Original Article

Vitamin D (25-OH) levels in asymptomatic healthy population

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Objectives: To determine the levels of vitamin D in healthy asymptomatic adults of our region.

Methodology: This hospital based descriptive study was conducted at Peshawar Institute of Medical Sciences, Peshawar, Pakistan on healthy asymptomatic subjects aged between 16-80 years from April 2013 to August 2013. Those taking vitamins supplements, using sun blocks, known hypocalcemic, metabolic bone disease patients and pregnant and lactating women were excluded. Demographic information including color of skin, veil observation practice, menstrual history of female patients and BMI was recorded. Vitamin D levels were measured and as per international protocol levels <20nm/dl were considered deficient, between 20nm/dl and 30nm/dl insufficient and greater then 30nm/dl were taken as normal.

Results: The study included 376 asymptomatic subjects with mean age 40±15.1 year; 213 (56.6%) were females and 163 (43.4%) males. 325 (86.4%) had below normal vitamin D levels. 229 (60.5%) were deficient and 96 (25.5%) were in insufficient group with only 47 (12.5%) had normal vitamin D levels. 94.61% with BMI >25kg/m^2 had below normal vitamin D levels as compared to 83.81% with BMI <25kg/m^2. 84.93% of reproductive age females had lower vitamin D levels as compared to 82.1% of menopausal females. Only 9.28% of veil observing females had vitamin D level in normal range as compared to 24.65% of non veil observing females. Only 21 (10.39%) had normal levels among dark or wheatish complexion group as compared to 26 (14.94%) among fair complexion group.

Conclusions: In vast majority of asymptomatic subjects, the vitamin D levels were found to be below normal level. (Rawal Med J 2014;39: 124-127).

Key words: Vitamin D, healthy adults, veil, BMI.

INTRODUCTION

Vitamin D plays very important role in calcium homeostasis in our body and is required in sufficient amount for normal bone development and mineralization.[1] It plays a role as an immune modulator and tumor suppressor.[1-3] It stimulates the maturation of cells of many systems and has helps in functions of brain, pancreas, heart, skin and reproductive organ.[4]

Vitamin D has two main physiological forms i.e. vitamin D2 (ergocalciferol) obtained from yeasts and plants and vitamin D3 (cholecalciferol) produced by body itself in skin after it is exposed to ultraviolet light from sun.[3,5] Vitamin D_3 can be obtained from artificial sources and is present in some foods like fish, mushrooms, eggs, and meat.[3]

Deficiency of Vit D_3 has emerged as important health issue all around the world.[1-3,6,7] Decreased levels cause rickets, osteomalacia and osteoporosis, and is associated with diseases like multiple sclerosis, diabetes, rheumatoid arthritis, cardiovascular diseases, microbial infections and myopathies.[1-3] Its deficiency is suspected of fostering breast, colon and prostatic cancer.[8] It can be stored in the body and can result in toxic levels which can lead to calcium deposition in various organs.[9] In severe cases, it can lead to mental retardation, pulmonary hypertension and even facial changes.[9]

Clinical practice guidelines issued by Endocrine Society defines vitamin D deficiency as serum 25(OH) vitamin D levels less than 20 ng/dL, whereas insufficiency constitutes levels between 20 ng/dL and 30 ng/dL. Serum levels greater than 30 ng/dL are deemed sufficient for children and adults.[10] These guidelines recommend screening for vitamin D deficiency in people at risk, while 400 IU/day is recommended dose for infants younger than 1 year of age and 600 IU/day for older children, 19 to 70 years old adults, pregnant and lactating women.[11] In adults of >70 years of age, the dose is

increased to 800 IU/day.[11]

Over one billion globally are estimated to have low levels of this vitamin and majority is asymptomatic.[1] It affects all ages and all quadrants of world including Europe, American Continent, Asia and Australia.[12] In our region, the prevalence of low vitamin D level (<30 ng/dL) is reported to be from 85-98%,[1] prevalence was found 80-85% in India[13] and similar results were reported from Iran.[14] A study on Pakistani immigrants to UK in 1970 showed vitamin D_3 deficiency.[12,15] In Karachi, Pakistan, 90%[10] and 92% had vitamin D deficiency.[16] Other studies have shown Occult osteomalacia and vitamin D_3 deficiency in healthy pregnant and lactating mothers and their breast fed infants.[17,18] The aim of this study was to measure the levels of serum 25(OH) vitamin-D3 in healthy asymptomatic adults.

METHODOLOGY

This hospital-based study was conducted on healthy asymptomatic males and females, who were aged between 16-80 years who presented to Peshawar Institute of Medical Sciences from April 2013 to August 2013. They were either patients with no symptoms of Vitamin D deficiency or attendants of patients attending the outdoor department of our hospital. Those taking vitamins supplements, using sun blocks, know hypocalcemic patients, metabolic bone disease patients and pregnant and lactating women were excluded from the study. Using an anticipated population proportion of 85%, a relative precision of 0.05 with 95% confidence the sample size calculated under WHO software for sample size calculation was 376, which allowed us to estimate the prevalence within 5% of the true value with 95% confidence. A written informed consent was obtained from each participant. A semi structured questionnaire was filled for each participant which included variables like height (cm), weight (kg), BMI (kg/m2) age (years) and skin color, while observation of veil for pardha and menstrual history from female participants.

Blood samples were analyzed within 48 hours of collection. As per clinical practice guidelines by Endocrine Society, the vitamin D levels were classified vitamin D deficient when serum 25(OH) vitamin D levels were less than 20 ng/ dL, insufficient when levels were between 20 ng/ dL and 30 ng/ dL. Serum levels greater than 30 ng/dL were deemed sufficient for children and adults. Data were analyzed using SPSS version 16.0.

RESULTS

Our study included 376 healthy asymptomatic volunteers. Mean age was 40±15.08 year (Table 1). 163 (43.4%) were males and 213 (56.6%) were females.

Mean vitamin D level was 22.11±18.56. 325(86.4%) people have below normal vitamin D levels with 229(60.9%) having vitamin D deficiency (Table 2). Four (1.1%) subjects had vitamin-D levels in toxic range.

89.57% (146) of males had levels below normal range and only 16 (10.43%) had levels in normal range. Out of 213 females, only 31 had levels in normal range and 179 had levels below normal range. Subjects with age 20-40 had the lowest level (Table 3).

Table 1. Age distribution of study participants (n=376).

Age	Number	Percentage
<20 years	33	8.8%
20-40 years	178	47.3%
41-60 years	129	34.3%
>60 years	36	9.6%

Table 2. Vitamin-D (25-OH) levels (n=376).

Vitamin-D (25-OH) Level	Number	Percentage
<20 ng/dL	229	60.9%
20-30 ng/dL	96	25.5%
>30-100 ng/dL	47	12.5%
>100 ng/dL	4	1.1%

Higher the Body Mass Index lower was the vitamin D level (Table 4). Out of 140 veil observing females, 13 (9.28%) had levels in normal range and 127 (90.72%) had below normal levels. Where as in non veil observers, this number was 18 (24.65%) and 52 (71.23%), respectively (Table 5). 3 (4.1%) of non veil observer female had levels in toxic range.

Table 3. Age wise distribution of vitamin D (25-OH) levels (n=376).

		<20 ng/dL	20-30 ng/dL	>30-100 ng/dL	>100 ng/dL	
AGE	<20 years	15	8	9	1	33
	20-40 years	107	51	18	2	178
	41-60years	80	33	15	1	129
	>60years	27	4	5	0	36
Total		229 (60.9%)	96 (25.5%)	47 (12.5%)	4 (1.1%)	376

Table 4. Body Mass Index wise distribution of vitamin D (25-OH) levels (n=376).

		Vitamin-D level				
		<20 ng/dL	20-30 ng/dL	>30-100 ng/dL	>100 ng/dL	Total
BMI	<25	140 (58.09%)	62 (25.72%)	35 (14.52%)	4 (1.6%)	241
	25.1-30	42 (60%)	21 (30%)	7 (10%)	0	70
	>30	47 (72.3%)	13 (20%)	5 (7.7%)	0	65
Total		229	96	47	4	376

Table 5. Vitamin D (25-OH) levels in veil observer and non veil observer females (n=213).

	Vitamin-D level				
	<20 ng/dL	20-30 ng/dL	>30-100 ng/dL	>100 ng/dL	Total
Veil observer	110 (78.57%)	17 (12.14%)	13 (9.28%)	0	140
Non veil observer	34 (46.57%)	18 (24.65%)	18 (24.65%)	3 (4.1%)	73
Total	144	35	31	3	213

Out of 213 females, 146 were in reproductive age of their life. 124 (84.93%) of these 146 had vitamin-D levels below normal and only 19 (13%) had normal vitamin-D levels where as 3 (2%) had levels in toxic range. In 67 menopausal females, 12 (17.9%) had normal vitamin-D levels and 55 (82.1%) had below normal levels. 174 (46.27%) were of fairish complexion while 202 (53.73%) had dark or wheatish complexion. Only 21 (10.39%) had normal levels among dark or wheatish complexion group as compared to 26 (14.94%) among fair complexion group.

DISCUSSION

Despite the fact that Pakistan is in a tropical region having adequate exposure of sunlight all the year round, to produce vitamin-D3, there is a gross deficiency of vitamin D. Our study showed that 86.4% of asymptomatic subjects had vitamin D levels below normal. This is similar to a study on symptomatic population of Karachi.[1] Our finding of 13.6% subjects having normal levels is better then found by Zuberi et al in their studies.[15] Studies from Iran and India showed 79.6% and 69% prevalence of vitamin D deficiency which is higher than our population.[18,19]

Our study showed that fair complexion subjects had better vitamin D levels as compared to dark/wheatish complexion subjects. Studies showed that pigmented skin people have more chance of having vitamin D deficiency as increased pigmentation reduces capacity of skin to manufacture vitamin D from sunlight.[3] However, a study from Denmark showed no effect of pigmentation of skin on vitamin D levels.[20] The ability of skin to manufacture vitamin D is also affected by adipose tissue as adipose tissue of obese patient causes decreased absorption of sunlight and in turn decreases the vitamin D production.[21] Our study also showed that people with BMI<25kg/m^2 had better levels of vitamin D. Subjects with higher BMI had lower levels. Similar findings are noted in studies across the globe.[3,13,22]

84.93% of reproductive age females in our study had vitamin-D levels below normal as compared to 82.1% of postmenopausal females. Our finding is in contrast to studies which showed that post menopausal women have even lower levels of vitamin D.[23,24] For the manufacturing of vitamin D it is necessary to have proper exposure to sunlight. Our cultural limitations play important role in this aspect as majority of our females observe pardha. Our study showed that only 9.28% of veil observer females had normal levels as compared to 24.65% of females who don't observe veil. Similar percentage found in other a studies.[24,25]

CONCLUSION

Our study showed that 60.5% of asymptomatic subjects were deficient and 25.5% were in

insufficient group with only 12.5% had normal vitamin D levels. Although our area has sufficient sun exposure yet the low levels of vitamin D means that there are other reasons of this finding.

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Conflict of Interest: None declared
Rec. Date: Dec 10, 2013 Accept Date: Jan 29, 2014

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