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Vitamin D Deficiency among Middle-Aged Women in Karaj, Iran

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Background: Vitamin D is a fat-soluble vitamin that is an essential nutrient in the body. It is present in both D2 and D3. Vitamin D deficiency as a major public health problem is known over the world.

Methods and Materials: This study was conducted to determine the prevalence of 25-hydroxyvitamin D deficiency in 240 middle-aged women (40-60 years old) in late April 2017 in Karaj. Sampling was done randomly from Blood tests were performed among the patients.

Results: The results showed that the prevalence of vitamin D deficiency was 95-90%, and the incidence was more pronounced between the ages of 30 and 30 years. The mean serum level of vitamin D showed a positive significant difference in different decades of age ($P < 0.0001$). The relationship between mean serum level with the type of house was not significant ($P = 0.142$), but there was negative and significant ($P < 0.001$) relationship with the house direction. The relationship of mean serum level with the number of pregnancies and the number of children was not significant ($P = 0.159$). The correlation of the mean serum level of vitamin D with Body Mass Index (BMI) was not significant ($P = 0.567$).

Conclusion: Vitamin D deficiency was prevalent in studied population, especially among youth comparing to elderly participants. Due to this research, enrichment and fortified dairy and some food with vitamin D is recommended**.**

Keywords: Correlation, Vitamin D deficiency, Middle-aged women

Introduction

Vitamin D is an essential factor in regulating the metabolism of minerals and bone tissue in the body (Kilishadi *et al.,* 2014; John *et al.,* 2008). The lack of it has an irreversible effect on bone growth and development. Therefore, it plays an important role in human health, fertility and growth. The recommended amount of vitamin D is 200-600 IU per day for all It is essential that the vitamin D plays both the role of vitamin and the role of hormone in the body as a vital ingredient in the body (Mobel and Hossein Pena, 2009; Mithal *et al.,* 2009; Norman, 2005).

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Vitamin D has receptors in the organs, including bones, heart, kidneys, nervous system, skin, teeth and the thyroid gland is also involved in strengthening the immune system (Holik, 2002). Therefore, the vitamin D deficiency has effects in all parts of the body (Gartner and Greer, 2003).

The presence of vitamin D is essential for the health of the musculoskeletal system. The adequate intake of vitamin D can greatly reduce the rate of osteoporotic fractures, including the hip fracture (Gholami, 2013). The production of vitamin D in the skin depends on factors such as age, skin pigmentation and UVB available to the body, which depends on the amount of UVB that reaches the surface, and that is affected by the geographic location, season, time, and atmospheric pollution level with increasing air pollution reduces skin vitamin D synthesis (Allali *et al.,* 2006; Kilishadi *et al.,* 2014). Air pollution is a very important factor in determining the percentage of UVB reaching the earth, which in fact, the areas with high air

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pollution are lower UVB reaching and thus the skin synthesis of vitamin D is less. A study in India showed that the mean serum levels of 25 (OH) D were 54% lower in those living in more air pollution areas than those living in less-infected areas (Agarwal *et al.,* 2002).

More than 90% of the body's need for vitamin D in the skin is provided by the sun's UVB rays. Another source of vitamin D is a nutrient that only supplies a small amount of rheumatism (Mobel and Hossein Pena, 2009) Vitamin D deficiency is usually found in people who are not exposed to enough sunlight or who have very low dietary levels of vitamin D (Rahmati *et al.,* 2016).

Today, vitamin D deficiency exists in developed and developing countries and is a health problem in these countries. Holic and co-workers (2005) found that 40 to 100% of the older men and women in Europe and Americans living in the community (not in the maintenance of the elderly) lack vitamin D. Estimates show that around one billion people in the world who suffering from moderate to severe vitamin D deficiencies (Holik, 2002; Sullivan *et al.,* 2005).

Comparison of the mean prevalence of vitamin D deficiency in Iranian males and females in the years 2000 and 2011 showed that the prevalence of deficiency in both genders increased in recent years. It has been reported that, in 2011, women suffered from deficiency much more than men, and the prevalence of vitamin D deficiency in the southern region of Iran has been lower than in other parts of the country (Saedinea *et al.,* 2013).

The prevalence of vitamin D deficiency in Middle Eastern countries, including Iran, is higher than Europe and the United States due to the type of coverage and lack of adequate skin contact with sunlight, especially in women. Coverage, especially in women, is a major contributor to the prevalence of Vitamin D deficiency in Middle Eastern and Islamic countries. For example, in some countries like Saudi Arabia, the United Arab Emirates, Jordan, Turkey, and Lebanon in which women cover all parts of their body that prevent them to expose to sunlight.

Regardless of the country's geographical position and the availability of suitable sunshine, unfortunately, many people in the country are unprofitable aware of how to use this godly blessing. Training that increase awareness of how sunlight can be used can dramatically increase the vitamin D serum level and subsequently reduce its problems. The need for vitamin D varies in different age groups and should be provided depending on age and body condition. Mid-aged people who are also the subject of this study are more likely to be exposed to vitamin D deficiency than others. The ability to produce vitamin D via the skin is reduced in older people, so that a 70-year-old will make 75% less vitamin D than a 20-year-old person (John *et al.,* 2008). It has been reported that the needs of body to vitamin D is depended to age group. Figure 1. Relationship between age and daily need of vitamin D.

Considering the importance of vitamin D in the body and its implications for bone health and the functioning of other organs, and given the rising life expectancy and demographic changes towards the growth of middle-aged populations in today's societies, and also the importance of having a healthy life in this age, it is necessary to study the causes and teach ways to prevent and improve shows vitamin D deficiency.

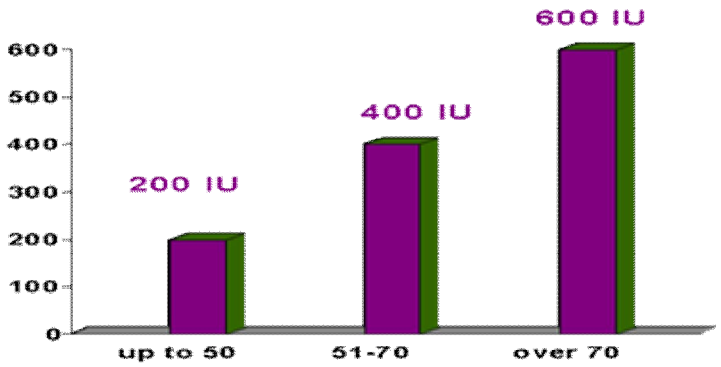

Figure 1. Relationship between age and daily need of vitamin D.

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Methods and Materials

This cross-sectional study was conducted in April 2017 in Karaj, Iran. In present study 300 middle-aged women (30-60 years old) were randomly selected from the patients referring to comprehensive health centers. The women who were pregnant, or under the supervision of supplement, underwent a doctor's review, and underlying conditions such as kidney, liver, endocrine disorder, corticosteroid and anticonvulsant therapy excluded from the study. Demographic factors (including age, height and weight, veil type, type and direction of house, habitat area, rate of exposure to sunlight and the usage of sunblock lotion were recorded with a questionnaire, a blood sample was taken to determine the level of vitamin D (25 (D) OH).

Laboratory tests

Sampling was performed in spring and near the place of residence of the subjects after obtaining their consent, then 2cc blood from women (30- 59 years old) was obtained. Blood samples were transferred to the laboratory of the Kahrizak Alborz Institute in 4-8 °C temperature. After centrifugation, the level of vitamin D (25 (D) OH) was measured. Statistical analysis was performed using SPSS software (version 21). The normal distribution of variables was verified by the Kolmogorov-Smirnov test. The continuous variables were reported as mean and standard deviation. P-value < 0.05 was considered as significant.

Results

Of 300 referred women, 240 eligible women aged between 30-59 years old were enrolled in the study. The majority of the studied women aged between 30 1nd 33 years. Table 1 shows the demographic data of the participants. Table 2 shows the serum level of vitamin D in different ages. According this table, there was a positive significant difference in different decades of age ($P < 0.0001$). Furthermore, there was inverse and not significant relationship ($P = 0.84$) between vitamin D serum level and weight. The correlation between the mean serum level of vitamin D and the veil was negative and not significant ($P = 0.81$). The relationship between mean serum level with the type of house was inverse and not significant ($P = 0.142$) but there was negative and significant relationship ($P < 0.001$) with the house direction. The relationship of mean serum level with the number of pregnancies and the number of children was positive and not significant ($P = 0.159$). The correlation of mean serum levels of vitamin D with BMI was negative and not significant ($P = 0.567$).

Discussion

The high prevalence of vitamin D deficiency (89.84%) was found in the studied samples of present study. This result is supported by Hovsepian *et al.,* (2011). This study showed vitamin D deficiency was higher in younger subjects than the older age groups (Hovsepian *et al.,* 2011). However, the research results of Niafar *et al.,* (2009) and Nakamura *et al.,* (1999) were different, because of a decrease in the vitamin D production capacity with aging and hormonal disorders. The research results of John et al., showed that the ability of vitamin D production in skin gets less at the elderly comparing to 20-years-old, in that production of vitamin D in people with 70-years-old is 75% less than people with 20 years old (John *et al.,* 2008). Study at the Endocrinology and Metabolism Research Center of Tehran University of Medical Sciences revealed that the prevalence of vitamin D deficiency in the western regions of Iran was about 60-40% (Saedinea *et al.,* 2013). The prevalence was severe and moderate, which is consistent with the results of the present study.

Study of vitamin D deficiency in 11 European countries confirmed the prevalence of vitamin D deficiency in most of the studied countries (Scientific Committee on Food of European Commission Health & Consumer Protection Directorate General, 2003). There were similar reports in the Asian and even the sunny countries (Alagol *et al.,* 2000; Keane *et al.,* 1998). The studies that conducted by the Endocrine Research Center of Tehran University of Medical Sciences, revealed that the deficiency of vitamin D was 40% to 80% in the country (Larijani *et al.,* 2003). According to the findings of the present study, the effect of the veil on vitamin D was not significant in women. However, 30 percent of individuals wear dress were 30-40 years old and 10 percent aged 40-60 years old, but the severe deficiency was higher at the age of 30-40 years old. The average level of vitamin at the category of 30-34 years old was 15.32 while the mean vitamin level in the age group of 55-59 years old was 35.7.

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Table 1. Frequency of demographic variations and their correlation with vitamin D level.

Variation	Category	Frequency		Average Group	Standard deviation	Correlation with vitamin D	
		No:	Percent	Vitamin Level		Percent*	Probably L.
Average age	30-34	80	33	15.32	12.06	36.6 [p]	P = 0.000
	35-39	53	22	20.87	12.5		
	40-44	37	15	26.91	16.17		
	45-49	27	11	27.37	21.06		
	50-54	24	10	27.25	15.31		
	55-59	19	8	35.7	22.36		
Average weight	40-49	5	2	22.56	17.32	-0.9 [p]	P = 0.84
	50-59	28	12	25.83	17.81		
	60-69	99	41	21.69	16.04		
	70-79	76	32	19.98	13.13		
	80-89	26	11	27.99	21.06		
	< 90	6	3	28.02	18.62		
Average of BMI	> 18.5	5	2	25.12	16.38	-3.7 [p]	P = 0.567
	18.5-24.9	61	25	26.87	18.44		
	25-29.9	138	58	19.69	14.98		
	< 30	36	15	25.88	15.90		
Average House Direction	North	93	39	23.32	16.77	-21.1 [k]	P = 0.001
	South	102	43	22.97	15.49		
	West-East	45	19	19.62	17.37		
Average Type of Home	House	120	50	26.1	18.35	-9.5 [k]	P = 0.001
	Flat	120	50	18.9	13.20		
Average Type of veil	Chador	182	76	22.65	16.72	-1.3 [k]	P = 0.81
	Dress	58	24	21.99	15.26		
Average No. of Pregnancy	0	10	4	33.43	20.99	6.6 [k]	P = 0.171
	1	29	12	20.41	14.32		
	2	105	44	20.24	13.05		
	3	65	27	19.18	12.36		
	4	24	6	31.16	24.18		
	5	6	3	35.18	19.49		
	6	6	3	40.61	21.95		
	7	4	2	42.13	29.59		
Average No: of Child	0	11	4	30.97	21.47	6.8 [k]	P = 0.16
	1	28	12	20.93	14.32		
	2	106	44	20.28	13.05		
	3	65	27	18.85	12.36		
	4	14	6	34.5	24.18		
	5	6	3	35.18	19.49		
	6	7	3	40.61	21.95		
	7	4	2	42.18	29.59		
Average Literacy	Illiterate	19	8	34.75	21.96	-13.9 [k]	P = 0.004
	Elementary	60	25	24.9	18.19		
	Secondary	96	40	20.46	12.61		
	Diploma	60	25	19.43	15.00		
	Upper Diploma	5	2	25.27	3.52		
Average height	150-159	92	38	20.48	14.73	13.5 [p]	P = 0.037
	160-169	136	57	22.43	15.11		
	170 <	12	5	38.58	28.73		

* [P]= Pearson's correlation and [K] = Kendall's correlation

Table 2. Frequency of Vitamin D level in the different age category.

Vitamin D level	Frequency		Age					
	No.	Percent	30-39		40- 49		50-59	
			No.	Percent	No.	Percent	No.	Percent
1-9.9	64	27	47	42.19	11	17.19	6	9.38
10-19.9	66	28	43	65.15	16	24.24	7	10.61
20-29.9	51	21	27	52.94	13	25.49	11	21.57
30-39.9	22	9	7	31.82	11	50	4	18.18
40-49.9	22	9	5	22.73	7	31.82	10	45.45
50-75	12	5	4	33.33	5	41.67	2	16.67
75 <	3	1	0	0	1	3.33	2	66.67

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The deficiency index in the study was 89.58% (215 person), the deficiency rate in the age group of 30-40 was about 130 out of 133 (97.74%), in the age group of 50-40, 58 out of 84 (69.05%), in the age group of 50 - 59, 38 out of 43 (88.37%). The high prevalence of vitamin D deficiency in youth compare to elderly can be attributed using more sunscreens and cosmetics, preference for living in apartments and afraid of skin cancer due to sun exposure. In addition, the older people are usually scattered around farming.

Conclusion

Vitamin D deficiency was prevalent in studied population, especially among youth comparing to elderly. Due to this research, enrichment and fortified dairy and some food with vitamin D is recommended.

Conflict of Interest

There was no conflict of interest regarding this study.

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Authors' contribution

ZGR: Study implementation, data collection and analysis, writing the first draft of paper.

SST: Study design and confirming data analysis, editing and confirming the final draft of the paper.

ED: Confirming data analysis, confirming the final draft of the paper.

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