Study of Vitamin D Levels in Women of Different Socioeconomic Groups

ABSTRACT

Aim Vitamin D deficiency is a major health problem in both the developed and developing countries across the globe. The factors responsible for vitamin D deficiency (VDD) can be skin complexion, poor sunlight exposure, vegetarian food habits and lower intake of vitamin D fortified foods. Adequate sunlight exposure and intake of foods rich in vitamin D and proper screening of women can prove helpful to prevent vitamin D deficiency.

Materials and Methods A cross-sectional study was conducted in the Department of Biochemistry Government Medical College (GMC) Jammu, on 200 women, falling in the reproductive age group of 20–49 years, attending the OPD of GMC Jammu. Inclusion criteria adopted was non-pregnant, non-lactating women of reproductive age groups without any history of chronic disease, vitamin D intake or any other dietary supplementation and consent to participate the study.

Results Vitamin D deficiency was defined as serum 25(OH) D levels ≤20 ng/ml. The study found that 32.5% patients had severe vitamin D deficiency followed by 31.5% with moderate deficiency and 25.5% with mild deficiency, which varied in different socioeconomic classes with the middle socioeconomic class having the lowest 25(OH) D levels.

Conclusion In lack of naturally occurring vitamin D rich foods, food fortification or supplementation with vitamin D and adequate sunshine exposure should be given a higher priority among women. More studies on a larger sample are needed to further substantiate the findings of the present study.

INTRODUCTION

Vitamin D deficiency (VDD) is on rise as a major health problem in India. Majority of the population in India resides in areas receiving ample sunlight throughout the year; still VDD is a problem of growing concern. Skin complexion, poor exposure, vegetarian food habits and lower intake of vitamin D fortified foods could be attributed to the high prevalence of VDD in India. However, until the early 1990, VDD was considered to be rare in India. Such belief was based on studies measuring serum calcium and alkaline phosphatase in Indian population. Till the year 2000, there was no systematic study which directly assessed body vitamin D status of Asian Indians residing in India. A study conducted apparently healthy subjects to measure their serum levels of vitamin D using sensitive and specific assay documented that significant hypovitaminosis was present in up to 90% of the subjects.

Vitamin D is synthesized endogenously in the presence of sunlight. India is a country with abundant sunshine, but still a high prevalence of VDD has been documented amongst all age groups in the range of 50–90%, VDD is responsible for skeletal disorders but recent evidence suggests that VDD can also lead to other health issues like cardiovascular diseases, diabetes mellitus, obesity hypertension, etc. The prevalence of vitamin D deficiency was found to be higher amongst females than in males. The factors responsible for VDD could be skin complexion inadequate exposure to sunlight and vegetarian food habits; however, looking at the spectrum and high prevalence of VDD in India there is a need for further research to identify the major risk factor responsible for VDD despite of abundant sunshine available in the areas. VDD affects all age groups, therefore strategies such as increasing awareness among mass about adequate exposure to sunlight, rich dietary source of
vitamin D and fortification of food with vitamin D, which are consumed by majority of people and implemented for prevention and control of VDD throughout the nation. Vitamin D is required to maintain normal blood levels of calcium and phosphate, which in turn is needed for the normal mineralization of bone, muscle contraction, nerve conduction and general cellular function in all the cells of the body. Assessment of vitamin D status of an individual is reflected by measurement of circulating vitamin D metabolites. Only two metabolites, namely, 25-hydroxy vitamin D and 1,25-dihydroxy vitamin D have received the greatest attention in biochemical estimation of vitamin D. Calcium and vitamin D are important to the reproductive female. Deficiency leads to serious skeletal consequences, yet optimum levels or sufficiency is widely debated. Most of the literature and reference labs set 30 ng/ml as sufficient, although the institute of medicine uses 20 ng/ml as the standard. Caution should be used in reviewing literature linking vitamin D to various disease sates as very few randomized trials exists, and the findings have not been replicated. No formal screening guidelines exist for vitamin D deficiency, but given the variable exposure of sun and level of obesity many of our patients have risk factors. Vitamin D levels should be measured by 25(OH) D and only sent to reference laboratories to ensure a correct reading. Supplementation with vitamin D up to 4000 IU/day is considered safe, but not recommended. The main source of vitamin D is sunshine exposure, even though a large percentage of the Indian population (>80%) is suffering from vitamin D deficiency, women from reproductive age group are exposed to greater risk of developing bone abnormalities and other associated disorder due to low vitamin D levels. There is a lack of scientific literature on the status of vitamin D and calcium in women of reproductive age from India. Despite the sunny environment hypovitaminosis is common in India. According to the various studies published earlier there is a widespread prevalence of varying degrees (50–90%) of vitamin D deficiency, women from reproductive age group are exposed to greater risk of developing bone abnormalities and other associated disorder due to low vitamin D levels. Hence, the present study of vitamin D and calcium levels in women of reproductive age in Jammu.

MATERIALS AND METHODS

A cross-sectional study was conducted in the department of biochemistry, Government Medical College (GMC), Jammu, on 200 healthy women attendants of patients and female patients with minor ailments, falling in the reproductive age group of 20–49 years, attending the OPD of GMC Jammu. Inclusion criteria adopted was non-pregnant, non-lactating women of reproductive age groups without any history of chronic disease, vitamin D intake or any other dietary supplementation and consent to participate the study. A pretested questionnaire was administered to each subject to obtain the information on sociodemographic profile, such as name, age, educational qualification, present occupation and monthly income of the family. The socioeconomic status of the individuals was calculated using Kuppuswamy classification (Table 1).

The study was made using non-fasting blood samples for the biochemical tests from all the study individuals for serum 25(OH) estimation taken. Vitamin D levels were estimated in Abott architect chemiluminescent microparticle immunoassay. Vitamin D deficiency was defined as serum 25(OH) D levels ≤20 ng/ml. The levels were further categorized under mild deficiency (12–20 ng/ml), moderate deficiency (6 < 12 ng/ml) and severe deficiency (<6 ng/ml).

RESULTS

The mean age of studied group was found to be 37 ± 6 years. The percentage of individuals from urban background was 78%, while 22% were from rural back-
ground (Fig. 1). The percentage of individuals from upper socioeconomic class was 20.5% (41), from upper middle class were 66 (33%), from middle class were 47 (23.5%) and from lower socioeconomic class were 46 (23%). The median values for serum 25(OH) D levels and calcium level was found to be 8.29 ng/ml and 10 mg/dl, respectively. It was found that 32.5% patients had severe vitamin D deficiency followed by 31.5% with moderate deficiency and 25.5% with mild deficiency. Only 10.5% of subjects had serum 25(OH) D levels equal to or more than 20 ng/ml (Table 2). It was further found that the subjects from middle socioeconomic class had the mean lowest serum 25(OH) D levels as compared to the subjects from upper, upper middle and lower socioeconomic class.

**DISCUSSION**

A unique property of vitamin D is that it can be produced endogenously in the skin sufficient sunlight exposure, especially exposure to sunlight ultraviolet B (UVB) radiation. It has been regularly reported that more than 80% of vitamin D intake is from sun exposure. Other than its role in maintaining calcium and phosphorus homeostasis promoting healthy bone mineralization, inhibition of cell growth, regulation of apoptosis, vitamin D is involved in regulating functions of female reproductive system. Hormones regulated by the vitamin D system include estradiol, progesterone, human chorionic gonadotropin and human placental lactogen, all of which are critical in maintaining the regulation of reproductive health.

Other than the geographical factors and ambient UVB radiation, there are individual-specific variables that effect endogenous production of vitamin D, such as limited access to sunlight, air pollution, skin condition and pigmentation (skin type), time spent outdoors, type of clothing and skin protection practices. People with darker skin tend to require more UVB exposure (longer time outdoors) to produce vitamin D. Exogenous sources of vitamin D include food and supplements. Very few foods naturally contain vitamin D. Fatty fish, such as salmon or mackerel contain relatively high amounts, whereas other high foods, such as meat eggs and shell-fish, contain relatively low quantities.

Out of the subjects studied, none had the sufficient/normal levels of vitamin D i.e., >30 ng/ml as per the international standards, which corresponds to the national average of India. However, it was further found that the subjects from middle socioeconomic class had the mean lowest serum 25(OH) D levels as compared to the subjects from upper, upper middle and lower socioeconomic class. The mean level of 25(OH) D of the subjects was 8.29 ng/ml which was much below normal; with severely deficient levels of vitamin D found even in unsuspecting patients.

**CONCLUSION**

Vitamin D deficiency is a problem of growing concern across all socioeconomic groups in the Indian women of reproductive age. These women may possibly have a higher risk for skeletal consequences and other related complications in future life. In lack of naturally occurring vitamin D rich foods in the country, food fortification or supplementation with vitamin D and adequate sunshine exposure should be given a higher priority among these women. There is a need of conducting more studies on a large sample to assess vitamin D status in women of reproductive age group from different parts of Jammu to substantiate the findings of the present study.

<table>
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<th>Socioeconomic Class</th>
<th>&gt;20 ng/ml</th>
<th>Mild 12–20 ng/ml</th>
<th>Moderate 6–12 ng/ml</th>
<th>Severe &lt;6 ng/ml</th>
<th>Total (%)</th>
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<td>11</td>
<td>11</td>
<td>12</td>
<td>41 (20.5)</td>
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<tr>
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<td>22</td>
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REFERENCES