FREQUENCY AND RISK FACTORS FOR SERUM VITAMIN D DEFICIENCY AMONG FEMALES OF PAKISTAN

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ABSTRACT

Background: Vitamin D deficiency is now documented as pandemic. It has been estimated that 1 billion people worldwide have vitamin D deficiency or insufficiency and Pakistan, is not an exception. **Objective:** The objective of present study was to determine the frequency and risk factors for vitamin D deficiency among patient attending out patients department. **Patients and Methods:** This was a cross sectional study, conducted from 1st July to 31st December, 2013 in the outpatient department of Sheikh Zayed Medical College/Hospital Rahim Yar Khan. A total of 140 consecutive women with complaint of generalized body aches, of 15 years and above age, who have given verbal consent, were included in the study. The data was collected on a predesigned and pretested questionnaire which included variables on age, residence (rural/urban), number of rooms in house, exposure to sunlight, type of clothing (full sleeve/half sleeve) dietary intake of vitamin D such as milk and food supplement. Serum vitamin D (25 OH vitamin D) level ≥30ng/dl, was taken as normal, 21-29 ng/dl as insufficient and 11-20 ng/dl as deficient. Chi square test was applied for comparing groups for risk factors association, with p value of <0.05 as significant. The data was entered and analyzed in SPSS version 16.0. **Results:** A total of 150 women of 15 years and above were included in study, with 73% having vitamin D_3 level of <30 ng/dl. The mean level of serum vitamin D level was 19±2.1 ng/dl, with minimum 4 ng/dl to maximum of 43.7 ng/dl. Urban residence, illiteracy, poor housing, lack of sun exposure, wearing veil, lack of milk, meat and vitamin D supplement intake as significant (p value <0.05) risk factors. **Conclusion:** Our findings revealed that there is a very high burden of vitamin D deficiency among females of our region. Urban residence, illiteracy, poor housing, lack of sun exposure, wearing veil, lack of milk, meat and vitamin D supplement intake as significant risk factors of low serum vitamin D levels.

Keywords: Vitamin D deficiency, Risk factors, Women.

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INTRODUCTION

Vitamin D deficiency is now documented as a pandemic.[1] It has been estimated that 1 billion people worldwide have vitamin D deficiency or insufficiency and Pakistan, is not an exception.[2,3] The major cause of vitamin D deficiency is the lack of adequate sun exposure for most humans. Very few foods naturally contain vitamin D, and foods that are fortified with vitamin D are often inadequate to satisfy either a child's or an adult's vitamin D requirement.[4] Vitamin D deficiency causes growth retardation and rickets in children and will lead to osteopenia, osteoporosis, fractures in adults and influences on maternal and fetal health.[5] Vitamin D deficiency has been associated with increased risk of common cancers, autoimmune diseases, diabetes mellitus, hypertension, and infectious diseases.[6,7] Muscle weakness has long been associated with vitamin D deficiency. Vitamin D receptor are present in skeletal muscle and vitamin D deficiency has been associated with proximal muscle weakness, increase in body sway, and an increased risk of falling.[8,9] Vitamin D deficiency in adults can also cause a skeletal mineralization defect. The unmineralized osteoid provides little structural support for the periosteal covering. As a result, patients with osteomalacia often complain of isolated or global bone discomfort along with aches and pains in their joints and muscles.[10] Although the reason for the increase in vitamin D deficiency is unclear, changes in lifestyle are likely to be important, such as use of sunscreens, adoption of covered attire due to cultural norms, obesity and global environmental pollution may be causative.[11] As the primary source of vitamin D is endogenous synthesis in the skin after exposure to ultraviolet rays of sunlight; the diet is a secondary source of vitamin D.[4]

As there are reports showing high prevalence of vitamin D deficiency in the Pakistani population, parturients and their newborns,[3,12] so present study was planned to search for possible risk factors for vitamin D deficiency, with intention to suggest

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interventions for prevention of this curable deficiency disease. The objective of present study was to determine the frequency and risk factors for vitamin D deficiency among patient attending outpatient department, Sheikh Zayed Medical College/Hospital, Rahim Yar Khan.

PATIENTS AND METHODS

This was a cross sectional study, conducted from 1st July to 31st December, 2013 in the outpatient department of Sheikh Zayed Medical College/Hospital Rahim Yar Khan. A total of 140 consecutive women with complaint of generalized body aches, of 15 years and above age, who have given verbal consent, were included in the study. Ethical approval was sought from Institutional Review Board of Sheikh Zayed Medical College/Hospital, Rahim Yar Khan. Women having any other disease such as; Diabetes mellitus, Coronary heart disease, Renal or hepatic impairment, Anemia, Typhoid, Tuberculosis and subjects with less than Rs. 15000/ month income were excluded. Routine investigations such as, x-ray chest, blood CP, urine D/R, BSR, S. creatinine, HBsAg, Anti HCV, Widal test & malarial parasite were done. The data was collected on a predesigned and pretested questionnaire which included variables on age, residence (rural/urban), number of rooms in house, exposure to sunlight, type of clothing (full sleeve/half sleeve) dietary intake of vitamin D such as milk and food supplement. Blood sample was taken for serum 25 OH vitamin D level measurement and sent to pathology department of Sheikh Zayed Hospital, Rahim Yar khan. Serum vitamin D level ≥30ng/dl, was taken as normal, 21-29 ng/dl as insufficient and 11-20 ng/dl as deficient.[13,14] We categorized insufficiency and deficiency as low vitamin D level. Ethnicity was described as settlers (Punjabi, Pashto and Urdu speaking) and locals (Seraiki speaking). Monthly income was categorized as group 1, Rs. 15000-30000/ month and group 2, as Rs. 31000+/ month. Frequencies and percentages were calculated for categorical data, mean and standard deviation for numerical data. Chi square test was applied for comparing groups for risk factors association, with p value of <0.05 taken as significant. The data was entered and analyzed in SPSS version 16.0.

RESULTS

A total of 140 women of 15 years and above were included in study, with 73% having serum vitamin D_3 level of <30 ng/dl (Figure I). The mean level of serum vitamin D level was 19±2.1 ng/dl, with minimum 4 ng/dl to maximum of 43.7 ng/dl. Mean age of study subjects was 38±12 years. It was noted that 37% women were below 30 years of age, 93% belonging to rural areas, 81% were married, 70% having ≥3 children, 46% lactating their children, 18% were illiterate, 26% having family income of < 30000 Rs/ month. Our results showed that majority (86%) have ≤3 rooms in house, 63% reported a lawn or courtyard in house.

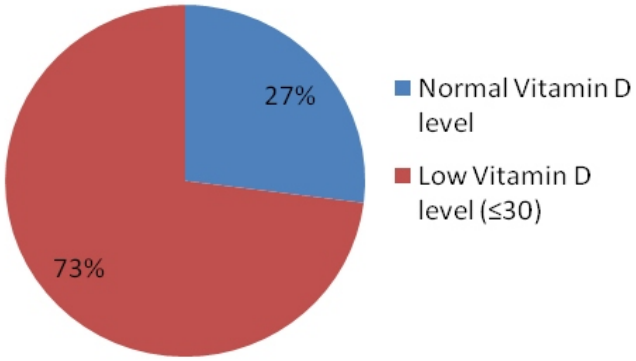
Table I: Risk factors for vitamin D insufficiency and deficiency

Characteristics	Groups	Low serum vitamin D <30ng/dl (%)	P. values
Age	≤ 30 years	71 %	0.68
	> 30 years	74 %	
Ethnicity	Settlers	74%	0.4
	Locals	66%	
Residency	Rural	71%	0.04
	Urban	100%	
Education	Illiterate	100%	0.000
	Literate	67.2%	
Reproductive age	Yes	65.2%	0.005
	No	86.2%	
Income (Rs)/Month	≤30000	80%	0.226
	>30000	70.9%	
Number of rooms in house	≤3 rooms	69.2%	0.004
	>3 rooms	100%	
Lawn/courtyard in h ouse	Yes	74.7%	0.609
	No	70.9%	
Sit in sunlight	Yes	66%	0.008
	No	85.7%	
Sunlight exposure in your house/office	Yes	89.5%	0.000
	No	56.8%	
Wear veil	Yes	87.1%	0.001
	No	63.6%	
Wear half sleeve	Half sleeve	100%	0.00
	Full sleeve	71%	
Milk intake daily	Yes	71%	0.00
	No	100%	
Take any vitamin-D	Yes	61.9%	0.048
	No	77.8%	
Weekly meat intake	Yes	68.3%	0.001
	No	100%	

In our study, 41% reported wearing veil, whereas, only 8% wore half sleeve clothes, 92% reported daily intake of milk, 28% reported intake of any vitamin D preparation, 51% reported sun light exposure in home or workplace and 84% reported weekly meat intake.

When test of significance was applied it was noted that, 71% of ≤30 years age were having vitamin D level below 30 ng/dl, as compared to 74% in >30 years age group. (P= 0.68**).** Our study showed that among settlers, (Punjabi, Pashto & Urdu speaking) 74% have vitamin D level below 30 as compared 66% in locals (Seraiki speaking) (P=0.4).

Figure I: Low vitamin D level (≤30) among study subjects.



It was noted that 71% among rural as compared to 100% among urban population, vitamin D level was ≤30 ng/dl (P= 0.04). 73% married as compared to 71% unmarried have low vitamin D level. (P= 0.8). 77% among women having ≤3 children as compared 63% women having >3 children, have low vitamin D level. (P= 0.07). 100% of illiterate, whereas, 67% of literate women have low vitamin D level. (P= 0.00). 80% of women below Rs. 30000/month of family income as compared to 73% above Rs. 30000/ month family income were having low vitamin D level. 69% of women with ≤3 rooms in house as compared to 100% of women with >3 rooms in house have low vitamin D (P= 0.04). Our results showed that 74% having lawn/courtyard, as compared to 73% having no lawn/courtyard in house were having low vitamin D (P= 0.6). 66% of those who gave history of sitting in sunlight, as compared to 85% who gave no history, were having low vitamin D (P= 0.00). 87% of women who veil, as compared to 63% not veiling, were having low vitamin D (P= 0.001). All of the women who wear half sleeve, whereas, 71% of women who use full sleeve have low vitamin D (P= 0.02). 71% having daily milk intake as compared to 100% with no daily milk intake were having low vitamin D (P= 0.01). 61% of women with history of vitamin D intake as drug, as compared to 78% with no history, were having low vitamin D (P= 0.04). 65% of reproductive age as compared to 86% of above reproductive age were having low vitamin D (P= 0.00). 68% of women with history of weekly meat intake as compared to 100% with no history, were having low vitamin D (P= 0.00)

DISCUSSION

This study was conducted to assess vitamin D level and risk factors for its deficiency among women of Rahim Yar Khan located in central Pakistan, in of southern Punjab attending OPD and private clinic. Our results showed that 73% of our female study subjects have either insufficiency or deficiency of vitamin D. A previous study showed that majority of the females were vitamin D deficient (91.50 %) with mean vitamin D levels of 21.77 ± 21.66 nm/L. Mean vitamin D levels were significantly different among females residing in downtown and suburbs. High frequency of vitamin D deficiency was observed in females dwelling in downtown (Saddar). According to the results of multiple linear regression analysis, determinants of VD levels were age, town of residence, and housing structure.[15] Our study showed that age was not a significant risk factor for low vitamin D levels, however, urban residence and houses having > 3 rooms were significantly associated with it. In another study, overall, 90.5% of females had vitamin D deficiency with 42.6 and 23.3% having secondary hyperparathyroidism and high bone turn over respectively. Prevalence of vitamin D deficiency, secondary hyperparathyroidism, and high bone turnover was significantly different among towns. Mean vitamin D levels were significantly low and iPTH levels significantly high in females with high bone turnover.[16] Calcium intake was not significantly different among females with normal, high, and low bone turnover. Our study showed that lack of intake of vitamin D supplements and milk was significantly associated with low vitamin D levels.

A previous study showed that poor diet, religious & cultural practices of the region and poverty were

some of the important reasons for vitamin D deficiency.[17] This is comparable to our study where more conservative, wearing veil have low level of vitamin D, similarly low intake of milk, meat was also associated with low vitamin D levels. A study in India, reported similar results and showed that increased hours spent working indoors, pollution and limited sun exposure has reduced vitamin D synthesis and ultimately poor vitamin D status if not compensated by dietary intake. Dietary vitamin D intake was very low in India because of low consumption of vitamin D rich foods, absence of fortification and low use of supplements.[18]

Women consuming ≥ 12.5 μg vitamin D/d from food plus supplements had a 37% lower risk of hip fracture (RR = 0.63; 95% CI: 0.42, 0.94) than did women consuming < 3.5 μg/d. Total calcium intake was not associated with hip fracture risk, however in our study lack of intake of vitamin D or calcium supplement showed low vitamin D levels.[19] Milk consumption was also not associated with a lower risk of hip fracture (P for trend = 0.21). This is in contrast to our study where low milk intake was associated with low vitamin D level. Another study reported risk factors can be divided into non-modifiable risk factors such as age and skin color, modifiable risk factors such as sunscreen use and low vitamin D intake and it comparable to our study.[20] A study conducted by Kumar J and colleagues found that older age, female sex, non-White ethnicity, obesity, less frequent milk drinking, and watching over 4 hours of television, video or computer per day were associated with 25(OH)D levels below 15 ng/ml. Vitamin D supplement use was associated with a lower risk for deficiency.[21] As far as, low milk intake and vitamin D supplements are concerned it is comparable to our results. A study with similar findings with our results, from Japan revealed that limited exposure to sunlight and a limited diet were the primary causes amongst 31 confirmed cases of rickets.[22] The limitation of our study was that we included only patients having monthly family income of Rs. > 15000 and have missed burden of disease and risk factors among lower class of community.

CONCLUSION

Our findings revealed that there is a very high burden of vitamin D deficiency among females of our region. Urban residence, illiteracy, poor housing, lack of sun exposure, wearing veil, lack of milk, meat and vitamin D supplement intake are significant risk factors of low serum vitamin D levels. Further studies are suggested that include the general population in sample so that burden of disease may be assessed among low income groups as well.

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