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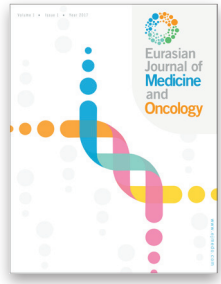

Research Article

Vitamin D Seasonal Variation in the Elderly in Residantial Care in Turkey

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Abstract

Objectives: Many factors influence the intensity and duration of ultraviolet exposure, including geographic location, seasons, dietary intake, atmospheric conditions, and daily sunlight exposure. Our objective was to characterize the effect of diet and the seasonal variation of hypovitaminosis D in housebound elderly people in Konya Nursing Home (NH).

Methods: In total, 41 old-aged participants (22 males, 19 females) who lived in Konya NH were included in the present study. Serum vitamin D3 (VD3) levels were measured and compared in the winter and summer for each group. The results were evaluated between each other and with 20 old-aged participants (10 women, 10 men) who had similar demographic conditions, were healthy, and living outside the NH.

Results: The mean ages of the NH and control groups (CGs) were 74.75±3.90 (65–93) and 73.72±2.90 (68–83), respectively. The mean VD3 levels were 20.36±6.54 ng/mL in summer and 19.29±6.00 ng/mL in winter for men in the NH group. The mean VD3 levels were 19.58±6.93 ng/mL in summer and 18.29±4.69 ng/mL in winter for women in the NH group. The mean VD3 levels were 24.79±6.59 ng/mL in summer and 20.94±5.29 ng/mL in winter for men in the CG. For women in the CG, the mean levels were 25.30±6.77 ng/mL in summer and 20.73±6.50 ng/mL in winter. There were no differences in the mean levels between the NH group and CG in the summer and winter periods.

Conclusion: VD is not required only for bone development and growth of children, it is also required bone strength in adults and prevent osteoporosis and fracture risk in the elderly. All of the seasons VD deficiency was found in older aged people in housebound and living outside. We must fortify the dietary products with VD and increase sunlight exposure in older aged people.

Keywords: Old-aged people, vitamin D, vitamin D deficiency

Vitamin D (VD) insufficiency has been found to be common in the elderly, particularly in nursing home (NHs) and in the housebound. The synthesis of VD3 in the skin under the influence of ultraviolet (UV) light decreases with age due to insufficient sunlight exposure and decreased functional capacity of the skin. The cutaneous synthesis of VD is responsible for >90% of 25-hydroxy VD [25(OH)D] levels in the serum, and some seasonal variations in circulating VD levels have been observed, particularly in Northern and Central European populations.[1, 2]

Diet provides a minor part of the VD requirement. In Turkey, where dairy products are not fortified with VD, VD intake is usually low, and its status mainly depends on sunlight exposure.

Many factors may influence the intensity and duration of UV exposure, including geographic location, seasons, dietary intake, atmospheric conditions, and the daily length

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of time spent outdoors. In the present study, we aimed to determine the seasonal variation of hypovitaminosis D in housebound old-aged people in Konya NH.

Methods

In total, 41 participants (22 males, 19 females) living in Konya NH were included in the present study. Serum VD3 levels were measured and compared in the winter and summer. The results were evaluated between each other and with 20 old-aged healthy participants (10 males, 10 females) who had similar demographic conditions and lived in their own home, in Konya. Venous blood samples were taken between January and February in winter and between June and August in summer. In all participants, blood samples were drawn for the measurement of 25(OH)D. After centrifugation at 2000 g for 10 min at room temperature, 3- and 5-mL serum samples were sent on the same day to the laboratory to be frozen at –80°C and stored before analysis. Serum 25(OH)D levels were measured using high-performance liquid chromatography. According to the serum 25 (OH) D levels, >30 ng/mL is sufficient, 20–30 ng/mL is insufficient, <20 ng/mL is deficient, and <10 ng/mL is considered serious VD deficiency.[3] Exclusion criteria included parathyroid, thyroid, hepatic, or renal disease; or the use of drugs that are known to have an influence on bone metabolism, such as VD, calcium, corticosteroids, and hormone replacement therapy with a bisphosphonate and calcitonine. The present study was performed in accordance with the Declaration of Helsinki. Informed consent was obtained from all participants for being included in this study. Statistical analysis was performed using SPSS for Windows. Differences between both groups were analyzed using the Mann–Whitney U test. Paired sample test was used to compare the VD3 levels in the winter and summer. The results where $p<0.05$ were considered statistically significant.

Results

Mean ages were 74.75±3.90 (range: 65–93) and 73.72±2.90 (range: 68–83) in the NH and control groups (CGs), respectively. There was no significant difference in the mean age between the groups. Mean VD3 levels are shown in Table 1. There were no significant differences in the mean levels between the NH group and CG in the summer and winter periods. There were no significant differences in the mean VD levels between men in the NH group and CG in summer (p=0.119) and in winter (p=0.269). Mean VD levels were significantly higher (p=0.008) in women in the CG in summer than in the NH group. There were no significant differences (p=0.146) in the mean VD levels between women in the NH group and CG in winter. The average VD intake was found to be 400 IU/week and the average calcium intake was found to be 781 mg/day which were both lower than the recommended levels.

Table 1. Patient characteristics and mean VD3 levels of both groups

	Control	RC people	p
Mean age	73.72±2.90 (68-83)	74.75±3.90 (65-93)	0.08
Male	10	22	
Female	10	19	
Mean VD (Winter-Male)	19.29±6.00	20.94±5.29	0.269
Mean VD (Summer-Male)	20.36±6.54	24.79±6.59	0.119
Mean VD (Winter-Female)	18.29±4.69	20.73±6.50	0.146
Mean VD (Summer-Female)	19.58±6.93	25.30±6.77	0.008

VD3: Vitamin D3

The participants were divided according to the duration of living in the NH. There were 29 participants who stayed in the NH for 1–4 years and 12 participants who stayed for >5 years. VD3 levels in the summer were <20 ng/mL in 16 and >20 ng/mL in 13 of the 29 participants. VD3 levels were >20 ng/mL in 6 of the 12 participants. VD3 levels <20 ng/mL were found in 19 of the 29 participants and levels >20 ng/mL were found in 10 of the 29 participants. VD3 levels <20 ng/mL were found in 9 of the 12 participants and levels >20 ng/mL were found in 3 of the 12 participants in winter. There was a negative correlation between VD3 levels and the duration of living in the NH.

Discussion

VD3 was present in all housebound old-aged people and control participants in all years. A seasonal variation in the circulating VD levels was not been observed in either group. Globally, VD deficiency appears to be common in sick and older-aged populations.[4] Several studies have indicated that hypovitaminosis D is related to an increase in the risk of hip fracture.[5, 6] The risk of falling increases with age; falls occur due to multiple reasons, such as the loss of balance and muscle weakness. With VD supplementation, muscle strength in the lower extremities can be improved and neuromuscular functions can be recovered so that fractures associated with falling are reduced; the nonvertebral fracture ratio was found to decrease from 43% to 19% [6] in old-aged people. In a study from Russia, lower serum VD and PTH levels were detected in men and women with hip fracture than in the CG. 67% of hip fracture and 47% of CG in VD level was <25 nmol/L (p=0.006). Similar to our study, VD deficiency was detected in half of the old-aged people at NHs in France and Australia. That study reported that with VD and calcium supplementation, the frequency of fractures can be reduced.[7]

In the newly published Dietary Reference Intakes, the elderly >70 years old have a higher RDA of 800 IU.[7] However, skin synthesis may not be the only determinant of the status in elderly people. Other factors, such as the reduced absorption of dietary sources of VD, may also be involved.[8]

A seasonal effect has been observed in African-American populations if there is high sun exposure, and some research from Europe has demonstrated the same seasonal effects.[1, 2] There is a measurable decline in subjects of all ethnicities between early fall and midwinter. In the present study, no seasonal variation was observed in the serum VD levels in participants in the NH group.

Generally, foods are naturally poor in VD content,[9, 10] and people cannot obtain >2 µg (80 IU)/day of VD from the dietary intake[11] because this amount is lower than the recommendation. Hence, the oral intake of VD via fortified foods or supplements seems necessary. Although VD supplementation significantly improves serum 25(OH)D levels, [12] it is not a suitable method of enhancement of the VD status of the general public, and dietary intervention seems to be indispensable. Nowadays, the fortification of foods with VD has been accepted as an approach to improve the serum VD status. Canada and the United States are famous for the fortification of certain foods, such as dairy products, margarine, and breakfast cereals, either mandatorily or optionally. No such practice exists in our country yet.

In the present study, VD deficiency was detected in the CG. This indicates that they do not consume enough dietary VD. VD-fortified foods have been prepared in many developed countries, and our country needs to implement this as soon as possible.

Disclosures

Ethics Committee Approval: The study was approved by the Local Ethics Committee.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship contributions: Concept – A.K., E.T.; Design – E.T.; Supervision – A.K.; Materials – A.K.; Data collection &/or processing – E.T., A.K.; Analysis and/or interpretation – A.K.; Literature search – E.T.; Writing – E.T., A.K.; Critical review – A.K.

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