

**An Observational study to assess the prevalence of Vitamin D deficiency in Indian women****Ravi Kumar<sup>1</sup>, Kajal Kunwar<sup>2\*</sup>, Anup Kumar<sup>3</sup>, Nimisha Agrawal<sup>4</sup>**<sup>1</sup>Senior Resident, Department of Orthopaedics, Nalanda Medical College and Hospital, Patna, Bihar, India<sup>2</sup>Senior Resident, Department of Obstetrics and Gynaecology, AIIMS Patna, Bihar, India<sup>3</sup>Additional Professor & Head, Department of Orthopaedics, AIIMS Patna, Bihar, India<sup>4</sup>Assistant Professor, Department of Obstetrics and Gynaecology, AIIMS Patna, Bihar, India**Received: 02-09-2020 / Revised: 26-10-2020 / Accepted: 08-11-2020****Abstract**

**Aim:** The aim of this study 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. **Methods:** This was a prospective study conducted in a government teaching hospital located in Patna, Bihar, India from March 2018 to February 2020. The prevalence of vitamin D deficiency in our study the level of vitamin D was done in 840 women, irrespective of the clinical features by the method of electrochemiluminescence. Sunshine exposure was calculated as hours of exposure/day X% of body surface area exposed. **Results:** In the present study 840 women attending the clinic were taken for the consideration and the vitamin D level were done in them. The prevalence of vitamin D deficiency (level <20 ng/ml) was 68.24% among women with age <30 years and it was 56.97% among women with age >30 years. The prevalence of vitamin D deficiency was 90.19% among illiterate women and it was 41.60% among literate women. Prevalence of vitamin D deficiency was 71.09% among non working women and 38.06% among working women. **Conclusion:** 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.

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

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**Introduction**

The deficiency of vitamin D or hypovitaminosis D has emerged as an important area of research. Inadequate levels of vitamin D are widespread irrespective of age, gender, race, and geography[1]. Vitamin D a fat soluble vitamin also functions as a hormone. It is involved in maintaining the integrity of skeletal system as it regulates parathyroid hormone, calcium and phosphorous metabolism[2]. It is also essential for calcium homeostasis and musculoskeletal health[3,4]. The level of 25-hydroxyvitamin D [25(OH)D] is

considered as the most reliable index for assessing an individual's vitamin D status[5]. Deficiency of vitamin D and calcium may lead to osteoporosis. Deficiency of vitamin D can cause low bone mass (rickets in children and osteomalacia in adults) and muscle weakness, thus increasing the risk of fracture[6,7]. The intestinal calcium absorption reduces to as low as 10-15 per cent in vitamin D-deficient state, whereas it is 30-80 per cent in vitamin D-sufficient state[8]. Adequate intake of calcium together with vitamin D can help in maintaining peak bone mass[7]. The presence of vitamin D receptors and enzymes which produce the active form of vitamin D (i.e. 1,25-dihydroxyvitamin D) in the skin have highlighted the potential role of vitamin D in reducing risk of chronic diseases, such as carcinomas, autoimmune diseases, infectious diseases and cardiovascular diseases[2]. However, the Institute of Medicine Committee in its report on dietary

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requirements for calcium and vitamin D has concluded that there are inconclusive and inconsistent data that vitamin D and calcium lower the risk of cancer, cardiovascular disease, diabetes, infections, autoimmune disorders and other extra-skeletal consequences[9]. Vitamin D deficiency is prevalent in India. Factors such as length and timing of sun exposure, amount of skin exposed, latitude, season, level of pollution in atmosphere, clothing, skin pigmentation, application of sunscreen, dietary factors and genetic factors may lead to hypovitaminosis D[4,7-10]. Other factors which may cause lower levels of vitamin D include changing food habits, consuming only vegetarian food, less intake of vitamin D-fortified foods, high fibre diet-containing phosphates and phytates, cultural and traditional practices, unplanned and unspaced pregnancies[4,7,11]. Association between modifiable factors such as sun exposure, sunscreen use, geographic allocation, atmospheric pollution, clothing, melanin pigmentation, ageing and vegetarian diet and decreased vitamin D synthesis has been reported[12,13]. The primary source of vitamin D is sunlight. Vitamin D is synthesized in the skin by conversion of 7-dehydrocholesterol to cholecalciferol (vitamin D<sub>3</sub>) when it is exposed to ultraviolet B radiation (wavelength: 290-320 nm)[4,14]. Dietary sources of vitamin D include animal products such as fatty fish, food items fortified with vitamin D and supplements[9,14]. Adequate levels of vitamin D can be achieved by exposure to sunlight. Exposing skin (arms and face area) to sunlight without applying sunscreen for half an hour (between 1000 and 1400 h) every day is considered adequate to avoid hypovitaminosis D[7].

An individual's serum concentration of 25(OH) D of at least 20 ng/ml (50 nmol/l) is considered sufficient, levels >30 ng/ml (75 nmol/l) are not related with benefits, and levels >50 ng/ml (125 nmol/l) have been associated with some risks.<sup>9</sup> Thus the aim of this study 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.

#### Material and Methods

This was a prospective study conducted in a government teaching hospital located in Patna, Bihar, India from March 2018 to February 2020 after taking the approval of the protocol review committee and

institutional ethics committee. In order to study the prevalence of vitamin D deficiency in our study the level of vitamin D are done in 840 women, irrespective of the clinical features by the method of electrochemiluminescence.

#### Methodology

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. The Women age 18-55 years were included in this study. The age >18 yrs or <55 yrs; women with parathyroid hormone (PTH) deficiency, with chronic liver disease and women with renal disease; were excluded from the study.

#### Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2010) and then exported to data editor page of SPSS version 19 (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics included computation of percentages and means.

#### Results

In the present study 840 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 68.24% among women with age <30 years and it was 56.97% among women with age >30 years.

It also shows that the prevalence of vitamin D deficiency was 90.19% among illiterate women and it was 41.60% among literate women. Prevalence of vitamin D deficiency was 71.09% among non working women and 38.06% among working women.

It also shows that the prevalence of vitamin D deficiency was 71.45% among rural women, 63.67% among women with low income and it was 56.65%, 44.57% among urban women and women with high income respectively.

**Table 1: Demographic profile of the patients**

Parameter	Total number of patients	No. of patients with vitamin D <20 ng/ml (%)
Age below 30 years	510	348 (68.24)
Above 30 years	330	188 (56.97)

<b>Education</b>		
Illiterate	316	285 (90.19)
Literate	524	218 (41.60)
<b>Category</b>		
Non working	685	487 (71.09)
Working	155	59 (38.06)
<b>Area</b>		
Rural	494	353 (71.45)
Urban	346	196 (56.65)
<b>Income</b>		
Low	490	312 (63.67)
High	350	156 (44.57)

**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	345	182 (52.75)
Less	495	389 (78.59%)
<b>Supplements</b>		
Yes	156	62 (39.74)
No	684	493(72.08)

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

Vitamin D level (ng/ml)	No. of patients	Percentage
below 20	548	65.24
20 – 30	276	32.86
Above 30	16	1.90

Table 2 shows that the prevalence of vitamin D deficiency with more exposure to sun was 52.75% with more exposure to sun and it was 78.59% 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 39.74% and 72.08% respectively Table 3 shows that the prevalence of Indian women with vitamin D level below 20 ng/ml was 65.24%, women with levels between was 20-30 ng/ml was 32.86% and women with above 30 ng/ml was 1.90.

### 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 non-working and also having low income. It was found in the present study that the prevalence of vitamin D level below 20 ng/ml in the Indian women was 65.24% and

the prevalence of vitamin D level below 30 ng/ml in Indian women was 98.10%. 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[15]. 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 [16]. 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>17</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 >10ng/ml [18] 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>11</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 decrease the vitamin D stores.<sup>19</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 [20]

### Conclusion

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.

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