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Evaluation of seasonal relationship with vitamin D levels in Van region

Van yöresinde D vitamini düzeyleri ile mevsimsel ilişkinin değerlendirilmesi

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ABSTRACT

Aim: Vitamin D is a fat-soluble vitamin which is found in certain foods and can be synthesized from its precursors with exposure of sunlight. It is known that serum 25-hydroxy vitamin D (25-OH Vit D) concentration is the best indicator of Vitamin D level. Main source of Vitamin D is the synthesis to the skin with sunlight exposure. In our study we investigated the vitamin D levels of patients administered to our hospital in Van. We aimed to determine any significant difference between age, sex and seasonal differences of the 25-OH vit D levels.

Materials and Method: Patients admitted to Yuzuncu Yil University Faculty of Medicine Dursun Odabas Medical Hospital from 01.01.2013 to 01.01.2014 with 25-OH vit D levels were determined and evaluated respectively.

Results: Mean age for males (n=306) was found as 46.65±16.62 and for females (n=1613) as 43.58±15.03. Mean 25-OH vit D in males was found as 18.95±7.93 ng/mL and in females it was found as 14.79±9.42 ng/ml. 25-OH vit D levels of males were found significantly higher than that of females ($p<0.05$). When 25-OH vit D levels were analyzed according to season, a mean of 25-OH vit D for the summer season was found significantly higher than those of the winter or autumn-spring months ($p=0.006$). Although Van receives one of the highest amount of sunlight due to its geographical position, we consider that there exists a deficiency in all age groups in the society, for all seasons.

Conclusions: According to these findings we conclude that both nutritional support and Vitamin D supplementation is important for recovery of vitamin D deficiency in and around the city of Van.

Keywords: Vitamin D, gender, sunlight, solar energy, season

ÖZ

Amaç: D vitamini, bazı gıdalarda bulunan ve güneş ışığına maruz kalan öncülerinden sentezlenebilen yağda çözünen bir vitamindir. Serum 25-hidroksi vitamin D (25-OH Vit D) konsantrasyonunun Vitamin D seviyesinin en iyi göstergesi olduğu bilinmektedir. D vitamininin ana kaynağı güneş ışığına maruz kalan ciltten sentez edilmesidir. Çalışmada Van'da hastanemize başvuran hastaların D vitamini düzeylerini geriye yönelik taradık. 25-OH vit D düzeylerinin yaş, cinsiyet ve mevsimsel farklılıkları arasındaki ilişkiyi araştırdık.

Gereç ve Yöntem: Yüzüncü Yıl Üniversitesi Tıp Fakültesi Dursun Odabaş Tıp Merkezine başvuran 01.01.2013 - 01.01.2014 tarihleri arasında 25-OH vit D düzeyleri tespit edilen ve kriterleri sağlayan sonuçlar dahil edildi.

Bulgular: Erkeklerin yaş ortalaması (n = 306) 46.65 ± 16.62, kadınlarda (n = 1613) 43.58 ± 15.03 olarak bulundu. Erkeklerde ortalama 25-OH vit D 18.95 ± 7.93 ng / mL ve kadınlarda 14.79 ± 9.42 ng / ml olarak bulundu. Erkeklerin 25-OH D vitamini düzeyleri kadınlardan anlamlı derecede yüksek bulundu ($p <0.05$). Mevsime göre 25-OH D vitamini seviyeleri analiz edildiğinde, yaz mevsimi için 25-OH Vitamin D ortalaması kış mevsimine ya da Sonbahar-İlkbahar aylarına göre anlamlı olarak yüksekti ($p = 0,006$).

Sonuç: Her ne kadar Van, konumu itibariyle en çok güneş alan şehirler arasında olsa da, tüm mevsimler ve yaş gruplarına göre vitamin D düzeylerinin düşük olduğunu düşünüyoruz. Bu bulgulara göre, Van ilindeki ve çevresindeki vitamin D eksikliğinin düzelmesi için hem beslenme desteğinin hem de D vitamini desteğinin önemli olduğu sonucuna vardık.

Anahtar Kelimeler: D vitamini, cinsiyet, güneş ışığı, güneş enerjisi, sezon

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INTRODUCTION

Vitamin D is a lipid soluble vitamin which is found in food and also can be produced from its precursors due to exposure of sunlight [1]. According to recent studies it was shown that vitamin D deficiency is also important for the pathogenesis of diseases such as diabetes [2], cardiovascular diseases [3], cancer [4] and multiple sclerosis [5] in addition to its well known role on bone metabolism [6,7]. The major source of vitamin D is food intake and the exposure of sunlight to the skin. It was demonstrated in studies that vitamin D levels can vary at different countries according to their latitude and longitude because of their varied sunlight conditions [8,9]. There are also variations among cities in Turkey in respect to the sunlight exposure and the quality of sunlight. Geographical variations such as climate and sunlight exposure may affect vitamin D levels and Bone Mineral Density (BMD) values [10,11]. City of Van (43E20. 38N 28) and towns in vicinity are within the first ranks in Turkey according to quantity of sunlight energy per square meter [12]. It was known that best indicator for vitamin D in a person is the concentration of serum 25-hydroxyvitamin D (25-OH Vit D) [13]. We aimed to determine levels of vitamin D by investigating vitamin D levels at individuals over 18 who administered to our hospital. We also aimed to demonstrate any possible differences of 25-OH vit D levels due to age, sex and seasons.

MATERIALS AND METHODS

Patients administered to Yuzuncu Yil University Faculty of Medicine Dursun Odabas Medical Hospital from 01.01.2013 to 01.01.2014 with 25-OH vit D levels were determined and evaluated respectively. The patients with chronic diseases (diabetes mellitus, chronic kidney failure, hypertension, etc) and patients that receive 25-OH vit D medication were excluded from the study and above 18 year of age, lack of a diagnosed chronic disease, liver, kidney, thyroid function in one or more of the function has not been detected and had not previously been treated with vitamin D included in the study. Permission was obtained from the local ethics committee with the dated 18.12.2015 and numbered 05.

The patients that were included into the study (n=1919) were divided into groups according to their age, sex and season in which the 25-OH vit D results were measured. Seasonal groups were defined as: Summer group; June, July, August and September, Winter group; October, December, January and February, Autumn-Spring group; September, March, April and May; age groups; between 18-39 years, between 40-65 years and above 66 years. In addition we constructed three groups according to serum 25-OH vit D concentrations; 25-OH vit D level between 1-20 ng/mL, 25-OH vit D level between 21-50 ng/mL and 25-OH vit D level above 50 ng/mL. Serum 25-OH vit D concentration was determined by using electro chemiluminescence method with Architect i2000 SR (North Chicago. Illinois. USA) auto analyzer. % CV values of the equipment and method for the defined days were 3.2% and 1.7% respectively.

Statistical Analysis

The data obtained from the hospital information system was analyzed by using Statistical Package for the Social Sciences 13.0 (SPSS 13.0 for Windows). To evaluate the difference between groups ONE-WAY ANOVA test and independent Sample-t test were used. To evaluate the categorical data, chi-Square test was used. Results were expressed as mean±SD and statistical significance was accepted as $p<0.05$.

RESULTS

Mean age of males (n=306) was 46.65±16.62 and age of females (n=1613) was 43.58±15.03. Mean levels of 25-OH vit D of males was found as 18.95±7.93 ng/mL, whereas it was found as 14.79±9.42 ng/ml for females. Mean 25-OH vit D for all of the patients included in the study was found as 15.53 ng/ml (Figure 1). 25-OH vit D levels of males was found statistically significantly higher than that of females ($p<0.05$). No significant difference was found for 25-OH vit D levels according to ages (Figure 2, Table 1). When 25-OH vit D levels were analyzed according to seasonal mean 25-OH vit D level of summer was found significantly higher than Autumn-Spring seasons (Table 1). Analyses of categorical data show that 77.3% of all patients (n=1492) had 25-OH vit D concentration lower than 20 ng/mL, 21% of patients (n=405) had between 21-50 ng/mL and 1.1% (n=22) had higher than 50 ng/mL. Analyses

of other categorical data were given at table 2.

Table1: 25-OH Vitamin D means according to age and season

	25-OH Vit D (ng/mL) M±SD	%95 OGA		p value
		Lower limit	Upper limit	
Age Groups				
18-39 Years (n=817)	15.15±9.01	14.53	15.78	0.246
40-65 Years (n=926)	15.7±9.32	15.1	16.31	
66 Years and above (n=212)	16.25±10.26	14.81	17.69	
Season Groups				
Summer (n=708)	16.028±10.03	15.52	17.04	0.026
Winter (n=618)	15.2±8.94	14.49	15.91	
Au-	15.00±8.49	14.33	15.68	

%95 OGA: %95 confidence interval of means.

Table 2: Distribution of 25-OH vitamin D status within sex, season and age groups.

	25-OH vitamin D Status			
Sex	1-20 ng/ mL	21-50 ng/mL	>50 ng/ mL	p value
Male %within group (n)	59.8% (183)	39.9% (122)	0.3% (1)	0.0001
Female % within group (n)	81.2%(1309)	17.5% (283)	1.3% (21)	0.0001
Season				
Summer %within season (n)	74.9% (522)	23% (160)	2.2% (15)	0.006
Winter % within season(n)	79.5% (484)	19.5% (119)	1% (6)	0.006
Au- tumn-Spring % within season(n)	79.2% (484)	20.6% (126)	0.2% (1)	0.006
Age				
18-39 years % within age group (n)	79.3% (637)	19.8% (159)	0.9% (7)	0.001
40-65 years % within age group (n)	76.5% (702)	22.3% (205)	1.2% (11)	0.001
66 years and above % within age group (n)	77.3% (153)	20.7% (41)	2% (4)	0.001

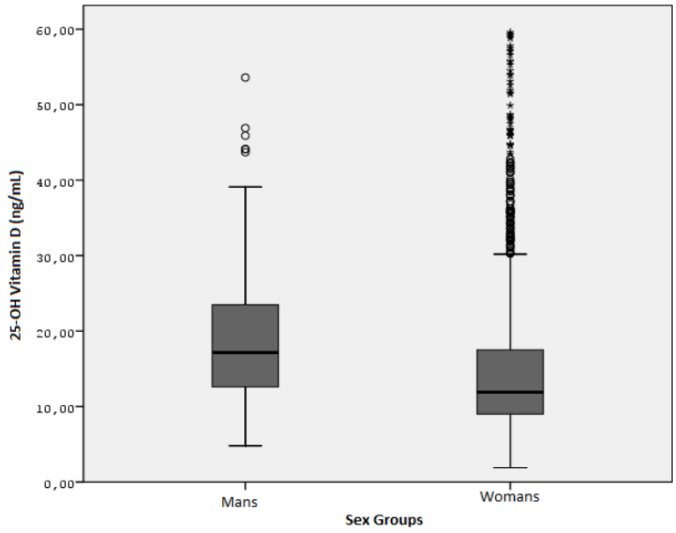

Figure 1: 25-OH vitamin D concentration levels according to sex.

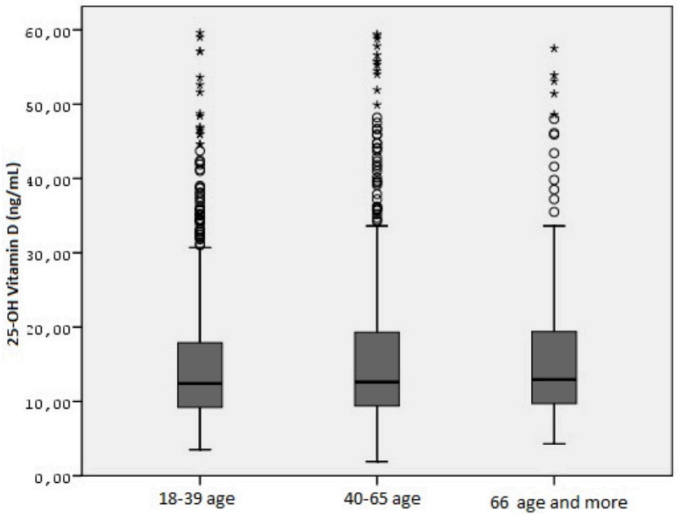

Figure 2: 25-OH vitamin D concentration levels according to age groups.

DISCUSSION

Vitamin D deficiency is increasing around the world [14]. In addition, vitamin D deficiency is known to increase the osteoporosis and risk of fractures by influencing bone and calcium metabolism. Therefore 25-OH vit D levels were investigated in many of the countries. It was found that 25-OH vit D level was higher in Northern European countries such as Norway and Denmark than countries such as Portugal and Spain which receive more sunlight because of their geographical coordinate in latitude and longitude [14]. This situation was linked with consumption of abundant fish oil and codfish liver oil in diet of North European countries. 25-OH vit D concentrations is varies from country to country in Middle Eastern. Besides this great variability between countries there are also

variations within country due to age and sex. For example Hashemipour et al. [15] found 25-OH vit D concentration of the population as 20.6 nmol/L, whereas Moussavi et al. [16] found the 25-OH vit D concentrations for subjects under 18 as 42 and 92 nmol/L for girls and boys respectively in their study. Lowest value for 25-OH vit D concentration among Middle Eastern countries was detected in Saudi Arabia. Sendari et al. [17] in their study found that mean concentration of 25-OH vit D in young males as 8.4±3.1ng/ml, in females as 11.5±4 ng/ml and in elderly people as 3.6±1.3 ng/ml. Comparably higher serum 25-OH vit D levels were found in Africans [18,19,20].

In studies conducted on 25-OH vit D in Turkey, Ucar et al. [20] found mean levels of 25-OH vit D were, 21.57±11.41ng/ml in 18-39 age group, 24.80±16.86 ng/ml in 40-69 age group and 22.40±15.56 ng/ml in above 70 age group. In our study 25-OH vit D concentration of 18-39 age group was 15.15±9.01ng/ml, of 40-65 age group was 15.7±9.32ng/ml and 66 years and above group was 16.25±10.26ng/ml. Severe 25-OH vit D deficiency was both found in the study of Ucar et al. [20] and in our study. Alagöl et al. [21] studied alterations of 25-OH vit D concentration in females in Turkey due to their preferences of dressing. In their study they have divided the patients in three groups as subjects dressing suitable for sunlight exposure, dressing in traditional style and dressing according to religious conditions. Alagöl et al. [21] in their study found that 25-OH vit D mean was as 56±41.3 ng/ml, 32.9± 24.4 ng/ml and 9± 5.7 ng/ml respectively. It can be expected to found high 25-OH vit D concentrations in patients when we consider the city of Van as among the highest solar energy receiving cities in Turkey. However we found that mean of 25-OH vit D levels for all patients was 15.53 ng/ml. Mean levels of 25-OH vit D (14.79±9.42 ng/ml) in females was statistically significantly lower than that of males (18.95±7.93 ng/ml) ($p<0.001$). The reason for the low 25-OH vit D levels in females can be explained with the preference of dressing according to traditional and religious conditions in this region. In addition when we evaluate 25-OH vit D levels between seasons, 25-OH vit D level in summer was significantly higher than both Autumn-Spring and Winter. When we divide 25-OH vit D results as between 1-20 ng/mL, between 21-50 ng/mL and above 50 ng/mL, 59.8% of males were below 20 ng/mL concentration and 81.2% of females were below 20 ng/mL concentration ($p<0.001$). Augmentation of this ratio in females can be explained by both nutritional habits and also by the attenuated sunlight exposure due to choice of dressing. When we evaluated the data according to seasons we have found the highest rate in the 1-20 ng/mL concentration range in all of the groups (Summer, Winter, Autumn-Spring; as 74.9%, 79.5% and 79.2% respectively). A similar situation was present also for the age groups. Rate of 25-OH vit D levels which have 1-20 ng / mL range within 18-39 age group was 79.3%, within 40-65 age group was 76.5% and within 66 years and above group was 77.3%. As a result we conclude that there exists a vitamin D deficiency in majority of the population at all age groups and at all seasons although Van is among the most solar energy receiving provinces in Turkey due to geographical position. Male population had higher vitamin D concentration than females but it was still below 20 ng/mL. This situation supports the presence of vitamin D deficiency in both of the sexes in Van .Vitamin D inadequacy are not clear, behavioral factors, such as limited sun exposure due to indoor lifestyles or urbanization, active protection against sunlight, and unfavorable dietary habits, may be some reasons [22]. Citizen in Van usually avoid sun exposure and adopt sun protection behaviors (e.g., wearing a hat or long sleeved clothing, using an umbrella or sunscreen, staying in the shade when outdoors). It is also unclear if sun exposure guidelines will be successfully adopted in these populations in real-life situations. Guidelines suggest that exposure of 25% of the body skin area for 5-30 min between 10 a.m. and 3 p.m. two or three times per week can satisfy vitamin D requirements. It is true that sunbed use can increase the serum levels of 25-OH-D and several studies have confirmed this finding. On the other hand, this increase is in most cases only transient and not sustained if sunbed use is not regular and continuous: a plateau in 25-OH-D level is indeed reached after just a few sunbed sessions due to a balance between photo-production and photo-degradation[23]. There are a number of factors that decrease the skin's production of vitamin D like aging, dark skin, and sunscreen application. level of knowledge about sun exposure

and dietary intake as vitamin D sources, but many people had poor knowledge about the safe times for sun exposure and many did not have time due to their working lifestyle [24]. According to these findings we conclude that both nutritional support, Vitamin D supplementation, sun exposure, tradiational wearings, and awareness of vitamin D deficiency is important for recovery of vitamin D deficiency.

Limitations: Might be the Vitamin D resistance polymorphism of individuals are determined. That might aslo help us to understand of underlyng behind the low levels of vitamin D status in the population. The other limitation of this study is the difference of male and female sample size.

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