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Quantitative comparison between amount of 25-Hydroxy vitamin D in Serum of 20-35 years old population of in Iran; In Winter and In Summer

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ABSTRACT

Vitamin D deficiency is very frequently observed among young women. Vitamin D deficiency is high in winter because of reduced exposure to sunlight. The main objective of this study was to Assessment 25-hydroxyvitamin D level in Iranian young women in winter and summer. In this cross-sectional study, 4212 men and women_ aged 20 to 35 years, who attended a single-consultation outpatient clinic, were selected. Who participated in this study toward the end of summer, and in winter Serum 25-hydroxy vitamin D (25-OHD) concentrations were measured. T test and X2 were used for data analysis. 4200subjects (66.4% women, 33.6% men) aged 20 to 35 (mean age ± SD 27.11 ± 12.6) participated in the study. The mean 25-(OH) D concentration in summer was 13.41 ± 13, and in winter it was 11.7 ± 11, and the difference was statistically significant (p< 0.02). The prevalence of 25-(OH) vitamin D deficiency was 87.7% in winter and 78.7% in summer (p < 0.05). Low vitamin D status among Young Men and Women during two consecutive winter seasons, improved vitamin D status during the summer was found. Serum 25(OH)D was strongly associated with parameters related to sun exposure, but only weakly with intake of vitamin D supplements.

Key words: 25-Hydroxyvitamin D, vitamin D status, seasonal variation;

INTRODUCTION

Vitamin D insufficiency in adults causes, osteopenia, secondary hyperparathyroidism, and osteomalacia [1]. Vitamin D is obtained through synthesis in the skin by ultraviolet (UV)B radiation and by intake from food or supplements. In Northern Europe, vitamin D status is highest during late summer and lowest in late winter [2].during winter, vitamin D-synthesizing UVB radiation does not reach the surface of the earth [3]. In countries distant from the equator, there is seasonal variation in UV-B exposure because of the lower angle of the sun and the greater cloud cover in the winter months. In addition, more clothes are worn in winter, which reduces skin exposure to UV-B. As a result of this seasonal variation in UV-B radiation, there also is seasonal variation in 25(OH)D concentrations, such that concentrations are highest in late summer and early autumn and lowest in late winter and early spring. The concentrations of 25(OH)D cares inversely associated with fat mass. This association has been attributed to the

sequestration into adipocytes of fat-soluble vitamin D generated in the skin or orally ingested, before it can be transported to the liver and converted to 25(OH)D [4]. Results of studies in Iran among different age-groups indicate a high prevalence of vitamin D deficiency [5,6]. Studies in Isfahan have shown a high prevalence of the problem among high school children, pregnant women, and newborns [7]. Results of a study in Tehran showed that the prevalence of vitamin D deficiency was also higher among the general population [8,9,10,11].Iran is one of these sunny countries. We suggest that because of high humidity through summer in our region, people avoid leaving their homes, and so vitamin D deficiency can even be as high in summer as winter. In this study, we determined seasonal variation of plasma vitamin D levels in residents of men and women aged 20 to 35.

MATERIALS AND METHODS

This cross-sectional study was carried out among men and women aged between 20 and 35, who had resided in the Shafagh laboratory of Iran.

Detection of 25 OH vitamin D by ELISA

Vitamin D level was determined in serum by Enzyme Linked Immune Sorbent Technique (ELISA) using OH vitamin D ELISA kit; Catalog No.EIA-4696 (DRG International, Inc.), CA, U.S.A. the status of 25OH vitamin D was evaluated as follows: According to Endocrine Society Clinical Practice Guidelines, vitamin D deficiency was defined as a 25 (OH) D < 20 ngl/L (50 nmol/l), and insufficiency as a 25 (OH) D between 21and 29 ng/l (52.5and72.5nmol/L), and 25 (OH) D level ≥ 30 ng/l (75 nmol/l) as the optimal level [12]. participated in this study toward the end of summer and winter. Serum was separated and kept at –80°C. Then 25-OHvitamin D were measured in Shafgagh laboratory.

Definition of vitamin D deficiency

Mild, moderate and severe vitamin D deficiencies were defined as 25-OHD values of 20-35 ng/ml, 10-20 ng/ml, and <10 ng/ml respectively. There is also another classification for vitamin D deficiency in the literature. In this classification, the combination of moderate and severe vitamin D deficiencies are considered vitamin D deficiency (25-OHD <20 ng/mL) and mild vitamin D deficiency (25-OHD 20-30 ng/mL) as vitamin D insufficiency [13]. We used the first classification. However, the second classification was used after stating its usage.

Statistical analyses

For comparison and determination of correlation between qualitative variables, c2 test was used. For comparison levels of vitamin D in different seasons, paired T test was used, and $p < 0.05$ was considered statistically significant.

RESULTS

4200 subjects (66.4%; 2784 women, and 33.6%; 1416 men) aged between 20 and 35 (mean age ± SD 27.11 ± 12.6) participated in the study. The mean 25-(OH) D concentration in summer was 13.41 ± 13, and in winter 11.7 ± 11, and the difference was statistically significant ($p < 0.02$). (Table I). The prevalence of vitamin D insufficiency was 93.2% in winter and 90.7% in summer ($p < 0.01$). Vitamin D deficiency was 87.5% and 78.7% in winter and summer respectively ($p < 0.05$) (Table II). Seasonal variation was statistically significant in both sexes ($p < 0.05$). (Table 2) Differences between the sexes in both seasons were statistically significant ($P < 0.0001$). There was no significant statistical correlation between age and serum levels of vitamin D. In the normal vitamin D level group, 7% used sunscreen regularly, 25.4% sometimes and 67.6% did not use it. Analysis of data showed no significant statistical correlation between sunscreen use and vitamin D deficiency**.**

Table 1. Mean and standard deviation of variables measured in summer and winter.

Lab data	Summer (mean ± SD)	Winter (mean ± SD)	p value
Vitamin D [ng/ml]	13.41 ± 13	11.7 ± 11	0.02
Calcium [mg/dl]	9.91 ± 4.8	9.85 ± 0.7	0.86

Table 2. Prevalence of vitamin D deficiency in the study population

Season	Vitamin D insufficiency n (%)	Vitamin D deficiency n (%)
Winter		
Total	3924 (93.2%)	3684 (87.5%)
Men	91.5%	81.4%
Women	94%	90.6%
Summer		
Total	3816 (90.7%)	3312 (78.7%)
Men	89%	67%
Women	91.4%	84.5%
p value (between summer and winter)	< 0.001	< 0.05

DISCUSSION

In the present study, we found that, the prevalence of vitamin D deficiency was higher in summer (90.7%) than in winter (78.7%). Because of solar radiation in winter, the duration of sunlight exposure is limited compared to summer; vitamin D deficiency is high in winter, and likewise at high latitudes [9]. The 25-hydroxyvitamin D levels were 40% higher in summer than in winter, a reflection of the differences in solar exposition. The mean winter values were below 15 ng/mL, which is the value used as the defining limit for deficiency by some authors [10,11].In Great Britain, a population-based study performed by Hyppönen et al. reported comparable data with a mean 25OHD level of 60.3 nmol/L (95% CI, 59.5–61.0) and 15% (95% CI, 14.4–16.5) of the included 45-year-old participants withserum 25OHD levels <40 nmol/L [12].Seasonal variation of serum 25OHD is caused by the strong dependence on the exposure to sunlight, especially in people living at high latitudes. Ultraviolet light stimulates the conversion of 7-dehydrocholesterol to cholecalciferol (vitamin D3) in the skin and is therefore essential for optimal vitamin D levels [13].In our study, both sexes had vitamin D deficiency insummer and winter (67% of men and 84.5% of womenin summer, and 81.4% of men and 90.6% of women inwinter). The summer/winter difference was substantially higher than the 14% observed in the adult American population, and much lower than the 88% of differences observed in the infant Spanish population at a latitude similar to our own, in which the summer values were similar [14]. The difference between men and women could be the result of differences in their skin coverage and also their jobs. The high prevalence of vitamin D deficiency in both sexes in our study could be due to cloudy weather for most of the time in our region In addition to reduced exposure to sunlight, a diet lowin vitamin D also causes vitamin D deficiency [15]. The effectiveness of ultraviolet light in the skin synthesis of vitamin D has been demonstrated in a similar way to the oral administration of vitamin D even in elderly patients [16]. But it has also been observed that, in patients with high sunlight exposure, the relationship between vitamin D intake and 25-hydroxyvitamin D levels diminishes, perhaps due to a catabolism of vitamin D caused by solar exposure. The skin's melanin content, which negatively influences the synthesis of vitamin D, can also contribute to conditioning lower levels of 25- Hydroxyvitamin D in black Americans or in the Arab Mediterranean population [11], as in the southern European population [17], accentuating the nutritional deficits. Finding the causes of vitamin D deficiency in anycountry is very important. In our area, the north of Iran,sun exposure is low even in summer and bread is oneof the principal features of the diet in Iran. Thus webelieve that encouraging people to consume more foodscontaining vitamin D and calcium, and also fortifyingfood, are needed to prevent vitamin D deficiency andits complications in our region.The limitation of our study was that we did notevaluate the level of serum 1, 25 OH vitamin D although theserum concentration of 25-(OH) D is the most sensitivebiochemical marker of a subject's vitamin D status [18].

CONCLUSION

In summary, we found that seasonal variations in 25(OH) D concentrations have a significant effect on thresholds for a diagnosis of vitamin D sufficiency. In a high humidity climate, the prevalence of vitamin D deficiency is high, even in the summer. To prevent progressive damage and morbidity rates due to vitamin D deficiency, it is necessary to encourage people to increase sunlight exposure. Vitamin D should also be supplemented in food in places with a sultry climate.

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