

## To study the incidence and correlation of hypovitaminosis 'D' in distal radius fracture in patients above 50 years age

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### Abstract

**Background:** Hypovitaminosis D is common in the India. The aim of this study was to determine the incidence of hypovitaminosis D and related correlates among patients with distal radius fracture in age above 50 years at orthopaedic speciality centre Hospitals in India.

**Methods:** A prospective study was carried out in 39 patients with distal radius fracture, aged 50 years and older, admitted to Trauma Unit of orthopaedic speciality centre Hospitals in India, from August 2018 through August 2019. Serum 25-hydroxy vitamin D level was measured by enzyme-linked immunosorbent assay; and serum calcium level measured. The data was collected and sorted by age, sex, occupation (indoor and outdoor working), BMI, comorbidities (HTN, DM, hypothyroid) and addictions (smoking and alcohol), low serum calcium.

**Results:** Patients' median age was 70 years (range: 50-99); 53.8% were females and 46.2% male. Low vitamin D incidence. Of all patients, 61.5% had vitamin D deficiency (<20 ng/ml); 25.6% reported vitamin D inadequacy (from 20 to 29 ng/ml) and vitamin D levels were normal in 10.3% (>30 ng/ml). 2.6% reported vit d toxicity and also 64.1% reported with abnormal serum calcium level and 35.9% reported with normal serum calcium level. According to the analysis, vitamin D deficiency was significantly associated with age (p-0.017), gender female (p-0.042), Indoor employed group (p-0.001), more common in left side, high BMI (p-0.002), more common in DM (p-0.045), HTN (p-0.049), low calcium (p-0.002) and not significantly associated with co-morbidities like hypothyroidism (p-0.687), an addiction like alcohol (p-0.976), smoking (p-0.966). The limitations of our study include the relatively small sample size and a possible selection bias, as the study included 39 patients admitted with distal radius fracture to a tertiary care hospital in 1 year.

**Conclusion:** The incidence of hypovitaminosis D is high among patients with distal radius fracture and associated with age and sex above 50 years age and high BMI, Indoor employed, co-morbidities (DM, HTN), low serum calcium level and not significantly associated with, hypothyroidism and an addiction like (alcohol and smoking). Increasing awareness about prevention as well as detection and treatment of vitamin D deficiency is recommended.

**Keywords:** Hypovitaminosis D, serum calcium level, Distal radius fracture.

### Introduction

The incidence of hypovitaminosis D has become a major health problem in many developed and developing countries in old age above 50 years. They contribute to both morbidity and mortality in the elderly, individuals [1]. The incidence of hypovitaminosis D varies among different countries and populations and seems associated with age, race, Co morbidity, BMI, and geography. [2] The incidence of hypovitaminosis D seems to increase with poor economic status, reduced sunlight exposure in employing people, Altered neuromuscular coordination and vitamin D deficiency were given as reasons for a higher incidence of fractures above 50 year age. [3] Low levels of 25-hydroxyvitamin D are reported to be associated with compromised skeletal health and poor muscular function, increasing the risk for falls and osteoporotic fractures, especially in older people age above 50 year. [4,6] Most studies defined 25-hydroxy vitamin D (25OH-D) levels of less than 20 ng/ml (50 nmol/L) as vitamin D deficiency. [7] the incidence of vitamin D deficiency was reported as 70% or higher in South Asia and varied from 6% to 70% in Southeast

Asia in orthopaedic trauma patient. In a review conducted by the nutrition-working group of the International Osteoporosis Foundation, hypovitaminosis was defined as the 25OH-D level of less than 30 ng/ml (75 nmol/L) and was prevalent in all regions of the world. Levels below 10 ng/ml (25 nmol/L) were most common in South Asia and the Middle East. [8] Predictors of low 25OH-D levels include older age, female sex, higher latitude, winter, season, darker skin pigmentation, less sun exposure, dietary habits, and absence of vitamin fortification. [10] Although the Middle East region high rates of hypovitaminosis D in fracture patient reports have studied the prevalence of vitamin D deficiency in the Middle East and Mediterranean regions, and there is a need to run such studies in different Middle East countries with variations in culture and climate. [11] low intake of calcium and milk was found to increase fracture risk, while vitamin D supplementation was found to reduce fracture risk [31]. calcium intake, vitamin D and physical activity are important modifiable lifestyle factors in bone health and, the strength of their impact on reducing the risk of fracture [31]. The aim of this study was to determine the incidence of hypovitaminosis D in patients admitted with distal radius fracture in old age above 50 years. In addition, the potential risk factors that may be associated with the occurrence of hypovitaminosis D were explored.

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### Material & Method

Patients with above 50 years old with distal radius fractures who were admitted to the Trauma Unit of, orthopaedic

**Table 1: Vitamin D level as per investigation distribution of patient**

Vitamin D	Number of patients	Percentage (%)	C.I. (Lower, Upper )
Deficient	24	61.5	46.2,76.8
Insufficiency	10	25.6	11.9,39.3
Sufficient	4	10.3	0.8,19.8
Toxicity	1	2.6	0, 7.6
Total	39	100	

speciality centre Hospitals in India, from august 2018 to august 2019 were included. and patients with pathological fracture, Compound fracture, below 50 years of age, and those who had experienced major accidents were excluded The study composed of 39 admitted cases with participation eligibility criteria. during the study all cases in assessing the vitamin D level and serum calcium level. Ethical approval was obtained from the local authority. Informed written consent was obtained from all the participants prior to the study. Data collection was performed in the trauma in patient department. Using a structured questionnaire, personal interviews were conducted with each patient and/or patients’ relatives by personally. The questionnaire contained items about social, demographic characteristics like name, sex, age, and residence ,comorbidities like DM, HTN, Hypothyroid , occupation, weight & height for BMI, mechanism of injury, diet (veg or mixed), an addiction like smoking ,alcohol associated with other fracture. All tests were conducted after admission, including, X-ray of wrist joint, Weight and height were measured and the body mass index (BMI) was calculated. The total serum concentration of 25-hydroxy vitamin D was measured by enzyme-linked immunosorbent assay, And serum calcium level. Vitamin D serum levels were classified as vitamin D deficiency (<20 ng/ml), vitamin D inadequacy (from 20 to 29 ng/ml), normal vitamin D levels (30 -100 ng/ml), and toxicity > 100ng/ml. Data were recorded and descriptive statistics were used. square tests were used to compare study variables according to hypovitaminosis D . Patients were identified in 4 groups as 25-hydroxy vitamin D deficient (<20 ng/mL) , inadequacy (20 -29ng/mL), normal 30-100ng/ml, toxicity >

**Table 2: Serum calcium level as per investigation distribution of patient**

Calcium	Number of patients	Percentage (%)
Abnormal	25	64.1
Normal	14	35.9
Total	39	100

100ng/ml. Subsequently, gender, age, BMI, co-morbidity, occupation, addiction, mechanism of injury as prognostic factors for vitamin D deficiency. The significance level was set at P<.05.

**Results**

A total of 39 patients was included in the study. Patients’ median age was 70 years (range: 50-99); 53.8% were females and 46.2% male. 25.6% were housewives and 20.6% were farmers , 38.5% employed . comorbidities like HTN 56.4 % and DM 38.5 % hypothyroidism 7.7%, an addiction like alcohol 23.1 % smoking 10.3 % .Incidence of low vitamin D level Of all patients is 61.5% had vitamin D deficiency (<20 ng/ml); 25.6% reported vitamin D inadequacy (from 20 to 29 ng/ml) and vitamin D levels were normal in 10.3% (>30 ng/ml). 2.6 % reported vit d toxicity (table 1)and also 64.1 % reported with abnormal less than 9.2 mg/dl serum calcium level and 35.9 % reported with normal serum calcium level (table 2) Of the patients.

The incidence of vitamin D deficiency in a study age above 50 year, associated with According to analysis, vitamin D deficiency was significantly associated with age (p -0.017 ) ,gender female (p- 0.042) ,Indoor employed group (p- 0.001 ) ,more common in left side ,high BMI (p-0.002), more common in DM (p-0.045 )& HTN (p-0.049), low calcium (p-0.002) and not significantly associated with ,hypothyroidism (p-0.687), addiction like alcohol (p-0.976 ), smoking (p-0.966 ). In this study 2-times increase in the chance to have a vitamin D deficiency if the BMI increases by 1 kg/m<sup>2</sup>, also low serum calcium was the prognostic factor for vitamin D deficiency— patients with a deficient vitamin D and low serum calcium level more likely to get this distal radius fracture in age above 50 year. Gender and age female more than male also were found to be associated with vitamin D deficiency.

**Table 3: Results distribution of patient**

		Vitamin D		Total	p-value	
		Deficient	%			Non Deficient
Age group	≤ 60	3	23.1	10	76.9	0.017*
	61 – 70	9	64.3	5	35.7	
	71 – 80	7	77.8	2	22.2	
	> 80	3	100	0	0	
SEX	Male	8	44.4	10	55.6	0.042*
	Female	16	76.2	5	23.8	
Co-morbidities	DM	9	56.3	7	43.8	0.045*
	HTN	12	54.5	10	45.5	0.049
	Hypothyroidism	2	100	0	0	0.687
Occupation	Outdoor	2	15.4	11	84.6	< 0.001*
	Indoor	22	84.6	4	15.4	
Addiction	Alcohol	5	55.6	4	44.4	0.976
	Smoking	3	75	1	25	0.966
Calcium	Abnormal	20	80	5	20	0.002*
	Normal	4	28.6	10	71.4	
BMI	≤ 25.00	2	20	8	80	0.002*
	25.01 - 29.99	17	85	3	15	
	≥ 30.00	5	55.6	4	44.4	

p-value < 0.05 (Significant) Chi-square test used.

**Discussion**

In this study, the incidence of hypovitaminosis D and associated predictors were evaluated among patients admitted with distal radius fracture to a trauma centre in the western part of India . about 61.5% had vitamin D deficiency (<20 ng/ml); 25.6% reported vitamin D inadequacy (from 20 to 29 ng/ml). In another study Indian population of orthopaedic trauma, total 1132 patients out of 693 patients 61.2 % low vitamin d level less than 20 ng/ml [1]. 275 patients who were admitted to the Assiut University Hospitals in 2014, a total of 133 patients was included in the study Of all patients with hip fracture, 60.9% had vitamin D

deficiency (<20 ng/ml), 15.8% reported vitamin D inadequacy (from 20 to 29 ng/ml), and 23.3% reported normal vitamin D levels 30 ng/ml. Patients with severe vitamin D deficiency (<10 ng/mL) represented 13.5% of the study population [3]. In Singapore, vitamin D deficiency was reported in 57.5% of 412 patients with hip fracture and insufficiency was reported in 34.5%; only 8% of patients had normal vitamin D levels [5]. In another study 75 patients, of which 21 had an ankle fracture, 23 had a fifth metatarsal base fracture, and 31 had a stress fracture. the mean age was 52 (range, 16–80) years, thirty-five of the fracture patients (47%) had an insufficient vitamin D level (below the recommended level of 30 ng/ml), and 10 of the patients (13%) had a level that was deficient (< 20 ng/ml) [6]. Hypovitaminosis D was common among patients with a foot or ankle injury. Patients with a low energy fracture of the foot or ankle were at particular risk for low vitamin D, especially if they smoked, were obese, or had other medical risk factors [6]. In other studies, the prevalence of 25-hydroxy vitamin D deficiency was higher compared to our study, From University of Mainz, Germany study, A total of 219 patients admitted with vertebral fragility fractures were found to have abnormally 89% lower levels of vitamin D [8]. also In Japan, 90% of patients with hip fracture incidence of deficiency (25(OH) D <20 ng/mL) was 71.7% (10). This may be explained by the lack of community awareness about vitamin D deficiency, inadequate intake of fortified foods with vitamin D, lack of adequate exposure to the sun in elderly individuals, and decrease in body surface area exposed to sun due to dress traditions [10]. In a population-based study among 362 reproductive age women in rural Upper Egypt, 61% were of low socioeconomic status and 47.8% were illiterates. These findings may indicate an increased hip fracture risk among older age-groups in a closely-related community [11]. the low socioeconomic status along with the low calcium intake may aggravate the consequences of 25-hydroxy vitamin D deficiency, which is reported in studies. low dietary intake of calcium and vitamin D and low levels of physical activity were evident. fracture risk was significantly associated with reduced calcium intake [11]. In our study in the elderly age above age 50-60 year, 23%, 61-70 year, 64.3%, 46.2% of men 44.4% and 76.2% of women and indoor working 84.6% patient more than outdoor working 15.4%, comorbidities like DM 56.3% HTN 54.5%, a BMI between 25-30 kg/m<sup>2</sup> 85%, BMI more than 31 kg/m<sup>2</sup> 55%, low serum calcium 64.1%, had

25OH-D levels below 20 ng/ml. The majority of our patients were diagnosed with low vitamin D level, A higher proportion of patients with distal radius fracture having a low vitamin D level And with a low serum calcium level. In a patient with a low serum calcium level are at 3 times higher chance of having a vitamin D deficiency compared to patients with normal serum calcium level. In study significant association of higher BMI and vitamin D deficiency, significant decrease in serum 25(OH) D<sub>3</sub> levels with increasing BMI was reported in 39 patient distal radius fracture. This finding may be explained by the fact that fat-soluble vitamin D is stored in the body fat, which reduces its bioavailability. Also, it may be attributed to less outdoor activities and less exercise of obese patients and therefore less sun exposure [15]. In our study Hypovitaminosis D was associated with gender and age. And in another study operatively treated for ankle fracture Of these 98 patients, 37% were deficient in vitamin D <20 ng/ml and 32% had vitamin D insufficiency (20-30 ng/ml, Patients with vitamin D deficiency were similar with regard to age, gender, and Comorbidities compared to patients with vitamin D levels less than 20 ng/ml [20]. Increased wrist and ankle fracture risk were significantly associated with low calcium level in older age group due to Low dietary intake of calcium and vitamin D and low levels of physical activity were evident [31]. Limitations of our study include the relatively small sample size and a possible selection bias, as the study included 39 patients admitted with distal radius fracture to a tertiary care hospital in 1 year. This excluded other patients with possible higher socioeconomic status treated in other facilities, pathological fracture; age below 50 years, compound fracture and consequently would have affected the results of the study.

### Clinical relevance

Our study results showed a high correlation between the incidences of hypovitaminosis D as seen in patients with distal end radius fractures. The best predictor of low levels of vitamin D is age above 50 years, sex female, low serum calcium level, high BMI, Co morbidities, like DM, HTN, occupation like indoor workers' group who were exposed less to sunlight. Not significantly associated with, hypothyroidism and addiction like (alcohol and smoking) Increased awareness regarding the prevention and detection of vitamin D deficiency is required.

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**Conflict of Interest: NIL**  
**Source of Support: NIL**

#### How to Cite this Article

Perke GV, Shyam A, Panchwagh Y, Sancheti P. To study the incidence and correlation of hypovitaminosis 'D' in distal radius fracture in patients above 50 years age. *Journal of Trauma and Orthopaedic Surgery* Jul-Sep 2020; 15(3): 12-15.