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## Original Research Article

# Prevalence of vitamin D deficiency in Indian women

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### ABSTRACT

**Background:** Vitamin D is the widespread nutritional deficiency in India yet it has been widely undiagnosed and untreated. Nowadays its deficiency has become the widely investigational topic as the role of vitamin D deficiency has been identified in various disorders.

**Methods:** In order to study the prevalence of vitamin d in our study (level <20 ng/ml) the 1052 women attending the clinic are taken into the consideration and the levels of vitamin d are done in them irrespective of the symptom.

**Results:** In our study the 1052 women attending the clinic were taken and it was found that the prevalence of vitamin D level <20 ng/ml was 64.06% and the level of vitamin D <30 ng/ml was 98.75% and it was higher in younger (65.51%), illiterate (89.92%), housewife women (70%) and its prevalence was higher in women residing in rural areas (69.94%) and also having an income <10,000 (61.96%).

**Conclusions:** Thus it was concluded the cut off level for the vitamin D deficiency level should be revised in according to the need of the people of India as the high prevalence of vitamin D deficiency in our study could be the result of our being over concerned and the internationally set up criteria for its deficiency and also ICMR should also revise the recommend daily allowance to include daily recommendation of vitamin D level.

**Keywords:** Indian women, Prevalence, Vitamin D

### INTRODUCTION

Vitamin D is the widespread nutritional deficiency in India yet it has been widely undiagnosed and untreated. Its deficiency affected the individual irrespective of the gender, age, sex, race and geography.

Nowadays vitamin D deficiency has become the widely investigational topic as the role of vitamin D deficiency has been identified in various disorders besides its worldwide known skeletal side effects. Chronic vitamin D deficiency in adults results in osteomalacia, osteoporosis, muscle weakness.<sup>1-7</sup> Recent researches had also linked vitamin D deficiency with the increased risk

of developing tuberculosis, otitis media, upper respiratory tract infections and influenza and many other infections.<sup>8-12</sup> Its deficiency has also linked with the increased risk of developing hypertension, diabetes, obesity and high triglyceride level ultimately leading to increased risk of cardiovascular mortality.<sup>13</sup> Researchers have shown epidemiological association of vitamin D deficiency and type1 diabetes.<sup>14</sup> A meta-analysis of observational studies showed a 30% reduction in risk of type 1 diabetes mellitus in children receiving vitamin D supplements.<sup>15</sup>

In India, the cultural and social taboos affect the lifestyle of the individuals. Most of the people of the country are pure vegetarians and the others are underprivileged.

These two factors affect the nutritional status leading to the vitamin deficiency in the individuals. Also, the clothing of the individuals will limit the sun exposure and ultimately aggravating the vitamin D deficiency.

Additionally, vitamin D deficiency supplements are available but most Indians were unaware about their requirement of vitamin D.

Plasma 25(OH)D or calcidiol (a summation of D<sub>3</sub> and D<sub>2</sub> forms) is the most reliable marker of vitamin D status. Immunoassays such as radioimmunoassay (RIA), enzyme linked immunosorbant assay (ELISA), chemiluminescence immunoassay and protein binding assays are used in routine testing of 25(OH)D in clinical laboratories. LCTMS (liquid chromatography tandem mass spectrometry) is the widely accepted reference method for 25(OH)D measurement. However, LCTMS is tedious, expensive and time consuming and therefore seldom used commercially.

Since vitamin D undernutrition is largely silent and subclinical, the indication for testing remains controversial. At present 25(OH) D test is the “most ordered test” in the USA. A similar trend has just begun in the upper socioeconomic stratum in India too.

Thus the aim of this paper is to encounter the gravity of the vitamin D deficiency problem throughout India so that the physicians take necessary caution and care in the diagnosis and treatment of Vitamin D deficiency.

But it is important to note that the studies which have reported an increased prevalence of vitamin D deficiency in India have taken the cut-off limits of approximately 20 ng/ml for severe vitamin D deficiency, cut-off limits of 30 ng/ml for moderate vitamin D deficiency, and a cut-off limit of <35 ng/ml as mild deficiency.

## METHODS

In order to study the prevalence of vitamin D deficiency in our study the level of vitamin D are done in 1052 women attending the Gynae clinic over the period of 6 months from September 2017 to January 2018 irrespective of the clinical features by the method of electrochemiluminescence.

Detailed history and examination were performed with special regard to socioeconomic status, clinical features suggestive of osteomalacia (e.g. proximal muscle weakness, bone pain, tenderness or fractures) or past rickets.

Daily intake of dietary calcium and vitamin D was calculated from a food frequency questionnaire. Any supplement intake was also noted. Daily sun exposure was assessed by taking a detailed history of the daily routine separately during summer and winter seasons and of the type of clothing worn.

Sunshine exposure was calculated as hours of exposure/day X% of body surface area exposed.

## Inclusion criteria

Inclusion criteria were age 15–60 yrs; all women attending the Gynaec clinic.

## Exclusion criteria

Exclusion criteria were age >15 yrs or <60 yrs; women with parathormone hormone (PTH) deficiency; women with premature ovarian failure; women with chronic liver disease; women with renal disease; women on antitubercular or antiepileptic treatment in the previous 3 months.

## RESULTS

In the present study 1052 women attending the clinic were taken for the consideration and the vitamin D level were done in them. Table 1 shows that the prevalence of vitamin D deficiency (level <20 ng/ml) was 65.51% among women with age <30 years and it was 61.83% among women with age >30 years.

It also shows that the prevalence of vitamin D deficiency was 89.92% among illiterate women and it was 43.9% among literate women. Prevalence of vitamin D deficiency was 70% among housewife women and 40.56% among working women.

It also shows that the prevalence of vitamin D deficiency was 69.94% among rural women, 61.96% among women with income <10,000 and it was 57.72%, 46.99% among urban women and women with income >10,000 respectively.

**Table 1: Distribution of patients according to age, education, category, housing and income.**

Parameter	Total number of patients	No. of patients with vitamin D <20 ng/ml (%)
Age <30	638	418 (65.51)
>30	414	256 (61.83)
<b>Education</b>		
Illiterate	462	415 (89.92)
Literate	590	259 (43.9)
<b>Category</b>		
Housewife	840	588 (70)
Working	212	86 (40.56)
<b>Housing</b>		
Rural	560	390 (69.64)
Urban	492	284 (57.72)
<b>Income</b>		
<10,000	586	363 (61.96)
>10,000	466	311 (46.99)

**Table 2: Distribution of patients according to exposure of sun and usage of vitamin D supplements.**

Parameter	Total no. of patients	No. of patients With vitamin D <20 (%)
<b>Exposure to sun</b>		
More	498	258 (51.80)
Less	554	416 (75.09%)
<b>Supplements</b>		
Yes	232	104 (44.8)
No	820	570 (69.51)

**Table 3: Distribution of patients according to vitamin D levels.**

Vitamin D level (ng/ml)	No. of patients	Percentage
< 20	674	64.06
20 - 30	365	34.69
>30	13	1.23

Table 2 shows that the prevalence of vitamin D deficiency with more exposure to sun was 51.80% with more exposure to sun and it was 75.09% among women with less sunlight exposure. It also shows that the prevalence of vitamin D deficiency among women using and not using the vitamin D supplements was 44.8% and 69.51% respectively Table 3 shows that the prevalence of Indian women with vitamin D level <20 ng/ml was 64.06%, women with levels between was 20-30 ng/ml was 34.69% and women with >30 ng/ml.

## DISCUSSION

In the present study it was shown that the prevalence of vitamin D deficiency was higher among younger, illiterate women. It was also higher among women residing the rural areas, and women those are housewife and also having income <10,000.

It was found in the present study that the prevalence of vitamin D level <20 ng/ml in the Indian women was 64.06% and the prevalence of vitamin D level < 30 ng/ml in Indian women was 98.75%. This is in accordance to the study conducted by Kritiar et al in Medanta, Gurgaon in which 25 (OH) vit D deficiency was 93% and out of which 34% subjects were 25(OH) vit D insufficient and 59% had frank deficiency and also in accordance to the study in Ballabgarh district in which the prevalence of Vitamin D deficiency (levels < 20 ng/ml) was found in 90.8%. Of the 381, only one individual was found to have vitamin D sufficiency.<sup>16</sup>

As per the report of International Osteoporosis Foundation, in North India, 96% of noenates, 91% of healthy school girls, 78% of healthy hospital staff, and 84% of pregnant women were found to have hypovitaminosis D. On the other hand, prevalence of vitamin D deficiency in southern India was estimated to

be 40% among males and 70% among females. There was also a significant rural urban variation in the vitamin D deficiency status that was attributed to the diversity of occupation which the people were involved in.<sup>17</sup>

Tandon et al shows that the mean vitamin D levels of the study population was 26.86 ng/ml and mean fasting blood glucose levels was 134.52±17.56 mg%. While evaluating the vitamin D status of the study population, 53.35% of the population has vitamin D deficiency, 19.48% had insufficiency and 26.83% had adequate vitamin D levels.<sup>18</sup>

Sachan et al had studied the 207 pregnant women from the Queen Mary Hospital, King George Medical University Lucknow for the maternal vitamin 25(OH)D level along with the cord blood vitamin 25(OH)D levels in the neonates. The result of the study was that the 42.5% of the women had the vitamin D level was <10 ng/ml and about 66.7% of the women had the vitamin D level was <15 ng/ml. Follow up had shown that the cord blood 25(OH)D levels was significantly lower (5.2±3 and 11.8±5 ng/ml) respectively in women with 25 (OH)D concentration was <10 ng/ml than in mother with 25(OH)D concentration >10 ng/ml.<sup>19</sup>

Goswami et al showed that despite of abundant sunlight, healthy persons in Delhi remained vitamin D deficient. This may be because of skin pigmentation, inadequate direct sun exposure as well as low-calcium, high-phytate diets, pregnancy, and winter-related reduced sunlight exposure which may affect vitamin D levels.<sup>20</sup>

Use of sunscreen could be one of the factors that affect vitamin D level. Few authors have reported that sunscreens block the cutaneous absorption of UV-B radiation and prevent sunburn and thus decreases the vitamin D stores.<sup>21</sup>

Matsuka et al showed that the long-term use of sunscreens may be associated with low body stores of vitamin D in some persons.<sup>22</sup>

## CONCLUSION

Vitamin D deficiency prevails in epidemic proportions all over the Indian subcontinent with the prevalence of 70 - 100% in the general population. The widespread deficiency of vitamin D deficiency in India could be because of the dietary intake, high fibre and phytate intake that will decrease the vitamin D levels.

Thus, it was concluded that to reduce the prevalence of Vitamin D deficiency in India it is very important that the public and private sector work very closely with each other such as the cut off level for the vitamin D deficiency level should be revised in according to the need of the people of India as the high prevalence of vitamin D deficiency in our study could be the result of

our being over concerned and the internationally set up criteria for its deficiency.

Also, ICMR should also revise the recommend daily allowance to include daily recommendation of vitamin D level. Government of India should organize programs to increase public awareness of vitamin D deficiency, causes and long term consequences. Daily physical activity in the sunshine should be included in the social curriculum and also the Government of India should take steps for the fortification of staple food with the vitamin D and also make an effort so that the vitamin D supplements should be available at the affordable costs.

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