

# Vitamin D status in women in İzmir

## İzmir'deki kadınlarda vitamin D düzeyi durumu

Ayfer AYDOĐDU ÇOLAK, Neře DOĐAN, Ümit BOZKURT, Ramazan AVCI, İsmail KARADEMİRÇİ

Tepecik Eđitim ve Arařtırma Hastanesi, Tıbbi Biyokimya, İzmir

### ABSTRACT

**Objective:** Vitamin D is a steroid hormone synthesized in the skin under the effect of sun light or it is taken with meals. The most important effect of vitamin D involves calcium homeostasis, and bone metabolism. Presumably one billion people have vitamin D deficiency or insufficiency. The aim of this study was to determine vitamin D deficiency in various seasons in female patients who were admitted to our hospital and to evaluate the difference between Vitamin D levels according to age groups.

**Methods:** Vitamin D levels of 10089 female patients who were admitted to our hospital between January 2011 and February 2013 were investigated retrospectively using the hospital information system. Serum vitamin D levels were determined in Cobas e 411 auto-analyzer using an electro-chemiluminescent method.

**Results:** Mean value of vitamin D for all patients was  $18.05 \pm 13.81$  (3-100) ng/ml. The prevalence of vitamin D deficiency, and insufficiency were 67.2, and 16.8%, respectively. There was a statistically significant difference in 25(OH) D levels observed in different seasons ( $p < 0.05$ ).

**Conclusion:** Vitamin D deficiency and insufficiency are common (up to 80%) in adult women and we believe that dietary support and vitamin D supplementation would be appropriate.

**Key words:** Vitamin D deficiency, vitamin D status, vitamin D levels, women, seasonal variations

### ÖZET

**Amaç:** D vitamini güneř ışığı ile ciltte sentezlenen veya diyetle alınan steroid bir hormondur. D vitamininin en önemli etkisi kalsiyum homeostazı ve kemik metabolizması üzerinedir. Dünyada 1 milyar kişide D vitamini eksikliği veya yetersizliği olduđu düşünölmektedir. Hastanemizde D vitamini ölçümü yapılan kadın hastalarda mevsimlere göre D vitamini düzeylerini arařtırmayı ve yař gruplarına göre D vitamini eksikliđini belirlemeyi amaçladık.

**Yöntemler:** Ocak 2011-Şubat 2013 tarihleri arasında hastanemiz bilgi sisteminden 10089 kadın hastanın D vitamin düzeyleri retrospektif olarak incelendi. Serum D vitamin düzeyleri aynı gün Cobas e 411 analizöründe elektro-kemilüminesans yöntemiyle ölçöldü.

**Bulgular:** Tüm kadın hastaların D vitamin sonuçları  $18,05 \pm 13,81$  (3-100) ng/ml'dir ve eksiklik (eşik: 20 ng/ml) prevalansı %67,1 (6770/10089 kadın); yetersizlik (eşik: 30 ng/ml) prevalansı %16,8 oranda bulundu. D vitamini düzeyinde mevsimler arasında anlamlı fark saptandı ( $p < 0.05$ ).

**Sonuç:** Tüm yetişkin kadın yaşlarında D vitamini yetersizliği ve eksikliği (%80'nin üzerinde) yaygındır. Diyet ve D vitamini takviyesinin uygun olduđu görüşündeyiz.

**Anahtar kelimeler:** Vitamin D eksikliği, vitamin D durumu, vitamin D düzeyi, kadınlar, mevsimlere göre deđişkenlik

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**Yazışma adresi:** Uzm. Dr. Neře Dođan, Gaziler Cad. No:468, Yenişehir-konak-İzmir  
**e-mail:** drnesesimsek@gmail.com

### INTRODUCTION

Vitamin D is a fat-soluble vitamin and belongs to a group of steroids which has hormone-like func-

tions. Vitamin D has two sources: the first one is cholecalciferol (vitamin D3) which is synthesized in the skin and the second one is ergocalciferol (vitamin D2) which is obtained from dietary. Both of them are

metabolized in the same way so that both are called as vitamin D. Nearly 80 to 90% of vitamin D requirement is provided by sun rays and 10-20% by the nutrients. The most important effect of vitamin D is on calcium hemostasis and bone metabolism <sup>(1,2)</sup>. Besides these effects, vitamin D also plays a role in the etiology of some cancers, multiple sclerosis, type 1 diabetes, Crohn disease and other autoimmune diseases and granulomatous diseases as tuberculosis <sup>(3)</sup>. Serum concentration of 25-OH vitamin D [25(OH) D] is the best indicator of vitamin D status and its levels do indicate the amount of vitamin D stored in the body. The 25-OH vitamin D is the best indicator of vitamin D status because it has a half-life of 3-4 weeks. There is considerable discussion about the reference values of vitamin D and cut-off values have not been developed by a scientific consensus process.

Most experts usually recommend using health-based reference values instead of population-based reference values which are very low <sup>(4)</sup>.

Normal value of serum levels of vitamin D is controversial. Recent studies show that a blood level of 25(OH) D<10 ng/ml is considered to be a very severe vitamin D deficiency, while <20 ng/ml indicates vitamin D deficiency, 21-29 ng/ml vitamin D insufficiency, 30 ng/ml vitamin D sufficiency whereas >150-200 ng/ml is vitamin D intoxication <sup>(5-7)</sup>. It is considered that one billion people in the world have vitamin D deficiency or insufficiency.

The aim of this study was to determine vitamin D deficiency dependency on seasons in female patients who admitted to our hospital and to evaluate the differences between vitamin D levels according to age groups.

## MATERIAL and METHODS

Vitamin D levels of 10089 female patients who admitted to our hospital between January 2011 and February 2013 were investigated retrospectively through the hospital information system. Only the data obtained from the outpatients were used, while

the data from the inpatients were excluded. Serum vitamin D levels were measured at the day of the blood collection using Cobas E 411 (Roche Diagnostics) device and an electro-chemiluminescent method (ECLIA) by using original reagent, control materials and a calibrator. The intra-assay and inter-assay CVs were 3.7% and 2.9%, respectively. The lower detection limit of the assay was 1.6 ng/ml. In this method total vitamin D is measured.

Ambulatory female patients were categorized into 3 age groups: 18-44 years, 45-64 years and over 65 years of age. The frequencies of vitamin D deficiency, and serum concentration of vitamin D were estimated and stratified by age groups and seasons.

All analyses were performed by using SPSS software (version 15.0.1, SPSS Inc. Chicago, IL). Data were reported as mean±SD (standard deviation) and also expressed as frequencies and 95% confidence intervals (95% CI). Differences were considered significant if p was <0.05.

İzmir is a large metropolis (the third big city in Turkey) with over 2 million inhabitants and a highly crowded buildings. Winter months involve 3-4 months, and the number of sunny days are higher than cloudy days.

This study is a retrospective, monocentric trial.

## RESULTS

A total number of 10089 women aged between 18 and 96 (56.2±15.0) years were included in the study. Mean serum 25-OH vitamin D level of the whole group was 18.05±13.81 (3-100) ng/ml with a statistical significant difference among spring, summer, autumn and winter months (21.07±17.77; 19.38±14.14; 16.69±13.65 and 16.94±13.00 ng/mL, respectively (p<0.001).

Overall prevalence of vitamin D deficiency and insufficiency was 16.8% and 67.2%, respectively. The highest prevalence of vitamin D deficiency and insufficiency was seen in women aged between 18 and 44 (15.6% and 73.3%, respectively) and 45 and 64 (17% and 67.5%, respectively) years. Its preva-

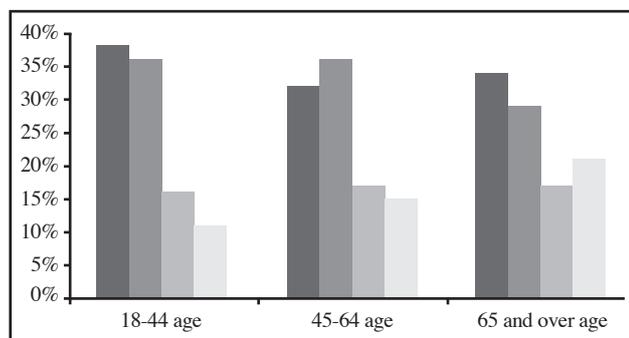
lence decreased with age down to 17.3% and 62.2% in women aged 65 and over 65 years of age, respectively. In 11.3, 15.4, 20.6 % of the women in the age groups of 18-44, 45-64, >65 years had sufficient levels of vitamin D. Only 16.1% of all women had sufficient vitamin D concentrations. Whereas the highest prevalence of severe deficiency was detected to be 37.5% in women aged between 18 and 44 years, while 33.5% of all women had severe vitamin D deficiency (Table 1). According to age groups, the prevalence rates of vitamin D deficiency were shown in Graphic A.

**Table 1. The prevalence of Vitamin D according to four categories as the excess deficiency, the deficiency, the insufficiency and sufficiency.**

	n	The Excess Deficiency <10 ng/ml (%)	The Deficiency 10-20 ng/ml (%)	The Insufficiency 20-30 ng/ml (%)	The Sufficiency 30-70 ng/ml (%)
		n	n	n	n
		18-44	37,5	35,8	15,6
n=2172	815	777	339	241	
<b>Age Groups (Years)</b>					
45-64	31,5	36,0	17,0	15,4	
n=4804	1515	1731	818	740	
>65	33,6	28,6	17,3	20,6	
n=3113	1046	889	537	641	
	33,5	33,7	16,8	16,1	
<b>Total</b>	n=10089	3376	3397	1694	1622

n, number of participants in each group.

**Graphic A. The frequencies of Vitamin D status in women according to age groups (percentage).**



Frequencies (%)

\*Blue is below 10 ng/ml, red is 20 ng/ml, yellow is 21-30 ng/ml and green is 30 ng/ml or greater.

## DISCUSSION

Data about vitamin D levels encompassing approximately 2 years were retrieved from our hospital information system, and examined retrospectively. Consequently, remarkably higher prevalence rates of vitamin deficiency and insufficiency were detected. Vitamin D deficiency has a high prevalence over the world. Especially, in the Middle East and Asia, vitamin D deficiency in adults is highly prevalent (8). Vitamin D levels were investigated in several studies conducted in Turkey. Especially in studies performed on pregnant mothers and their babies, a high rate of vitamin D deficiency has been shown (9-11). In our study we investigated Vitamin D levels in female patients admitted to our hospital, and average vitamin D levels were found to be below 20 ng/ml. When we accepted vitamin D deficiency cut-off value as below 20 ng/ml, the estimated prevalence of deficiency was 67.1 percent. However when we accepted vitamin D insufficiency cut-off value as below 30 ng/ml, prevalence of insufficiency was 83.9 percent. These values were higher than findings in a study performed by Ucar et al. (12) performed on young and elderly adults in Ankara. The authors found prevalence of vitamin D deficiency, and insufficiency as 20.7%, and 51.8%, respectively

According to a study which included both the young and old women, prevalence of deficiency and insufficiency of vitamin D were quite high. In the same study, vitamin D levels were lower in older women than in younger women (13). In our study, vitamin D sufficiency in women aged 18 to 44 years were found to be lower than both those aged 45-65 and also over 65 years of age. These results can be seen to be contrary to the expectation of a decreasing synthesis of vitamin D with aging in the older age group. Vitamin D supplementation might be given to the selected study group by physicians. Presence of a previous or ongoing treatment of vitamin D could not be checked which can be considered as one of the limitations of our study. Mean value of 25-OH vitamin D in spring was found to be higher than in sum-

mer. This can be due to vitamin D supplementations taken by women who were admitted to the study in spring, or it is also possible that the greater number of measurements in summer were from covered women. Our retrospective study design did not provide a possibility for getting any information about the clothing style.

According to a study, in 127 participants who were admitted into primary care health center in Spain and had no illness to effect vitamin D status, vitamin D levels were found to be  $\leq 10$  ng/ml in 34.5% of the participants <sup>(14)</sup>.

In another study including postmenopausal women between ages 47 to 66 who admitted into a rheumatology outpatient clinic, when 14.8 ng/ml was accepted as the lower limit of normal for vitamin D, prevalence of vitamin D deficiency was detected to be 64 percent <sup>(15)</sup>.

There are studies about postmenopausal women with osteoporosis who had not received adequate 25 (OH) vitamin D. In a study which was made in different cities of Turkey with postmenopausal women over 40 years of age, similar vitamin D levels were found (20 ng/dl) while the lowest level was detected in Osmaniye <sup>(16)</sup>.

In autumn and winter, vitamin D levels were close to each other, but lower than those observed in spring and summer months.

In a randomized study performed by Kull and his colleagues in Estonia compared to winter, at the end of the summer, vitamin D levels were higher in both gender <sup>(17)</sup>. Along with personal characteristics, many other factors as geographic region, race and cultural factors that affect vitamin D levels may vary depending on the research population <sup>(18,19)</sup>. In the epidemiological studies; for prevention of diseases like rickets, osteomalacia, and to maintain bone quality, normal serum 25-OH D concentrations should be kept at a minimum level of 20 ng/ml as recommended. As emphasized in these studies in order to reduce the risk of cancer, autoimmune, and chronic diseases such as cardiovascular diseases, serum 25-OH D level should be kept above 30 ng/ml.

Considering the high rates of vitamin D insufficiency and deficiency, when women admitted to the hospital with vitamin D deficiency symptoms, such as muscle weakness, and generalized bone pain, they should be questioned for vitamin D deficiency.

As a result of the data of our study, we recommend that vitamin D levels of all women living in our country should be measured.

Prevention of vitamin D insufficiency/deficiency can be achieved with education in the community, raising the awareness of the public about this issue, adequate exposure to sunlight, adequate and balanced diet rich in calcium and vitamin D content. Intake of foods fortified with vitamin D and taking vitamin D supplements should be considered when planning public health policy.

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