

# Vitamin D deficiency in individuals applying to physical therapy outpatient clinic

Vitamin D deficiency in Turkey

Nilufer Aygun Bilecik<sup>1</sup>, Zeynep Kilic<sup>2</sup>

<sup>1</sup> Department of Physical Medicine and Rehabilitation, Adana City Hospital, Adana

<sup>2</sup> Department of Physical Medicine and Rehabilitation, Ankara City Hospital, Ankara, Turkey

## Abstract

**Aim:** The aim of our study was to determine if there is vitamin D deficiency in adults who were examined in our hospital's Physical Medicine and Rehabilitation outpatient clinic and whose 25-OH vitamin D level was measured in laboratory examination, and to determine the difference between 25-OH D3 levels according to age, gender and seasons.

**Material and Methods:** The levels of 25-OH vitamin D in patients who applied to our outpatient clinic between April 2018 and April 2019 were examined retrospectively.

**Results:** The mean 25-OH vitamin D level in the examined patients (n = 1110) was 17.1 (19.2 ± 12.6). 25-OH vitamin D levels were statistically significantly higher in men than in women. The Vitamin D value in the April-October period was found to be significantly higher (p <0.05) than in the November-March period.

**Discussion:** In our study, widespread vitamin D deficiency and insufficiency were found in patients who applied to our hospitals. Emphasizing that this situation can be seen at a high rate even in sunny regions such as Adana, we think that it will be appropriate to inform people about benefiting from sunlight enough, proper nutrition and vitamin D supplementation when necessary.

## Keywords

25-Hydroxy vitamin D; Vitamin D deficiency; Age; Gender

DOI: 10.4328/ACAM.20524 Received: 2021-02-06 Accepted: 2021-04-01 Published Online: 2021-05-03

Corresponding Author: Nilufer Aygun Bilecik, Department of Physical Medicine and Rehabilitation, Adana City Hospital, Adana, Turkey.

E-mail: drnilaygun@gmail.com P: +905323562611

Corresponding Author ORCID ID: <https://orcid.org/0000-0002-5113-2287>

## Introduction

Vitamin D has important effects on calcium homeostasis and bone metabolism in the body [1, 2]. While Vitamin D<sub>2</sub> is produced by plants, the main source of vitamin D in humans is UVB radiation from sunlight. 80-90% of the daily vitamin D requirement is obtained from sunlight, and a very low amount is taken from foods and foods [3, 4]. For the positive effects of vitamin D to occur, adequate exposure to sunlight or the active form of vitamin D, which is the active form of 1,25-Dihydroxy D, must be kept at normal levels. While the half-life of 1,25 dihydroxy vitamin D, which is the active form of vitamin D, is 4-6 hours, the half-life of 25-OH D<sub>3</sub> is approximately 2-3 weeks, so 25-OH D<sub>3</sub> levels are generally measured in the body [5-7]. Subclinical vitamin D deficiency and insufficiency affect most men and women in all age groups in many geographical regions. This situation arises as a result of a diet poor in calcium, together with insufficient exposure to sunlight [8]. Despite the uncertainty about the ideal level of vitamin D, many studies accept vitamin D deficiency as a common problem, especially in winter, even in areas with plenty of sunshine [9, 10].

Vitamin D deficiency and insufficiency in Turkey pregnant women, babies, adults, and is one of the major health problems affecting the elderly. In this study, it was aimed to determine the frequency of vitamin D deficiency in individuals who applied to our physical therapy outpatient clinics and to investigate if there is a significant difference between 25-OH D<sub>3</sub> levels considering age, gender and seasonal differences.

## Material and Methods

25-OH vitamin D levels in patients admitted to our hospitals in Adana province between April 2018 and April 2019 were analyzed retrospectively. The data of the patients whose outpatient clinic records were examined and who had chronic renal failure, chronic liver disease and who had dialysis unit registration were not included in the study. 25-OH vitamin D levels were studied with Chromsystems (Chromsystems, Instruments and Chemicals, München-Germany) reagents and Agilent 1100 (Agilent Technologies, Germany) using HPLC (High Performance Liquid Chromatography) method. According to the manufacturer's information, Intra-assay CV <5%, inter-assay CV <7%, Linearity: 2.5-250 ng/ml. The patients were grouped according to age and gender. The distribution of vitamin D levels by months was examined.

### Statistical analysis

Statistical analysis was done using the SPSS 22.0 program. Mean, standard deviation, median, min-max, ratio and frequency values were used in the complementary statistics of the data. The distribution of variables was checked with the Kolmogorov-Smirnov test. The Kruskal-Wallis and Mann-Whitney U tests were used in the analysis of quantitative data. The Chi-square test was used in the analysis of qualitative data. P-values less than 0.05 were considered statistically significant.

## Results

The research was conducted on 1110 patients; 881 of the patients were female (79.4%), 229 were male (20.6%). The mean age of the patients was 55 ± 15.3, and the mean 25-OH vitamin D level was 19.2 ± 12.6. Taking 20 ng/ml as the cut-

off value, it was found that the rate of vitamin D deficiency was 61.7% and the rate of vitamin D insufficiency was 26.3% (Table 1).

The mean 25-OH D<sub>3</sub> level in female patients was 19 ± 13.1, while the mean 25-OH vitamin D level in male patients was 20 ± 10.1. While 25-OH vitamin D levels in 58.5% of men were below 20 ng / dl, this rate was 62.5% in women. The difference between vitamin D levels in both sexes was not statistically significant.

The mean 25-OH vitamin D value in men was significantly higher than in women (p <0.05) (Figure 1). The 25-OH vitamin D value was significantly higher (p <0.05) in the April-October period compared to the November-March period (Figure 2).

The average 25-OH vitamin D level was 20.8 ± 15.4 ng/ml in the 18-39 age group (n = 178), 18.7 ± 12.0 ng/ml in the 40-69 age group (n = 731), in patients aged 70 and over (n = 201) was found to be 19.5 ± 11.7 ng/ml. The 25-OH D<sub>3</sub> level did not differ significantly (p > 0.05) according to age groups (Table 2).

Considering the relationship between 25-OH vitamin D level and the periods, 25-OH vitamin D levels of 30 ng/dl and above were found to be statistically significantly higher in women in the April-October period compared to the November-March period (p=0.001). No such relationship was found in men. The rate of patients with 25-OH vitamin D level <20 ng/ml in the November-March period was significantly higher (p=0.001) compared to the April-October period (Table 3). There was no significant difference in vitamin D levels between men and women by age groups (p = 0,749 and p = 0,394, significantly).

**Table 1.** Patients' demographic characteristics and Vitamin D distribution.

	Median (Min-Max)		Mean±SD/ n-%
Age	55	18 - 93	55 ± 15,3
18-39 years			178 16,0%
40-69 years			731 65,9%
70 < years			201 18,1%
Gender			
Male			229 20,6%
Female			881 79,4%
Period			
April-October			648 58,4%
November-March			462 41,6%
January			20 1,8%
February			45 4,1%
March			134 12,1%
Engagement			168 15,1%
May			8 0,7%
June			82 7,4%
July			100 9,0%
August			54 4,9%
September			81 7,3%
October			155 14,0%
November			116 10,5%
December			147 13,2%
Vitamin D	17,1	2,8 - 128,1	19,2 ± 12,6
<20			685 61,7%
20-29			292 26,3%
30 <			133 12,0%

**Table 2.** Distribution of Vitamin D groups by periods

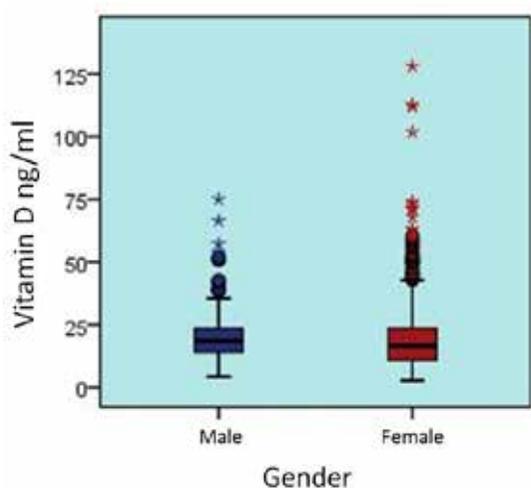
	Vitamin D Levels			P
	Mean±SD	Median (Min-Max)		
Total	19,2 ± 12,6	17,1	2,8 - 128,1	
<b>Gender</b>				
Male	20,0 ± 10,1	18,6	4,2 - 75,0	0,004
Female	19,0 ± 13,1	16,7	2,8 - 128,1	
<b>Period</b>				
April- October	20,3 ± 13,5	18,1	2,8 - 128,1	0,000
November - March	17,5 ± 11,0	16,1	4,2 - 112,9	
<b>Age</b>				
18-39 years	20,8 ± 15,4	18,0	4,2 - 112,9	0,147
40-69 years	18,7 ± 12,0	16,6	2,8 - 128,1	
70 < years	19,5 ± 11,7	18,1	4,2 - 71,4	

Kruskal-Wallis / Mann-Whitney U test

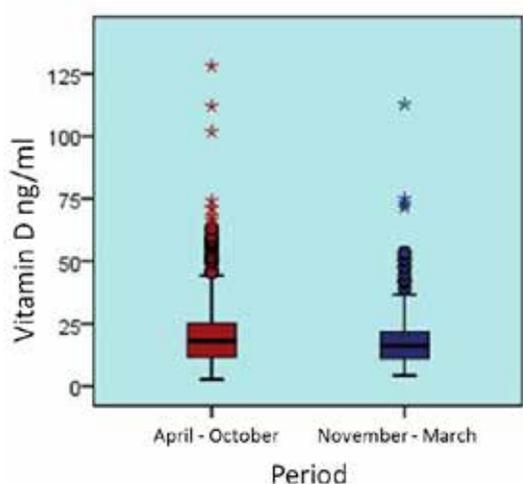
**Table 3.** Vitamin D levels in women by periods

Period	< 20 Vit. D		20≤Vit. D<30		≤ 30 Vit. D		TOTAL	
	n	%	N	%	n	%	n	%*
April - October	297	58,2	136	26,7	77	15,1	510	57,9
November - March	254	68,5	87	23,5	30	8,1	371	42,1
Total	551	62,5	223	25,3	107	12,1	881	100,0

Chi- square: 13,164                      p,0001



**Figure 1.** 25-OH D3 levels by periods



**Figure 2.** 25-OH D3 levels by gender

**Discussion**

25-OH Vitamin D has an important effect on calcium and bone metabolism. It increases the absorption of calcium and phosphate from the intestine and is an important factor in bone mineralization. Vitamin D deficiency causes secondary hyperparathyroidism, bone resorption and increases the risk of fracture formation. Severe vitamin D deficiency (25-OH vitamin D level <12.5 nmol/l or 5 ng/ml) causes rickets in children and bone mineralization defect that causes osteomalacia in adults. There are also publications showing that it is associated with cardiovascular diseases and type 2 diabetes [11, 12]. Vitamin D deficiency is common, especially among the elderly. 25-OH Vitamin D deficiency is common in Europe. However, seasonal changes have a significant effect on 25-OH Vitamin D levels because cholecalciferol is synthesized in the skin under the influence of ultraviolet (UV) light [13, 14]. Almost no 25-OH Vitamin D is synthesized between October and March in the United States and the northern parts of Canada and Northern Europe [15]. However, this is generally not the case in more southern countries [16]. Studies have found that vitamin D deficiency has a high prevalence not only in the risk group, but also in the Middle East and Asian countries [15]. Vitamin D levels also have been investigated in several studies conducted in Turkey [17-21]. In studies conducted in the last twenty years, Turkey, India, China, Saudi Arabia and Iran, even in a tropical climate and sunny countries such as high rates of vitamin D deficiency have been reported [15, 22]. In the study conducted by Ucar et al. in Turkey, when the cut-off value was taken as 20 ng/ml, 51.8% vitamin D deficiency and 20.7% vitamin D insufficiency were found in patients [21]. In our study, when 20 ng/ml was taken as the cut off value, 61.7% vitamin D deficiency and 26.3% vitamin D insufficiency were detected. In a French study, 25-OH vitamin D deficiency was found at a rate of 14% in the winter months in healthy adults [23]. In a study conducted by Levis et al., in South Florida, the importance of seasonal changes was emphasized by finding a statistically significant increase in 25-OH vitamin D concentrations of 13% in women and 14% in men during the summer period [24]. In the study conducted by Bozkurt et al., in Turkey, 25-OH vitamin D levels were found to be significantly lower in winter than in summer [18]. In our study, 25-OH D3 levels were found to be significantly lower in winter than in summer, in line with the literature. In our study, 25-OH vitamin D levels in men were significantly higher than in women (p <0.05). Similarly, in the study by Ono et al., 25-OH vitamin D levels in men were found to be statistically significantly higher than in women [25]. Many factors, such as cultural factors, geography, race, as well as personal characteristics affect vitamin D levels and may vary depending on the population in which studies are conducted [6, 22]. Although our study was conducted in a sunny region, a high level of vitamin D deficiency was detected. 25-OH vitamin D deficiency was found in more than half of the cases in the study performed by Kaya et al. on postmenopausal women in the Izmir region [26]. The reasons limiting our study are retrospective examination of the patients' records, their body mass indexes and the duration of exposure to sunlight, and the unknown presence or absence of any chronic diseases.

## Conclusion

In conclusion, a high rate of vitamin D deficiency and insufficiency was detected in patients who applied to our hospital in Antalya, and we think that it would be appropriate to supplement the person with vitamin D, bearing in mind that even in areas with abundant sunny and tropical climates, there may be high rates of 25-OH vitamin D deficiency. In addition, patient education about the importance of sunbathing and dietary content can also contribute to treatment.

## Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

## Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

**Funding:** None

## Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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## How to cite this article:

Nilufer Aygun Bilecik, Zeynep Kilic. Vitamin D deficiency in individuals applying to physical therapy outpatient clinic. *Ann Clin Anal Med* 2021; DOI: 10.4328/ACAM.20524