

**ORIGINAL RESEARCH**

# Assessment of prevalence of vitamin D deficiency in orthopaedic patients

<sup>1</sup>Dr. Ayush Chauhan, <sup>2</sup>Dr. Smriti Chaturvedi, <sup>3</sup>Dr. Preeti Sahu, <sup>4</sup>Dr. Deepak Vashistha

<sup>1</sup>Consultant Orthopaedic Surgeon, Chatrapati Shivaji Hospital, Sagar, M.P., India

<sup>2</sup>Assistant Professor, Department of Pathology, Bundelkhand Medical College, Sagar M.P., India

<sup>3</sup>Assistant Professor, Department of Anaesthesiology, Bundelkhand Medical College, Sagar M.P., India

<sup>4</sup>Assistant Professor, Department of Orthopaedic, LN Medical College, India

## Corresponding Author

Dr. Deepak Vashistha

Assistant Professor, Department of Orthopaedic, LN Medical College, India

Email: [deepakjim3738@gmail.com](mailto:deepakjim3738@gmail.com)

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## ABSTRACT

**Background:** Traditionally, vitamin D has been referred to as the sunlight vitamin or the anti-ricketic component. The present study was conducted to assess prevalence of vitamin D deficiency in orthopaedic patients. **Materials & Methods:** 140 orthopaedic patients of both genders were enrolled. After determining weight and height, the body mass index (BMI) was computed. The proportion of the body's surface area exposed each day and the average length of exposure were recorded in order to evaluate daily exposure to direct sunlight. **Results:** Out of 140 patients, males were 82 and females were 58. Vitamin D had frank deficiency (<20 ng/ml) was seen in 72, insufficiency (21–29 ng/ml) in 40 and sufficient (>30 ng/ml) in 28 cases. The difference was significant ( $P < 0.05$ ). BMI was 28.5 kg/m<sup>2</sup>, 26.3 kg/m<sup>2</sup> and 25.1 kg/m<sup>2</sup> in patients with vitamin D deficiency, insufficiency and sufficiency. The mean PTH was 43.1 pg/ml, 35.7 pg/ml and 38.2 pg/ml. The mean calcium was 9.5 mg/dl, 9.4 mg/dl and 9.8 mg/dl. The mean phosphorus was 3.1 mg/dl, 3.0 mg/dl and 3.5 mg/dl. The mean alkaline phosphate level was 92.3 U/L, 94.6 U/L and 96.7 U/L. Daily sunlight use >30 min was seen 40, 9 and 5 patients with vitamin D deficiency, insufficiency and sufficiency. The difference was non-significant ( $P > 0.05$ ). **Conclusion:** Lack of sunshine exposure, insufficient food consumption and supplementation, as well as other factors like age, obesity, medication use, sunscreen use, covering entire skin with clothing, and skin pigmentation, are risk factors for low vitamin D levels.

**Keywords:** BMI, vitamin D, calcium

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## INTRODUCTION

Traditionally, vitamin D has been referred to as the sunlight vitamin or the anti-ricketic component. It is vital for maintaining calcium homeostasis, and normal serum calcium concentrations are necessary for a number of processes, such as healthy bone mineralization, muscle contraction, and nerve impulse transmission. Osteoporosis, osteomalacia, muscle weakness, osteoarthritis, nonspecific back pain, gout, ankylosing spondylitis, widespread body aches, higher risk of falls, etc. are all caused by chronic vitamin D insufficiency.<sup>1,2</sup>

In fact, vitamin D insufficiency is widespread around the world and has been documented in healthy individuals of both sexes and in all age groups. Additionally, almost 90% of Indians who appear healthy have 25 (OH)D levels that are below normal. There are few reports in the literature comparing the prevalence of vitamin D deficiency in orthopaedic patients to that of the population that appears to be in

good health.<sup>3,4</sup> When treating patients, orthopaedic surgeons may find it helpful to have data on the prevalence of vitamin D deficiency and sufficiency. This will help them avoid unfavorable outcomes during surgery and recovery, maintain optimal physical function, and maintain their patients' independence in daily life.<sup>5,6</sup> The present study was conducted to assess prevalence of vitamin D deficiency in orthopaedic patients.

## MATERIALS & METHODS

The present study consisted of 140 orthopaedic patients of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. The presence of co-morbid conditions such as diabetes mellitus, hypertension, and ischemic heart disease, and the use of medications, such as oral vitamin D supplements was recorded. After determining weight and height, the body mass index (BMI) was

computed. The proportion of the body's surface area exposed each day and the average length of exposure were recorded in order to evaluate daily exposure to

direct sunlight. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

## RESULTS

**Table I Distribution of patients**

Total- 140		
Gender	Male	Female
Number	82	58

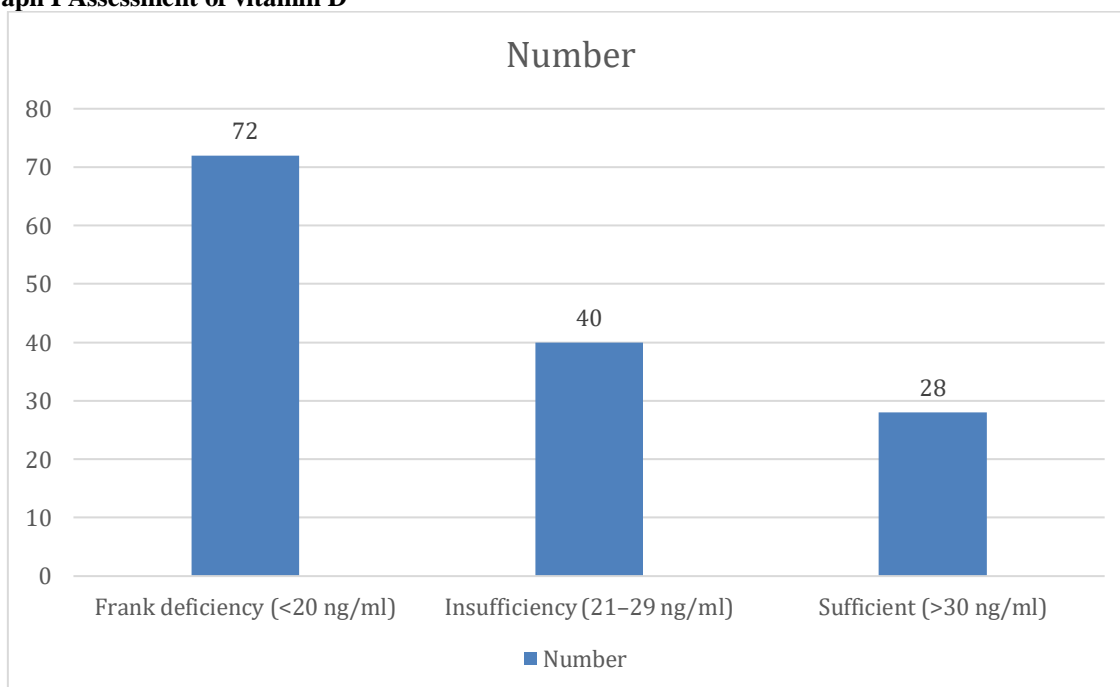
Table I shows that out of 140 patients, males were 82 and females were 58.

**Table II Assessment of vitamin D**

Vitamin D	Number	P value
Frank deficiency (<20 ng/ml)	72	0.01
Insufficiency (21–29 ng/ml)	40	
Sufficient (>30 ng/ml)	28	

Table II shows that vitamin D had frank deficiency (<20 ng/ml) was seen in 72, insufficiency (21–29 ng/ml) in 40 and sufficient (>30 ng/ml) in 28 cases. The difference was significant (P< 0.05).

**Graph I Assessment of vitamin D**



**Table III Assessment of parameters**

Parameters	Deficiency	Insufficiency	Sufficiency	P value
BMI (kg/m <sup>2</sup> )	28.5	26.3	25.1	0.81
PTH (pg/ml)	43.1	35.7	38.2	0.04
Calcium (mg/dl)	9.5	9.4	9.8	0.95
Phosphorus (mg/dl)	3.1	3.0	3.5	0.92
Alkaline phosphate (U/L)	92.3	94.6	96.7	0.17
Daily sunlight >30 min	40	9	5	0.02

Table III, graph I shows that BMI was 28.5 kg/m<sup>2</sup>, 26.3 kg/m<sup>2</sup> and 25.1 kg/m<sup>2</sup> in patients with vitamin D deficiency, insufficiency and sufficiency. The mean PTH was 43.1 pg/ml, 35.7 pg/ml and 38.2 pg/ml. The mean calcium was 9.5 mg/dl, 9.4 mg/dl and 9.8 mg/dl. The mean phosphorus was 3.1 mg/dl, 3.0 mg/dl and 3.5 mg/dl. The mean alkaline phosphate level was 92.3 U/L, 94.6 U/L and 96.7 U/L. Daily sunlight use >30 min was seen 40, 9 and 5 patients with vitamin D deficiency, insufficiency and sufficiency. The difference was non-significant (P> 0.05).

## DISCUSSION

In India, vitamin D insufficiency is widespread. Vitamin D deficiency occurs when the body doesn't get enough vitamin D, which is essential for overall health. Vitamin D can be synthesized by the body when the skin is exposed to sunlight.<sup>7</sup> People who don't get enough sunlight, such as those who live in northern latitudes, spend a lot of time indoors, or wear clothing that covers most of their skin, may be at risk. Vitamin D is found in some foods, such as fatty fish, egg yolks, and fortified dairy products, but it can be challenging to get enough from diet alone.<sup>8</sup> Certain medical conditions affecting the gut can interfere with the absorption of vitamin D from food.<sup>9</sup> Vitamin D is fat-soluble, so it can be sequestered in fat tissue, making it less available for use in the body. Many studies have drawn attention to the low vitamin D levels found in a variety of populations, including postmenopausal women, young adults, hospital staff, and schoolchildren.<sup>10,11</sup>

We found that out of 140 patients, males were 82 and females were 58. Pal et al<sup>12</sup> found that of the 1132 patients that were part of our study, 400 (36.3%) were female and 732 (64.7%) were male. Of the patients, 1034 patients (91.3%) had vitamin D deficiency (<30 ng/ml); 693 patients (61.2%) had a vitamin D level <20 ng/ml, and only 98 patients (8.7%) had appropriate levels of the vitamin. Compared to younger patients, older patients (61–80) had higher levels of vitamin D insufficiency. 670 males (91.5%) and 364 females (91.0%) out of 1132 patients had serum 25(OH) vitamin D levels below the cut-off of 30 ng/dl for vitamin D sufficiency (p-value = 0.75). Patients who spent less time in the sun on average had lower levels of vitamin D. In comparison to the sufficient group, the BMI level was higher in the deficient group. There is probably a high prevalence of vitamin D deficiency and insufficiency.

We observed that vitamin D had frank deficiency (<20 ng/ml) was seen in 72, insufficiency (21–29 ng/ml) in 40 and sufficient (>30 ng/ml) in 28 cases. Khadgawat et al<sup>13</sup> included 43 patients, 9 men (20.9%) and 34 women (79.0%, all postmenopausal). The mean age of patients was 62.2 +/- 12.3 years (range 50.5 to 74.2 years, men--62 +/- 13.4 years; women--62.3 +/- 12.4 years; p 0.73). History of adequate sun exposure was obtained in 34.8% cases only. Fracture occurred while patients were outside home in 10/43 (23.25%) while 33/43 (76.7%) patients sustained fracture at home. Of all fractures occurring at home, 51.5% patients sustained fracture consequent to fall/slip in the bathroom. The mean serum 25(OH)D level was 9.9 +/- 4.8 ng/ml (range 5-21.5 ng/ml). All patients except one (96.7%) had VDD. No significant difference in serum 25(OH)D levels was observed between patients with and without adequate sun exposure. BMD of patients with fragility fractures were significantly low in comparison to BMD of healthy controls. (cases --0.790 +/- 0.1 gm/sq cm vs controls 0.924 +/- 0.1 gm/sq cm; p 0.000). The mean

Z-score of spine BMD of cases was -1.13 +/- 1.4. No significant difference was observed in the BMD of patients with or without adequate sun exposure and with or without calcium and vitamin D supplementation at the time of fracture. Similarly, no significant difference was noted in BMD of patients with severe VDD and patients with mild to moderate VDD. All patients were contacted by telephone one year after the surgery (mean 12.3 months, range 9 to 13 months). Out of total 43 patients, 26 patients/families could be contacted, 11 (42.3%) died within one year of surgery, of which 8 patients died within first 6 months after surgery. Two patients died within 72 hours after discharge from hospital. Of 15 patients alive one year after surgery, two were able to walk without any support while 13 were able to walk with some support (stick or walker).

We found that vitamin D had frank deficiency (<20 ng/ml) was seen in 72, insufficiency (21–29 ng/ml) in 40 and sufficient (>30 ng/ml) in 28 cases. Bogunovic L et al<sup>14</sup> reviewed 723 patients who were scheduled for orthopaedic surgery. Overall, 43% of all patients had insufficient serum vitamin-D levels, and, of these, 40% had deficient levels. Among the orthopaedic services, the highest rates of low serum vitamin-D levels were seen in the trauma and sports services, in which the rates of abnormal (insufficient and deficient) vitamin-D levels were 66% and 52%, respectively. The lowest rate of abnormal vitamin-D levels was seen in the metabolic bone disease service. Patients between the ages of fifty-one and seventy years were 35% less likely to have low vitamin-D levels than patients between the ages of eighteen and fifty years (p = 0.018). The prevalence of low vitamin-D levels was significantly higher in men (p = 0.006). Individuals with darker skin tones (blacks and Hispanics) were 5.5 times more likely to have low vitamin-D levels when compared with those with lighter skin tones.

We found that BMI was 28.5 kg/m<sup>2</sup>, 26.3 kg/m<sup>2</sup> and 25.1 kg/m<sup>2</sup> in patients with vitamin D deficiency, insufficiency and sufficiency. The mean PTH was 43.1 pg/ml, 35.7 pg/ml and 38.2 pg/ml. The mean calcium was 9.5 mg/dl, 9.4 mg/dl and 9.8 mg/dl. The mean phosphorus was 3.1 mg/dl, 3.0 mg/dl and 3.5 mg/dl. The mean alkaline phosphate level was 92.3 U/L, 94.6 U/L and 96.7 U/L. Daily sunlight use >30 min was seen 40, 9 and 5 patients with vitamin D deficiency, insufficiency and sufficiency. Baig et al<sup>15</sup> assessed serum vitamin-D level. Of the total 79 patients, 58(73%) were females and 21(27%) males. Minimum age was one year and maximum 90 years, with a mean age of 41.91 and standard deviation of 19.1. Majority of the patients were seen in the 4th, 5th and 6th decades of life, and most of them were house wives. The serum Vitamin-D level was found low in 73(92%) patients and the most severe form of deficiency was seen in patients with tuberculosis. The limitation of the study is the small sample size.

## CONCLUSION

Authors found that lack of sunshine exposure, insufficient food consumption and supplementation, as well as other factors like age, obesity, medication use, sunscreen use, covering entire skin with clothing, and skin pigmentation, are risk factors for low vitamin D levels.

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