency and different societies have reported high prevalence of vitamin D deficiency (7, 8). However, as far as the sunlight is considered, which is a significant source of vitamin D, women in Muslim countries have limited absorption of sunlight due to Hijab (9, 10).

Iranian studies have also highlighted the high rates of vitamin D deficiency in different cities of Iran (11-13), and have reported higher prevalence in young and middle aged females (14). In addition, vitamin D deficiency is also significant in Iranian pregnant women, causing adverse perinatal outcomes (15, 16). Considering the fact that vitamin D deficiency has additional importance during pregnancy and is significantly higher in Muslim women.

2. Objectives

This study aimed to assess the serum level of vitamin D in women of reproductive age in Tehran.

3. Methods

3.1. Study Design

A multicenter cross-sectional study was performed in Islamic Azad university hospitals (Javaheri, Amiralmomenin, and Boo Ali hospitals) in Tehran, the capital of Iran, from 2013 to 2015. In this study, 300 women who referred to gynecology clinic of the afore-mentioned hospitals and aged 15 - 45 years were selected by simple random sampling method. The sample size was calculated as follows:

$$n = \frac{N\left(z_{1-\frac{\alpha}{2}}\right)^2 pq}{(N-1)\,d^2 + z^2 pq} \quad (1)$$

N = 1000
D = 0.01
A = 0.05
P = 0.5

Demographic information included age, height, body weight, body mass index (BMI), medical history and duration of daily sun exposure.

Patients with a history of chronic diseases, including diabetes mellitus Type 1, hypertension, thyroid and parathyroid diseases, malabsorption syndrome, osteomalacia, osteoporosis, kidney disease, liver disease, breast feeding, and patients who had used vitamin D supplement in the previous month were excluded from the study.

3.2. Measurement Method of 25-Hydroxyvitamin D

After an overnight fasting (10 - 12 hours), one venous blood sample was taken from the left cubital vein in sitting position between 8 and 9 am. Then, serum 25-OHD was measured by radioimmunoassay (Diasorin, United State).

According to the guidelines, vitamin D deficiency was defined as a 25-OHD level of less than 20 ng/mL (50 nmol/L), vitamin D insufficiency as 21 to 29 ng/mL, and a normal level as above 30 ng/mL (75 nmol/L) (35 - 38), and deficiency was classified as mild ($\geq$ 25 nmol/L), moderate (12.5-25 nmol/L) and severe ($\leq$ 12.5 nmol/L) (14).

3.3. Statistical Analyses

We used frequencies, percentages, and cross tabulations for descriptive analysis. Also, t-test, χ^2 test and one-way ANOVA were used to analyze the differences in mean serum levels for severe, moderate, and mild deficiencies. Analysis was performed by SPSS software Statistics (Version 18). A significance level of 0.05 was considered for all tests.

4. Results

A total of 300 patients were included in this study with the mean age of 31.17 $\pm$ 14.6 years. The mean weight of the study population was 67.52 kg, and the mean height was 162.55 cm.

The mean serum 25-OHD level was 18.32 $\pm$ 7.3 ng/mL. Of the included patients, 85.2% (257 of 300) were vitamin D deficient, and only 14.8% (43 of 300) had normal serum levels (Table 1). Among patients with vitamin D deficiency, 122 cases had severe deficiency, 96 had moderate, and 38 had mild deficiency.

Moreover, 97 cases (29.10%) were currently pregnant, among whom 83 were vitamin D deficient. The grade of vitamin D deficiency based on the trimesters is demonstrated in Table 2.

5. Discussion

A total of 300 women were included in this study, with the mean serum 25-OHD level of 18.32 $\pm$ 7.3 ng/mL and 85.2% vitamin D deficiency. Among patients with vitamin D deficiency, 122 cases had severe deficiency, 96 had moderate and 38 had mild deficiency and 29.10% were currently pregnant.

Recent studies on Iranian women revealed high prevalence of vitamin D deficiency with the highest prevalence in Tehran and lowest in Mashhad and Bushehr (14), that might be attributable to sunlight exposure, which is a significant issue for Iranian women who have limited absorption of sunlight due to Hijab (9, 10). The higher overall rate of vitamin D deficiency in the Middle East than in Europe and America (17) might also reflect the role of Hijab in Islamic countries.

In a study by Hovsepian on an Iranian sample of pregnant mothers in 2011 in the city of Isfahan, the trend of severe (26.9%), moderate (23.9%) and mild (19.6%) vitamin D deficiency (16) seemed to be similar to that of our study, which highlights the significance of paying attention to serum levels of vitamin D in pregnant mothers, and women of reproductive age.

In another study by Hashemipour (2004) in Tehran, the serum levels of vitamin D in young and middle aged women were significantly lower than the older group (14), which is in line with the results of this study. This difference can be justified by parenteral use of vitamin D plus calcium supplements that is commonly prescribed to older women in Tehran for prevention or treatment of osteoporosis.

Although multiple studies have addressed the important issue of vitamin D deficiency, especially in Iran, the literature review shows that this issue is still a common health problem in Iran. In 2014, Ebrahimi found that even in the city of Semnan with high sun exposure, Iranian adolescents were mostly vitamin D deficient and had little sun exposure. In the recent decades, the change in the playing habits of children has also been another factor contributing to less sun exposure, as children in today's world mostly sit at home and play computer games (18). Furthermore, it has been mentioned that the serum level of vitamin D is lower in the colder seasons of the year (16). However, in this study, the serum level of vitamin D was not significantly different in different seasons, which might be due to the small sample size when categorized into season of measurement. This might be due to the fact that the intense heat in the summer make women stay at home and even if they come out, their clothing (Hijab) would prevent efficient sun exposure.

Because various factors influence the serum level of vi-

Table 1. The Severity of Vitamin D Deficiency According to Different Age Groups, BMI Groups, Number of Parity, and Season of Sampling

Variable	Group	Severe Deficiency N = 122	Moderate Deficiency N = 96	Mild Deficiency N = 38	P Value
Age	15 - 25 years	50%	27.78%	16.67%	0.584
	(n = 56)	(n = 28)	(n = 16)	(n = 9)	
	26 - 35 years	38.95%	34.30%	11.63%	0.250
	(n = 178)	(n = 69)	(n = 61)	(n = 21)	
	36 - 45 years	34.5%	26.69	12.5%	0.025
	(n = 66)	(n = 25)	(n = 20)	(n = 8)	
BMI	BMI < 19				0.980
	3.13%	50%	25%	25%	
	(n = 4)	(n = 2)	(n = 1)	(n = 1)	
	19 < BMI < 25				0.058
	48.44%	43.55 %	29.03%	14.52%	
	(n = 62)	(n = 27)	(n = 18)	(n = 9)	
	25 < BMI < 30				0.054
	40.63%	32.69%	32.69%	21.15%	
	(n = 52)	(n = 17)	(n = 17)	(n = 11)	
	BMI > 30	40%	10%	30%	0.021
	(n = 10)	(n = 4)	(n = 1)	(n = 3)	
Parity	P = 0				0.325
	57.24%	44.58%	30.72%	12.05%	
	(n = 172)	(n = 77)	(n = 53)	(n = 21)	
	P = 1				0.145
	22.41%	36.92%	30.77%	16.92%	
	(n = 67)	(n = 25)	(n = 21)	(n = 11)	
	P = 2				0.014
	12.76%	32.43%	45.95%	8.11%	
	(n = 38)	(n = 12)	(n = 18)	(n = 3)	
	P = 3				0.025
	7.59%	8.32%	23%	13.8%	
	(n = 21)	(n = 8)	(n = 5)	(n = 3)	
Season of sampling	Spring				0.148
	35.17%	32.35%	40.2%	14.71%	
	(n = 106)	(n = 34)	(n = 42)	(n = 16)	
	Summer				0.003
	17.42%	50%	22%	12%	
	(n = 52)	(n = 26)	(n = 11)	(n = 6)	
	Autumn				0.008
	13.10%	52.63%	28.95%	5.26%	
	(n = 39)	(n = 20)	(n = 11)	(n = 2)	
	Winter				0.058
	34.48%	40%	30%	14%	
	(n = 103)	(n = 41)	(n = 31)	(n = 14)	

Table 2. The Severity of Vitamin D Deficiency in Non-Pregnant and Pregnant Women Based on Different Trimesters

		Severe Deficiency	Moderate Deficiency	Mild Deficiency	P Value
Non pregnant	67.59%	43.37%	30.1%	10.71%	0.128
	(N = 203)	(n = 88)	(n = 61)	(n = 22)	
Pregnant	First trimester				0.986
	9.66%	42.86%	46.43%	10.71%	
	(n = 29)	(n = 12)	(n = 13)	(n = 3)	
	Second trimester				0.997
	13.79%	32.5%	30%	20%	
	(n = 41)	(n = 13)	(n = 12)	(n = 8)	
	Third trimester				0.258
	8.97%	30.77%	34.62%	19.23%	
	(n = 27)	(n = 8)	(n = 9)	(n = 5)	

tamin D, as well as the fact that its deficiency causes multiple diseases and complications (3-6), it is still a major health problem, especially in women. Therefore, the authors of this study suggest that health policy makers take an urgent action on this matter, and that vitamin D deficiency should become one of the priorities outlined in the health policies.

This study had some limitations, including assessing one geographic region of residence, lack of controlling vitamin D intake during the day, limited sample size, and ignoring confounders such as level of education, type of job and type of dress for women.

Additional studies are required to determine the causes of vitamin D deficiency in different regions and provinces of the country to identify the reason for this high rate of vitamin D deficiency, especially in women of reproductive age. It is also necessary to design efficient policies and strategies to prevent and control vitamin D deficiency.

In conclusion, according to the results of this study, only 14.8% of the women of reproductive age had normal serum vitamin D levels, indicating that the majority of Iranian women in the reproductive age have vitamin D deficiency, which is an important health issue.

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