10.5005/jp-journals-10054-0058

ORIGINAL ARTICLE

Vitamin D Status and Its Association with Age and Gender in East Sikkim

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ABSTRACT

Introduction: Vitamin D deficiency is an underdiagnosed, overlooked, yet a major health problem globally. It is prevalent in all the age groups and genders affecting various systems in the body.

Materials and methods: A total of 360 patients attending the outpatient department were included in the study. Vitamin D levels were checked by enzyme-linked fluorescent assay (ELFA).

Results: A total of 64% patients were found to be deficient in vitamin D followed by 20% insufficient (n = 71), whereas 15% had sufficient vitamin D and the remaining 1% were found to be under potential toxicity. Females (63%) were mostly deficient than males (37%). The deficiency was highly prevalent in between the age groups from 23 to 33 years (18%).

Conclusion: Vitamin D deficiency is highly prevalent in Sikkim among the younger population which could be due to sedentary lifestyle, less exposure to sunlight, and low dietary intake.

Keywords: Deficient, Insufficient, Latitude, Prevalent, Sunlight, Vitamin D.

How to cite this article: Bhutia SC, Phukan RR, Verma Y. Vitamin D Status and Its Association with Age and Gender in East Sikkim. Indian J Med Biochem 2018;22(1):71-74.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Vitamin D is a prohormone with an important role in calcium metabolism and is described as a part of vitamin D–calcium–parathyroid hormone endocrine axis.[1] Globally, the deficiency of vitamin D has become an epidemic health problem affecting 70 to 100% of general population.[2] According to the Food and Agriculture Organization/World Health Organization[3] expert consultation, regions located between 42°N and 42°S latitude receive abundant sunshine, which is responsible for the cutaneous production of vitamin D. In spite of experiencing ample sunlight, the deficiency is highly prevalent in India affecting all age groups and genders.[1] The synthesis of vitamin D is largely affected by the latitude, sun exposure, seasons, atmospheric pollution, dress code, and skin pigmentation.[4,5] Sikkim, a northeastern state of India, lies in the latitude between 27°N and 28°N[6] and previous studies have reported high prevalence of hypovitaminosis D in northern parts of India with a latitude of 27°N.[7-9]

Studies have proven an association between low circulating vitamin D level with increased risk of diabetes, common cancers, hypertension, autoimmune, and infectious diseases. Some studies have highlighted that if the daily consumption of vitamin D is 1100 IU for a period of 4 years, it has found to decrease occurrence of cancers.[10,11] The most reliable indicator for determining vitamin D deficiency is serum 25-hydroxyvitamin D, [25(OH)] D,[12] and radioimmunoassay is the common method for the estimation.[13]

There are no published data regarding the occurrence of vitamin D deficiency in Sikkim, hence, we aim to estimate the vitamin D level in patients attending a tertiary care hospital in East Sikkim, India.

MATERIALS AND METHODS

Study Design

A hospital-based retrospective study including a total of 360 patients attending the outpatient Department of Orthopedics with minor ailments in a tertiary care hospital, East Sikkim, India were included in the study for a period of 1 year from April 2016 to April 2017.

Fasting venous blood samples were collected (2 mL) from the patients and the serum was used for the estimation of 25(OH)D by using a standard kit (BIOMERIUX, France) by ELFA. The procedures were followed as per the pack insert.

The patients were classified as vitamin D-deficient, insufficient, or sufficient based on the 25(OH)D concentrations of <20, 20 to 30, or >30 ng/mL,[14] respectively, according to recent consensus reported by Okazaki et al.[15]

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Patients with known kidney diseases, postrenal transplant, malignancies, diabetes, thyroid, skin and liver disorders were excluded from the study.

The statistical analysis was done by using the Statistical Package for the Social Sciences version 16.0 (SPSS Inc, Chicago, Illinois, USA). Data were represented as percentage and numbers.

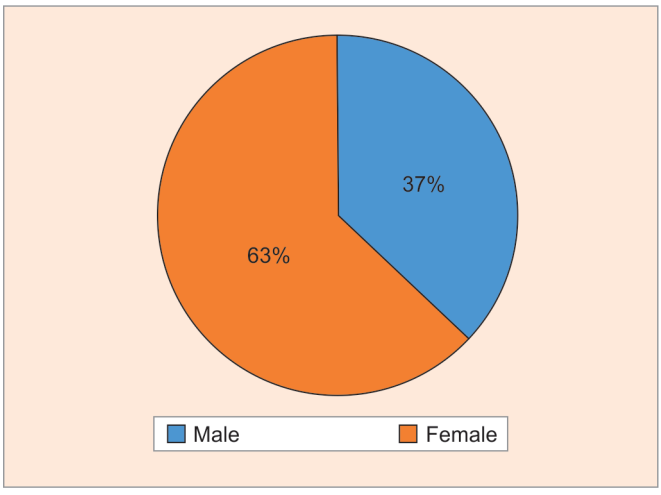
RESULTS

Table 1 represents the classification of patients with vitamin 25(OH)D deficiency according to different reference range. A total of 360 patients were evaluated for the study, out of which 64% were found to be deficient (n = 230) in vitamin D, 20% insufficient (n = 71), whereas 15% were sufficient (n = 53) and the remaining 1% were found to be under potential toxicity (n = 3).

Vitamin D deficiency and its status among the genders are given in Graph 1 and Table 2. It was observed that 63% (n = 228) females were deficient in vitamin D on comparison with males with 37% (n = 132). Among the female genders, 150 were insufficient (20–29 ng/ml) in vitamin D with 40 having deficient level (<20ng/ml); 37 females had normal level of vitamin D (30-100ng/ml) and only one female was found to be suffering from vitamin D toxicity (>100ng/ml). Regarding males, 81 patients were having insufficient levels followed by 30 with deficient levels of vitamin D, however 18 had normal levels and 2 with potentially toxicity.

Table 1: Prevalence of vitamin D deficiency status among patients

Status	*Total no 360*	*Percentage*
Deficient	230	64
Insufficient	71	20
Sufficient	54	15
Potential toxicity	3	1



Graph 1: Frequency distribution of vitamin D deficiency among genders

Table 2: Vitamin D status among the genders

Vitamin D status	*Female*	*Male*
Insufficient	150	81
Deficient	40	30
Sufficient	37	18
Potential toxicity	1	2

Table 3: Evaluation of vitamin D deficiency among the different age groups

Age group (years)	*Frequency (%)*	*Number of patients*
1–11	11.1	40
12–22	10.0	35
23–33	18.0	64
34–44	17.0	62
45–55	17.0	60
56–66	17.0	60
67–77	6.0	20
78–88	4.0	15
89–99	1.4	5

SD: Standard deviation

Table 3 depicts the distribution of vitamin D deficiencies in different age groups in the study population. It was observed that maximum numbers of patients with vitamin D deficiency were seen between 23 and 33 years of age with 18%, while same number of patients was found in the age group of 34 to 66, 45 to 55, and 56 to 66 years with 17%, followed by 11% in between 1 and 11 years. The age group between 12 and 22 years was 10%, whereas 6% were observed to be between 67 and 77 years; 4% of patients were between 77 and 87 years and the remaining 1% between 87 and 97 years of age.

DISCUSSION

Vitamin D deficiency has emerged as a major public health problem in India with nutritional factor having an important role in bone homeostasis. In the present study, out of 360 patients, it was observed that the highest number of patients (n = 230) were vitamin D deficient and in contrast, lowest number were with potential toxicity (n = 3). Females were mostly affected than males. The deficiency was highly prevalent in between the age group of 23 and 33 years (18%) followed by 34 to 44, 45 to 55, 56 to 66 and 67 to 77 years (17%), whereas the age group between 87 and 97 years was the lowest number (1%) with vitamin D deficiency. According to many studies, high number of vitamin D deficiency was reported in all age groups including toddlers, schoolchildren, pregnant women and their neonates, and adults including both genders living in rural and urban areas in India.[7,8,16] Hypovitaminosis D was recorded in women irrespective of age and lifestyle lying in a latitude of 24°N[17]

in Bangladesh and in southern parts of India,[8] which is in consort with our study. This may be due to dress code, occupation and lifestyle, dietary factor, and duration of exposure to the sunlight. Agarwal et al[18] have highlighted highest number of patients with vitamin D deficiency (83.7%) followed by 8.7% insufficient and 7.6% with normal levels, and it was found to be similar with our study having highest number of subjects with vitamin D deficiency followed by insufficient. Vitamin D deficiency [25(OH)D levels <20 ng/mL] is concomitant with the disease like rickets/osteomalacia, vitamin D insufficiency [25(OH)D levels between 20 and 308 ng/mL] with secondary hyperparathyroidism resulting from low dietary calcium level.[19,20] According to the age group, we observed younger population were more susceptible to hypovitaminosis D and our study has been consistent with the findings by Mehta et al,[21] and the reason could be due to sedentary lifestyle, diet deficient in vitamin D along with insufficient exposure to sunlight.

Sunlight is the key source for the endogenous production of vitamin D in the skin, and vitamin D deficiency in older people may be due to reduction in dietary ingestion, less exposure in sunlight-diminished intestinal absorption, and hydroxylation in organs like liver and kidneys.[22,23]

The limitation of our study was that we could collect only 360 patients due to the study design and as it was a first attempt to check the status of vitamin D in the state, we did not take ethnicity under consideration. Being a retrospective study, Inclusion of other biochemical parameters like alkaline phosphatase, parathormone, calcium and phosphorous could not be done which would have given a better picture of vitamin D status. More extensive study with larger sample size in apparently healthy individuals is required to establish a reference range of vitamin D in the populations of this region of the country as it may vary according to geographical location and ethnicity.

Yearly screening and sensitization should be initiated to create an awareness about the important role of vitamin D in the body. Implementation of food fortification program would be helpful to deal with the epidemic nature of its deficiency. Further, research with a larger sample size along with its association with biochemical and other causative factors should be done in all the four districts of the state to get a clearer picture about the status of vitamin D level in Sikkim.

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