

Original Research Article

Single center, observational study to analyze correlation between vitamin D-3 deficiency and age in patients with orthopedic disorders

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ABSTRACT

Background: Vitamin D deficiency has been strongly associated with various health outcomes, including all-cause mortality. Chronic vitamin D deficiency in adults and in old age results in osteomalacia, osteoporosis, muscle weakness, and increased risk of fall and long bone fractures.

Methods: We examined records of 1029 such patients and to analyze association of vitamin d-3 levels and categories of age groups (1-20, 21-30, 31-40, 41-50, 51-60, 61-70, 71-80, 81-90 years). We categorized mild, moderate and severe cases age wise.

Results: During the study period records for 1029 patients were evaluated, of which 347 (33.72%) male and 682 (66.27%) were female the mean age with standard deviation for male was 38.25±15.64 years and for female was 41.43±15.23 years. Vitamin D deficiency (<20 ng/ml) was present in 623 patients (61%), 189 patients (18%) had vitamin D level 20-30 ng/ml and 217 patients (21%) had sufficient levels of vitamin D.

Conclusions: Our study concludes that although there is high prevalence of vitamin D-3 deficiency across all age groups among orthopedic patients, age group 31-40 years, was found to be more affected.

Keywords: Prevalence, Vitamin-D deficiency, Orthopedic patients

INTRODUCTION

Vitamin D plays vital role in human body and its insufficiency is related to many health issues.¹ Deficiency of Vitamin D affects all people irrespective of age and gender.² Worldwide, many countries report very high prevalence of low vitamin D status. The 25(OH)D levels <30 nmol/L (or 12 ng/ml) in >20% of the population are common in India, Tunisia, Pakistan, and Afghanistan. As reported in literature it has been estimated that 490 million individuals were vitamin D deficient in India.^{3,4}

Vitamin D deficiency is highly prevalent, but the literature to support vitamin D supplementation is unsatisfactory to date.⁵ Vitamin D deficiency has been strongly associated with various health outcomes, including all-cause mortality.⁶ Vitamin D essential vitamin for bone health and

for preventing falls and fractures, and it has also been related to hypertension, diabetes, metabolic syndrome, cancer, autoimmune and infectious diseases.⁷ Various effects of age on vitamin D and calcium metabolism includes decreased calcium absorption, Intestinal resistance of calcium absorption to circulating 1, 25 (OH)₂D, decreased vitamin D receptors, decreased renal production of 1, 25(OH)₂D by the aging kidney, decreased skin production of vitamin D, Substrate deficiency of vitamin D.⁸

Aim of our study is to evaluate vitamin D deficiency in people of all ages and sex with focus on deficient (<20), insufficient (20-30) and sufficient (>30) vitamin D-3 levels which can help to prevent severe vitamin D deficiency in view of rising public health issue.

METHODS

This study was carried out after obtaining approval from the institutional ethics committee that is approved by ministry of health, government of India (EC/NEW/INST/2019/245). We adhered to the latest update of declaration of Helsinki guidelines. The study was a retrospective, observational study carried out for data duration January 2018 to August 2021. Medical records for patients of all age groups, both males and females who were admitted in the hospital with orthopedic disorders were reviewed. We examined records of 1029 such patients and to analyze association of vitamin d-3 levels and categories of age groups (1-20, 21-30, 31-40, 41-50, 51-60, 61-70, 71-80, 81-90 years). We categorized mild, moderate and severe cases with respect to a defined scale adapted from literature as described in the following paragraph.

In this classification, the combination of moderate and severe vitamin D deficiencies is as deficiency (25-OHD <20 ng/mL) and mild vitamin D deficiency is (25-OHD 20-30 ng/mL) as vitamin D insufficiency.⁹

Table 1: Diagnosis and classification.

25 [OH] level (ng/ml)	Diagnosis and classification
<20 (moderate)	Deficiency
<20 (Severe)	Deficiency
20-30 ng/ml	Insufficiency

RESULTS

During the study period records for 1029 patients were evaluated, of which 347 (33.72%) male and 682 (66.27) were female the mean age with standard deviation for male was 38.25±15.64 years and for female was 41.43±15.23 years.

Vitamin D deficiency (<20 ng/ml) was present in 623 patients (61%), 189 patients (18%) had vitamin D level 20-30 ng/ml and 217 patients (21%) had sufficient levels of vitamin D (Figure 1).

Table 2: Vitamin D status in different age groups.

Age (years)	<20	20-30	>30
1 to 20	32 (3.11)	5 (0.49)	8 (0.78)
21-30	129 (12.54)	19 (1.85)	19 (1.85)
31-40	226 (21.96)	70 (6.80)	66 (6.41)
41-50	122 (11.86)	39 (3.79)	47 (4.57)
51-60	60 (5.83)	22 (2.14)	41 (3.98)
61-70	32 (3.11)	21 (2.04)	19 (1.85)
71-80	16 (1.55)	8 (0.78)	16 (1.55)
81-90	6 (0.58)	5 (0.49)	1 (0.10)

According to age groups, vitamin D deficiency was more in young adults (31-40) than in other age groups. Vitamin

D deficiency in patients 31–40-year age group was 21.9% (Table 1, Figure 3). This difference in vitamin D was statistically significant between 61-80 years and 41-60 years (p<0.0001 and chi-square test=21.146) and between 61-80 years and 21-40 years (p<0.0001 and chi-square test=17.96).

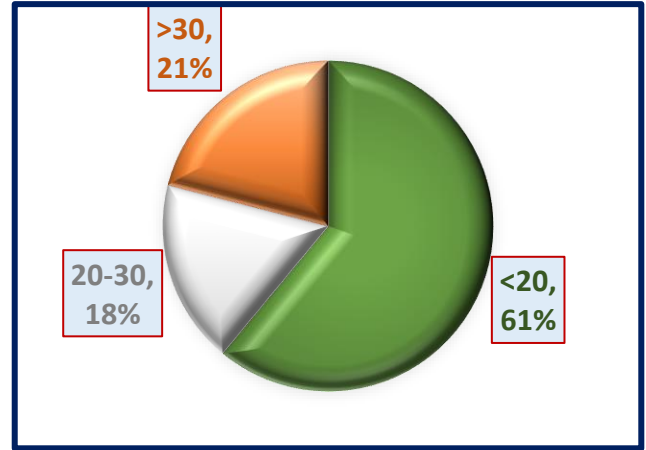


Figure 1: Patients with vitamin D-3 intervals (<20, 20-30 and >30).

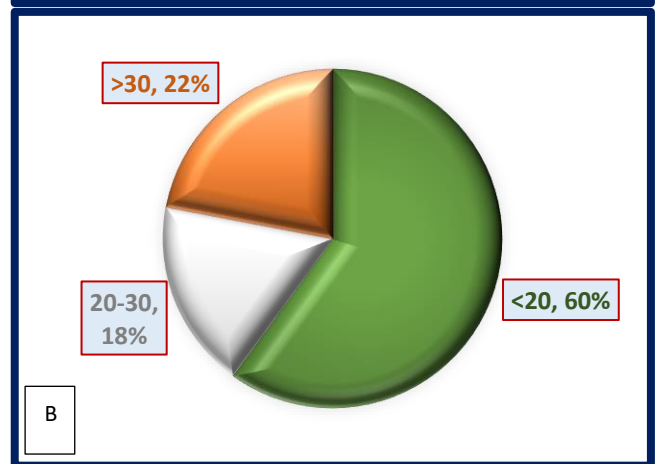
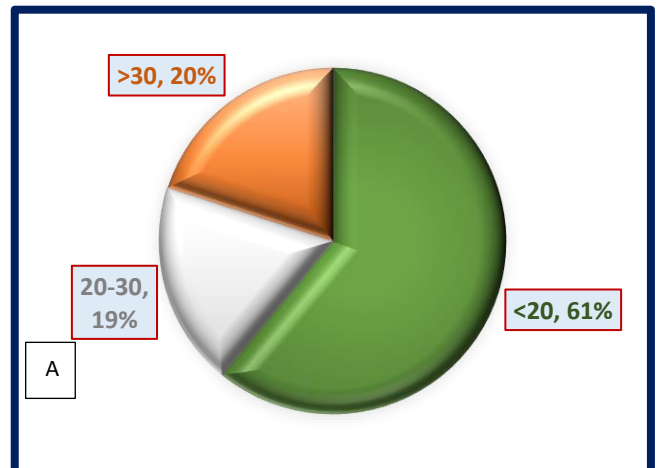


Figure 2 (A and B): Male patients with vitamin D-3 intervals (<20, 20-30 and >30). Female patients with vitamin D-3 intervals (<20, 20-30 and >30).

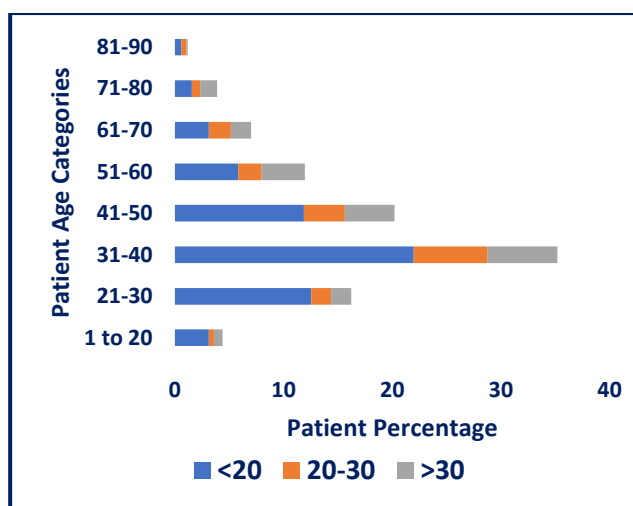


Figure 3: Patients with vitamin D-3 intervals (<20, 20-30 and >30).

DISCUSSION

We analyzed the data of the patients who were admitted with various orthopedic ailments.

Our study shows a high prevalence of vitamin-D deficiency among inpatients of orthopedic department of the hospital. According to the classification adapted from literature, the prevalence of vitamin D deficiency and vitamin D insufficiency in our study was found to be 61% and 18% respectively. A similar study by Hashemipour et al among the general population, aged 20-64 years reported that the prevalence of severe, moderate and mild vitamin D deficiencies was 9.5%, 57.6%, and 14.2% respectively which is overall 67% deficient cases and is consistent with the findings of the present study.¹⁰ Other hospital-based study in cohort of orthopedic patient of Western U. P. also reported prevalence of vitamin D deficiency in 61.2%.¹¹ Results of present study shows that there were 61% deficient patients which is less as compared to other studies conducted in India reported in literature with prevalence of 96.7%, 94.03% respectively.^{12,13}

The results of our study shows that more female 682 (66.27) were affected as compared to males 347 (33.72%) with higher prevalence of deficiency in young adults with age 31-40 years. Few other studies also confirm the association of deficiency of vitamin D with female gender.^{14,16} However, other studies reported in literature shows that older adults are often considered at increased risk of vitamin D deficiency.^{11,15} As reported in literature chronic vitamin D deficiency in adults and in old age results in osteomalacia, osteoporosis, muscle weakness, and increased risk of fall and long bone fractures.¹⁷ In present study we found no difference in vitamin D deficiency as per gender. With more young adults getting affected by the deficiency there may be serious health implications putting a huge burden on economy of the nation.

Current state of knowledge calls for coordination among health institutions to help identify the most effective approaches to improving the health of our population, precisely young adults as they are the backbone of economic stability of the nation in terms mitigation of this rising health problem.

CONCLUSION

On the basis of available clinical data, we conclude that the risk of vitamin D deficiency though extends to individuals of all ages among orthopedic patients, age group of 31-40 was majorly affected. Female gender is at a higher risk factor for hypovitaminosis D as compared to male. Public awareness of vitamin D deficiency needs to be increased by dedicated, collaborative efforts of concerned clinicians and public health workers.

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