Original Article

Evidence of vitamin d deficiency and its relation with possible cardiovascular risk among postmenopausal women.

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ABSTRACT

Background: Recent reports have shown that Vitamin D deficiency is rampant in tropical countries including India despite plenty of sunshine due to several factors. Ageing affects synthesis vitamin D. Post menopausal women are more vulnerable to vitamin D deficiency.

Aim: To determine the prevalence of vitamin D deficiency and to find out its relation with possible cardiovascular risk among postmenopausal women.

Methods: The present cross-sectional survey was conducted among 270 postmenopausal women between age group of 45 to 70 years attending Gynecology Out Patient Department of a tertiary care teaching hospital. Each study subject was interviewed and vitamin D adequacy was evaluated by measuring serum 25-hydroxyvitamin D.

Results: Vitamin D deficiency was prevalent among 70.7% of study subjects, whereas only 10.0% had optimum vitamin-D level. Participants having high cholesterol level had low vitamin D level. An inverse relationship was observed between BMI and vitamin D level among study subjects.

Conclusion: The findings of the study highlight that vitamin D deficiency is an alarming issue among postmenopausal women in India. Health promotional measures could help them in maintaining optimum BMI as well as achieving the optimum vitamin D levels.

Key words: Vitamin D deficiency, postmenopausal women, cardiovascular risk, BMI, obesity.

Introduction

Vitamin D or Sunshine vitamin is not only indispensable but also vital for human beings. Vitamin D is synthesized in the skin after sunlight exposure or can be obtained through a balanced dietary intake.[1] However; it is well known that natural sources of vitamin D in foods are not sufficient to supply the normal body requirements. Therefore, skin synthesis of vitamin D through exposure to sunlight is thought to constitute the major source of vitamin D.[2] However, various studies conducted in tropical countries have shown that Vitamin D deficiency is rampant in tropical countries including India despite plenty of sunshine due to several factors.[3-5]

Vitamin D has an established role in calcium and bone metabolism. Menopause is associated with an increased risk of obesity and a shift to an abdominal fat distribution with associated increase in health risks.[6] Ageing affects multiple steps of vitamin D metabolism as ageing skin has reduced efficiency to synthesize vitamin D upon exposure to sun.[7] This makes post menopausal women more vulnerable to vitamin D deficiency owing to their inevitable ageing process.

Only a fewer studies are available in the literature regarding evidence of vitamin D insufficiency and its relation with possible cardiovascular risk among postmenopausal women in India and none from western Uttar Pradesh thus information on the same is patchy and scanty. Therefore, the present study was planned with an objective to determine the prevalence of vitamin D deficiency among postmenopausal women. An additional objective was to find out its relation with possible cardiovascular risk among study subjects.

Materials and methods

The present cross-sectional survey was conducted at the Department of Pathology, Major S. D. Singh Medical College and Hospital, Fatehgarh, Uttar Pradesh during June to December 2013. The sample size was calculated with an anticipated prevalence of vitamin D deficiency of 80%,[8] 5% absolute precision, 95% confidence interval and 10% non-response error – as 270.

Study subjects were postmenopausal women between age group of 45 to 70 years attending Gynecology Out Patient Department and they were selected using systematic random sampling technique. First eligible study subject was picked up randomly and subsequent study subjects were selected at a predefined constant (3^{rd}) interval in this study till the desired sampling size was obtained. Women who had undergone hysterectomy or suffering from chronic debilitating diseases and bedridden patients were excluded from the study.

Information was collected by interviewing the study subjects using a structured proforma. It was ensured that respondents understand the meaning of questions well. Each study subject was interviewed and examined for Vitamin D deficiency. The questionnaire included questions about history of dietary habits, intake of milk along with other vitamin D rich food items (fish, eggs, butter, and cheese), exposure to sun and symptoms of vitamin D deficiency. Types clothing practices were also assessed in order to determine the extent of skin exposed to sun.

Vitamin D adequacy was evaluated by measuring serum 25-hydroxyvitamin D (25 (OH) D concentration) by Roche electro chemi-luminescence, as this was the primary circulating form of vitamin D. This serum concentration of 25(OH) D is a good reflection of cumulative exposure to sunlight and dietary intake of vitamin D, and is widely regarded as a robust "gold standard" indicator of vitamin D status.[9] 25 (OH) D level less than 20 ng/ml was considered deficiency, between 20-30 ng/ml was considered Insufficiency and more than 30 ng/ml was the desirable range as per Endocrine Society guidelines.[10]

Written informed consent was obtained in the local language from every study subject before conducting each interview and examination. They were explained about the nature and purpose of the study and were requested to participate in the study. To obtain consent, the author read the contents of the consent information sheet out loud to each respondent, who was given the opportunity to ask the questions. It took an average of 20 min to complete each interview. Ethical clearance for this study, as

per university norms, was obtained from the Institutional Ethics Committee for Human Research.

The collected data was entered into Microsoft-Excel 2007, coding of the variables was done. After cleaning, data was subsequently analyzed using Statistical Package for Social Sciences (SPSS) SPSS version 20.0 software. Interpretation of the collected data was done by using appropriate statistical methods.

Results

Out of 270 postmenopausal women vitamin D deficiency was prevalent among 70.7% of study subjects, 19.3% had insufficiency and only 10.0% had optimum vitamin-D level. Level of significance shows that vitamin D deficiency is significantly related to age. Vitamin D deficiency was observed to be highest in the age group of 45-50 years followed by in the age group of 51-55 years. (Table 1)

Table 1: Distribution of vitamin D level among study subjects

Age group	Deficient (%)	Insufficient (%)	Optimum (%)	Total
45-50	114 (77.0)	29 (19.6)	05 (3.4)	148 (54.8)
51-55	29 (70.7)	07 (17.1)	05 (12.2)	41 (15.1)
56-60	25 (67.5)	05 (13.5)	07 (19.0)	37 (13.8)
61-65	12 (48.0)	07 (28.0)	06 (24.0)	25 (9.3)
66-70	11 (57.8)	04 (21.1)	04 (21.1)	19 (7.0)
Total	191 (70.7)	52 (19.3)	27 (10.0)	270 (100)
Figures in parenthesis indicate percentage				

Table 2 depicts vitamin D level in relation to factors of cardiovascular risk i.e. triglyceride and cholesterol level. Vitamin D level is proportionately decreasing with rise in triglyceride and cholesterol level. Cholesterol level <200 mg/ dl is desirable. Level beyond desirable range indicates risk of obesity and cardiovascular diseases. Participants having high cholesterol level have low vitamin D level. (Table 2)

Table 2: Vitamin D level in relation to triglyceride and cholesterol level among study subjects

Variables	Levels of Vitamin D Mean ± S.D.
Triglyceride level	
<140	**28.6 ± 2.3**
141-400	**15.1 ± 2.8**
401-1000	**8.8 ± 2.4**
One way ANOVA, p = 0.069	
Cholesterol level	
<200	**22.7 ± 2.8**
200-400	**16.1 ± 2.2**
>240	**14.5 ± 1.9**
One way ANOVA, p = 0.051	

An inverse relationship was observed between BMI and vitamin D level among study subjects i.e. with increasing level of BMI, vitamin D level was declining.

Discussion

The present study revealed that, majority (70.7%) of study subjects were suffering from vitamin D deficiency, 19.3% had insufficiency and only 10% had optimum vitamin-D level and this vitamin D deficiency was found to be associated with increasing age. Similar findings were recorded by Harinarayan CV in his study from south India.[3] This finding can be attributed to the fact that menopause along with natural process of aging marks an important transition in vitamin D requirement as ageing skin is unable to synthesize the required amount of vitamin D because it cannot effectively absorb sunlight.[11]

It was seen in the current study that high BMI was significantly associated with lower levels of vitamin D. Another studies[12,13] is also in cohort with our observations. The reason why high BMI is related to low circulating 25 (OH) D is that vitamin D is a fat soluble vitamin which is

stored in adipose tissue and is sequestered in pool of fat. This causes low circulating level of vitamin D in the body. Obese people are more prone to vitamin D deficiency as subcutaneous fat which stores vitamin D, sequesters more cutaneously synthesized vitamin D. Therefore, results in less release of vitamin D from skin into circulation. Thus obesity creates a vitamin D deficient state.

Regarding associated of lower levels of vitamin D with the factors of cardiovascular risk i.e. triglyceride and cholesterol levels, this study confirms the results of another study.[8] Deviation from desirable range triglyceride and cholesterol level is suggestive of cardiovascular risk. Recently vitamin D insufficiency has been shown to be associated with increased risk of developing type 2 diabetes mellitus and cardiovascular risk factors such as hypertension and obesity from another study from Malasiya.[14]

This study has several strengths. First, we have collected the evidence of vitamin D insufficiency and its relation with possible cardiovascular risk among postmenopausal women from western Uttar Pradesh. According to our knowledge this aspect has not been closely investigated by the experts in the field. No similar experience is available in the literature. Second, study subjects were chosen randomly which provide protection against selection bias. Third, all the interviews were conducted by single person which creates a sense of uniformity. The study has some limitations as well. First, it is a hospital based study. A community based study would yield more generalizable results. Second, while linking vitamin D insufficiency with possible cardiovascular risk we could have performed bone marrow density, PTH levels too but it was not possible due to certain reasons.

Conclusion

The findings of the study highlight that vitamin D deficiency is really an alarming issue among postmenopausal women in India. Health promotion i.e. encouraging women to adhere to healthy lifestyles, losing their weight and themselves indulging in outdoor recreational activities could help them in maintaining optimum BMI as well as achieving the optimum vitamin D levels.

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