Section: Orthopaedics

Original Research Article

A DESCRIPTIVE STUDY ON PREVALENCE OF VITAMIN D DEFICIENCY AMONG ORTHOPAEDIC PATIENTS ATTENDING TERTIARY CARE HOSPITAL IN SOUTH INDIA

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Received : 10/01/2025
Received in revised form : 17/02/2025
Accepted : 03/03/2025

Keywords:
Vitamin D deficiency, Orthopaedic out-patients, South India.

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DOI: 10.47009/jamp.2025.7.2.110

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (2); 539-543

Abstract

Background: The status of vitamin D of human being is evaluated by 25 hydroxy cholecalciferol serum level and their low level are related to numerous acute and chronic diseases. Deficient vitamin D is a paramount public health problem in India. The objectives of the present study are to assess the prevalence of the vitamin D deficiency among the orthopaedic patients and to analyse the factors that lead to deficiency of vitamin D in south Indian population. **Materials and Methods:** Patients with age group between 20 and 80 years of both genders with orthopaedic illness were included in the study. Pregnant and lactating mother, patients with dermatological disorder, any other diseases and drugs that may affect the metabolism of vitamin D and patient on vitamin D supplementation were eliminated from this study. Details about time and duration sunlight exposure, pattern of dressing were enquired and recorded. The data collected were tabulated and statistically analysed. **Result:** A total of 50 patients attending the orthopaedic out-patient department were included in this study among them 32(64%) and 18(36%) were females and males respectively. The average age of the study participant was 25.5±12.5 years. The mean vitamin D3 level in the blood was 24.30 ± 9.94 ng/ml. 22 (44%) study participants had insufficient vitamin D3 level and 19 (38%) had deficient vitamin D3 level. **Conclusion:** In this study there is greater prevalence of deficient and insufficient status of vitamin D in people of all ages. Aggressive screening along with treatment strategies may prevent vitamin D deficiency and insufficiency.

INTRODUCTION

Fat soluble vitamin D is crucial for bone health and metabolism of minerals and it is effective in osteomalacia and rickets treatment and prevention.[1] Additionally vitamin D is essential for cellular proliferation, angiogenesis, rennin production, stimulating insulin production etc.[2] Status of vitamin D of human being is evaluated by 25 hydroxy cholecalciferol serum level, which is a vital metabolic product of vitamin D circulating in the body.[3] Various studies have shown that low level of 25 hydroxy cholecalciferol level are related to numerous acute and chronic diseases thus lifting attention regarding vitamin D.[1]

Deficient vitamin D exists globally and it is a paramount public health problem in India and it has been roughly calculated that 490 million beings are deficient to vitamin D in India.[4-6] Recent systematic review has demonstrated that almost one out of three of all the studies conducted globally has found vitamin D deficiency.[3] In India vitamin D deficiency has been found to be prevalent in approximately 70-90% over all ages from children to adult. Manoharan et al in his study had shown that vitamin D deficiency prevalence was 40.2% in the group of adult patients with complaints of non-specific musculoskeletal pain attending orthopaedic department.[7]

Inspite of being a country of plenty of sunrays especially south India throughout the year lately, many studies had reported increased rate of deficient vitamin D in the population of India. There are not many studies reported from southern district of India that focus on the vitamin D status among patients attending orthopaedic out-patient department. Hence, the present study was intended to assess the status of vitamin D among patients attending orthopaedic out-patient department. The objectives of the present study is to assess the prevalence of the vitamin D deficiency among the orthopaedic patients and to analyse the factors that lead to deficiency of vitamin D in south Indian population.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

MATERIALS AND METHODS

Patient population and Ethical consideration: The descriptive type cross-sectional study was done in the patients attending orthopedic outpatient department with orthopaedic illness in a tertiary care hospital in South India. Duration of the study was one year from with sample size of 50 study participants. The present study was commenced after getting approval from the human ethics committee of the institution (REF NO: 1996/EXT/2021) Informed written consent was obtained in local vernacular language from all the study population registered in the study.

Selection Criteria

Patients with age group between 20 and 80 years of both genders with orthopaedic illness attending orthopedic outpatient department were included in the study. Patient of more than 80 years and less than 20 years, pregnant and lactating mother, patients with dermatological disorder, chronic liver disease, chronic kidney disease, parathyroid disease, patients on chronic drug therapy like anticonvulsants, anti-tubercular drugs that may affect the metabolism of vitamin D and patient on vitamin D supplementation and patients using sunscreens were eliminated from this study.

Study Procedure

Study patients were registered according to the inclusion criteria after careful history, general examination and systemic examination. Demographic details, details of orthopaedic illness, associated co-morbidity, medications consumed by the study participants were documented. Details about time and duration sunlight exposure, pattern of dressing were enquired and recorded. Height and weight of each study participants were measured in meters and kilograms respectively and body mass index calculated.

Routine blood investigations and specific laboratory investigations like level of serum 25 hydroxy cholecalciferol, total calcium and phosphate, alkaline phosphatase were done and the reports were recorded in a data collection sheet. Biological reference value of serum 25 hydroxy cholecalciferol based on endocrine society guidelines are <20 ng/ml, 21-29 ng/ml, 30-100 ng/ml were considered as deficient, insufficient, sufficient respectively.[3]

The data collected were tabulated and statistically analysed. Base line and demographic details were performed by descriptive statistics. Qualitative variables were stated as number of patients (n) and percentage (%). Continuous variables were stated in mean ± SD. Chi square for analysis of categorical variable.

RESULTS

A total of 50 patients attending the orthopaedic out-patient department were included in this study according to the criteria of inclusion. Among the 50 study participants 32(64%) and 18(36%) were females and males respectively. The average age of the study participant was 25.5±12.5 years. Greater number of study participants were in age group of 41-50 years followed by 31-40 years. The body mass index of 14 (28%) study participant was normal in category and 28 (56%) were in over weight category. Regarding the sunlight exposure, 37(74%) study participants had history of less than 30 minutes sun exposure and 13 (26%) had history of more than 30 minutes sun exposure. Among the 50 study participants 15 (30%) had co-morbidities like diabetes mellitus, hypertension, rheumatoid arthritis and 35 (70%) had no co-morbidities. (Table-1)

The occupation of the study participants are shown in table 2 and table 3 shows the probable diagnosis made by the orthopedician for all the study participants. Table 4 shows the mean value of the blood parameters of the study population. The average value of serum calcium was 8.76 ± 0.84 mg/dl and the mean value of vitamin D3 level in the blood was 24.30 ± 9.94 ng/ml. Vitamin D3 status of the study participants are displayed in table 5 which shows that 22 (44%) study participants had insufficient vitamin D3 level and 19 (38%) had deficient vitamin D3 level. Table 6 shows that there is no significant association between the variables and the vitamin D3 status as the p value is more than 0.05. Pearson chi square statistic for sunlight exposure less than and more than 30 minutes is 3.84 and p value is 0.14.

Table 1: Baseline and demographic parameters of the participants.

Parameters	Value (n=50)
Male/Female, n (%)	18 / 32 , 36%, 64%
Age (years), mean ± SD	25.5 ± 12.5
Age group in years n (%)	
21 to 30	10 (20%)
31 to 40	11 (22%)
41 to 50	12 (24%)
51 to 60	8 (16%)
61 to 70	9 (18%)
BMI (kg/m2)	
Underweight less than 18.5	1 (2%)
Normal 18.5 to 24.9	14 (28%)
Overweight 25 to 29.9	28 (56%)
Obese more than 30	7 (14%)
Exposure to sunlight	
Less than 30 minutes	37 (74%)
More than 30 minutes	13 (26%)

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Co-morbidiies	
Diabetes mellitus	10 (20%)
Hypertension	3 (6%)
Rheumatoid arthritis	2 (4%)
Nil	35 (70%)

n is number of participants, expressed in percentage. BMI is Body mass index expressed in kilogram per metre square, SD is Standard deviation

Table 2: Occupation of the study participants

Occupation	Frequency (n)	Percentage (%)
House wife	30	60
Farmer	7	14
Store worker	5	10
Student	3	6
Office work	3	6
Retired	2	4

n is number of participants, expressed in percentage

Table 3: Provisional diagnosis of the study participants

Provisional diagnosis	Frequency (n)	Percentage (%)
Non specific musculoskeletal pain	16	32
Lumbar spondylosis	12	24
Low back pain	10	20
Generalised body pain	8	16
Cervical Spondylosis	2	4
Tenosynovitis	2	4

n is number of participants, expressed in percentage

Table 4: Mean value of blood parameters of the study participants

Blood Parameters	Mean ± SD
Calcium in mg per dl	8.76 ± 0.84
Phosphorus in mg per dl	4.17 ± 0.70
Vitamin D3 in ng per ml	24.30 ± 9.94
Alkaline Phosphatase in IU per litre	77.37 ± 24.74

SD is Standard deviation

Table 5: vitamin D3 status of the study participants

Vitamin D3 status	Frequency(n)	Percentage (%)
Deficient (less than 20 ng/ ml)	19	38
Insufficient (20 to 30 ng/ ml)	22	44
Sufficient (greater than 30 ng/ ml)	9	18

n is number of participants, expressed in percentage

Table 6: Association between variables and Vitamin D3 levels

Variables	Vitamin D3 Status			Chi square value	P value
	Deficient n(%)	Insufficient n(%)	Sufficient n(%)		
Age group in years					
21 to 30	4 (40)	5 (50)	1 (10)		
31 to 40	4 (36.4)	4 (36.4)	3 (27.3)		
41 to 50	6 (50)	6 (50)	0	5.90	0.65
51 to 60	3(37.5)	3(37.5)	2(25)		
61 to 70	2(22.2)	4(44.4)	3(33.3)		
Gender					
Female	15 (46.9)	13 (40.6)	4 (12.5)	3.56	0.16
Male	4 (22.2)	9 (50)	5 ((27.8)		
Exposure to sunlight					
Less than 30 minutes	17 (45.9)	14 (37.8)	6 (16.2)	3.84	0.14
More than 30 minutes	2 (15.4)	8 (61.5)	3 (23.1)		
BMI (kg/m2)					
Underweight	0	0	1 (100)		
Normal	4 (28.6)	7 (50)	3 (21.4)	6.46	0.37
Overweight	13 (46.4)	11 (39.3)	4 (14.3)		
Obese	2 (28.6)	4 (57.1)	1 (14.3)		
Co-Morbidity					
Yes	4 (26.7)	7 (46.7)	4 (26.7)		
No	15 (42.9)	15 (42.9)	5 (14.3)	1.65	0.43

ISSN (O): 2687-5365; ISSN (P): 2753-6556

n is number of participants expressed in percentage. BMI is Body mass index expressed in kilogram per metre square.

DISCUSSION

The report of different studies had demonstrated that deficiency in Vitamin D in every race, all age groups and various ethnic backgrounds.[8] It is estimated that deficiency to vitamin D influence greater than one billion people globally and it is endemic in India.[8] India is a nation of ample sunlight but astonishingly found to have numerous people with vitamin D deficiency regardless of their place they live.[3,8] In the present study the prevalence of Vitamin D deficiency among adult patients attending orthopaedic department of a tertiary care hospital was 82% among which 38% had less than 20ng/ml and 44% had 20 to 30 ng/ml. In a study conducted in western Uttar Pradesh among the orthopaedic patients, had documented that 91.3% patients had vitamin D deficiency, among them vitamin D level less than 20ng/ml was seen in 61.2% patients. In another study conducted in All India Institute of Medical Science, Delhi had shown a high prevalence of vitamin D deficiency (96.7%) among the orthopaedic patients with fracture of hip.9 The prevalence of vitamin D deficiency in female and male patients attending orthopaedic out-patient department in this study was 87.5% and 72.2% respectively. Kalra et al in a study carried on at Haryana had described that vitamin D deficiency was prevalent in 94.03% of female study participants attending the in OPD and had presented with musculoskeletal symptoms.[9] Babita Ghai et al reported in their study had shown that 66% and 73% of men and women respectively had deficient vitamin D levels.[10] Due to higher body fat percentage among females and due to frequent use of sunscreen, females tend to have lower vitamin D levels than males.[11]

In this present study with overweight category of body mass index 25 to less than 30 kilogram per meter square, 46.4% and 39.3% were deficient and sufficient in vitamin D respectively. Korean study had reported that 65% and 91.7% of men and women respectively with vitamin D deficiency had body mass index of 23 kilogram per meter square. Zarooni et al had shown in their study that there is correlation between vitamin D deficiency and obesity.[12]

In the present study 32% of the study participants had come to the OPD with non-specific musculoskeletal pain, 20% and 16% had low back pain and generalised body pain respectively. Vitamin D deficiency can present in varied forms, differing from nonspecific musculoskeletal pain to definite osteomalacia, clinically presenting as pain, weakness of muscles, pain, tenderness and difficulty in walking. The decrease in level of vitamin D levels lead to chronic low back pain, increased sensitivity to pain and decreased muscular and neurological activity. Vitamin D deficiency can also increase the probability of inflammatory activity at the vertebral endplates which may lead to decreased threshold of pain and which in turn lead to generalised bone and muscular pain that may end up in weakness. Hicks et al. showed in his study that there is an association between low levels of vitamin D and backache in the female study participants.[13] Plotnikoff et al. reported in his study conducted at Minneapoli that 93% of out-patients presented with constant nonspecific musculoskeletal pain syndromes did not respond to standard medical care were diagnosed to have vitamin D deficiency.[9]

In this study co-morbidities like hypertension and diabetes mellitus were seen in 26.7% and 46.7% as deficient and insufficient respectively. In a study by Zarooni et al had revealed that glucose intolerance was excessive in study population with deficient vitamin D levels and also revealed that increased cholesterol was seen in patients with deficient vitamin D.[12] Vitamin D has a vital part in improving function of beta cells of pancreas, insulin resistance reduction, and improvement in generalised inflammation. It acts instantly on the beta cells of the pancreas for insulin production by acting on the receptor of vitamin D and improve the action of insulin by acting on muscle cells and fat cells thereby minimising insulin resistance.[14] In this study daily sunlight exposure of less than 30 min was seen in 74% of study population and in that vitamin D sufficiency was seen in 16.2% and for more than 30 min 26% of study participants 23.1% had sufficient vitamin A study had shown that 16.3%patients exposed every day to sunlight for more than 30 minutes had sufficient vitamin D levels. It has been well documented that sunlight exposure has a crucial role in vitamin D synthesis and status of vitamin D level in each individual. It is also documented that, area of skin exposed to sunlight and duration of exposure to sunlight firmly related to the levels of vitamin D. Avoidance of sunlight due to fear of skin darkening and religious covering of body partially or whole especially in female population while travelling outdoor are the contributing factors for vitamin D deficiency. The garment depending on the colour and style worn by an individual can keep out varied amount of UVB radiation. The sunscreen with sun protecting factor eight can avoid 95% of UVB radiation. Male individuals are also avoiding exposure to sunlight especially in summer season due to increased temperature and misunderstanding of deleterious outcome of sunlight ignorance of vitamin D source.12 Many factors come up with vitamin D deficiency in sunny region they are sun rays, atmospheric particle pollution, the level of athletic activity, attire, ethnic and food habits.[12] In spite of the fact that insufficient exposure to sunlight that puts a subject vulnerable to vitamin D deficiency, sun exposure irrespective of latitude, seasonal variations or time duration of exposure do not confirm the subject to have sufficient vitamin D.[9]

As per the Indian Council of Medical research committee growing young children should have

ISSN (O): 2687-5365; ISSN (P): 2753-6556

outdoor athletic activity in order to have sufficient vitamin D. Adults in India especially in the urban regions are physically inert and are not being exposed outdoors which decreases the probability of vitamin D synthesis.[14] The requirement of deficienct vitamin D needed greatly rely on the grade of deficiency and inherent risk factors.[15] Physicians in India for the management of vitamin D deficiency frequently prescribe 60,000 IU cholecalciferol weekly for eight weeks.[14] Limitation of the study is, it is a cross-sectional study with less sample size, short duration with no follow-up after the prescription of vitamin D. Future study can be done with more sample size with greater duration and with follow up of vitamin D levels after treating deficient and insufficient status of vitamin D.

Screening the status of vitamin D help in early and adequate vitamin D supplement which may prevent and reduce morbidity of many diseases related to vitamin D deficiency like diabetes mellitus, polycystic ovarian syndrome, coronary artery diseases, autoimmune disorders there by helping to lead an improved quality of life. Inadequate vitamin D is not extensively recognized as an issue by the medical doctor and patients hence, significant realisation among researchers, clinicians and patients is essential and more vigorous screening of vitamin D status especially for the vulnerable people is required.

CONCLUSION

This study concludes that there is disturbingly greater prevalence of deficient and insufficient status of vitamin D in people of all ages among patients attending orthopaedic outpatient department. Hence, greater attention is required to beat the increasing prevalence of deficient and insufficient vitamin D status. Aggressive screening along with treatment strategies may prevent vitamin D deficiency and insufficiency thereby reducing morbidity which may help the population to lead an improved quality of life.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556