

# A Study about the Relationship between Vitamin D Level and Hip Fractures

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## Abstract

**Introduction:** Hip fractures are devastating injuries that most often affect the elderly and have a tremendous impact on both the health care system and society in general. The role of Calcium and vitamin D deficiency in bone metabolism is known and hence the necessity for further evaluation and studies to check its influence in hip fractures.

**Methodology:** A descriptive type of study was conducted between October 2012 and July 2014 in St. John's Medical College and Hospital. Patients who fulfilled the inclusion criteria, were included in the study. Once the diagnosis of hip fractures were made then following tests were done on day one of admission – Vitamin D (CLIA method), Calcium, Phosphate, ALP.

**Results:** The study also showed that the incidence of neck of femur fracture was comparable with intertrochanteric fractures. While neck of femur fractures were more common in female patients, while intertrochanteric fracture were common in male patients. These fractures were mainly seen in the age group between 61 to 70 years of age. The overall vitamin D deficiency was 76% among all patients, with more predominance (84.6%) in female patients. Increased grades of fracture injury were seen in both fracture neck of femur and intertrochanteric fractures, when Vitamin D level was below 20 ng/ml.

**Conclusion:** The prevalence of vitamin D deficiency among hip fractures necessitates correction of its serum value in the body. The treatment of vitamin D deficiency may decrease the incidence of hip fractures and result in milder grades of fractures. This may help in better management of hip fractures and reduce the financial burden of healthcare costs.

**Keywords:** Vitamin D, Vitamin D deficiency, Hip fractures

## Introduction

Hip fractures are devastating injuries that affect the elderly and continue to be expensive to health care and the patient [1]. Vitamin D is unique because it is a vitamin synthesized by the body and it functions as a hormone. It has a pivotal role in calcium homeostasis and bone mineral metabolism [2, 3]. We conducted a study to check the incidence of Vitamin D deficiency in Hip fractures and see if there is any correlation.

## Aim

To check the vitamin D levels in hip fractures and see if there is a correlation between the two

## Methodology

The study was conducted between October 2012 and July 2014 in St. John's Medical College Hospital. All patients with hip fractures (Intertrochanteric and fracture neck of femur) due to trivial fall and age more than 45 years were included in the study. The exclusion criteria were: open fractures of hip, age < 45 years, pathological fractures,

patient on chronic medication like steroids, anti-epileptics, patients on treatment for vitamin D deficiency, patient with liver cell failure, cirrhosis and chronic renal failure, fractures due to RTA. Patients were assessed clinically, with a thorough history and physical examination. The following blood parameters were done on day 1 of admission: Serum Calcium, Serum Phosphate, Serum ALP, Vitamin D (CLIA METHOD).

## Results

A total number of 77 patients were admitted and analysed between October 2012 and July 2014 in the department of Orthopaedics at St. John's Medical College Hospital. The patient's blood parameters were estimated and recorded. The age of the patients ranged between 52 years to 93 years (Table no. 1). Most patients were from the age group between 61 to 70 years. Age group versus type of fractures showed that the maximum incidence of fractures was in the age group 61 to 70 years for both fracture neck of femur and intertrochanteric fractures. Most of the patients presented on the 2nd to 7th day post injury to the hospital (53.2%). Comorbidities noticed were predominantly DM, which was in 39% of the patients. Of the total no. of patients, 49.4% were males and 50.6% were females (Table no. 2). Out of 77 hip fractures, fractures of the neck of femur were 39 and intertrochanteric fractures were 38 (Table no. 2). Out of the 38 intertrochanteric fracture patients, 22 were males and 16 were female patients. Out of the 39 fracture neck of femur patients, 23 were females and 16 were male patients. The study revealed that most common type of fracture neck of femur was type 3, followed

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**Table 1: Sample Size**

Age group	Fracture of neck Femur	Inter trochanteric fracture
51 - 60	10	11
61 - 70	12	13
71 - 80	6	6
81 - 90	8	7
>91	3	1
Total	39	38

by type 2. Among intertrochanteric fractures, type 2 was most common followed by type 3. Vitamin D analysis showed that 76.6% of Hip fractures patients had deficiency and 12% patients had normal levels. Vitamin D levels were deficient in 68% of males and 84% of females. Vitamin D deficiency was noted in 37% of fracture neck of fractures and 39% of inter trochanteric fractures. On comparison between type of fracture neck of femur and vitamin D deficient cases, maximum incidence was seen in type 3, followed by type 2 fractures. There was 100% incidence of Vitamin D deficiency in type 4 fracture neck femur cases. On comparison between type of inter trochanteric fracture and vitamin D deficient cases, maximum incidence was seen in type 2, followed by type 3 fractures. On combining both the fracture groups, 51 patients out of 59 patients with Vitamin D deficiency below 20 ng/ml had fracture grades type 2 and above. Table 3 shows the distribution of serum Calcium, serum Phosphorous and ALP values among all patients. 53% of all patients had ALP levels between 101 to 200 IU, while 41.6% of patients had ALP levels below 100 IU. Serum Calcium levels was found to be lower than normal (<8.5) in 57.1% of patients. 93.5 % of the patients had normal phosphate levels.

**Discussion**

The role of Vitamin D in preventing fractures is controversial [4]. A study showed that the mean 25-OHD level was lower in the subjects with hip fractures [5]. Its role in fracture healing is believed to be

**Table 3: Frequency & percentage**

ALP		
	Frequency	Percentage
< 100 IU	32	41.6
101 – 200 IU	41	53.2
> 200 IU	4	5.2
S. Calcium		
	Frequency	Percentage
< 8.5 mg/ml	44	57.1
8.6 – 10.2 mg/ml	33	42.9
S. Phosphate		
	Frequency	Percentage
< 2.5 mg/ml	3	3.9
2.6 – 4.9 mg/ml	72	93.5
>5 mg/ml	2	2.6

present, although current evidence is insufficient [6]. A meta – analysis in 2017 showed individuals with low levels of serum 25(OH)D have an increased risk of hip fracture, and this effect was evident when the serum 25(OH)D level was less than 60 nmol/L, and disappeared when the serum 25(OH)D level was more than 60 nmol/L [7].

Our study shows that lower levels of vitamin D may predispose not only to increased incidence of hip fractures but also to a higher grade of fracture. This closely correlates with another study, where Vitamin D deficiency and insufficiency were seen in 57.5% and 34.5% of hip fracture cases [8, 9]. This could potentially lead to unstable fractures, difficulty in reduction, implant failure, delayed healing and unexpected outcomes. Hence the need for correction of Vitamin D levels in geriatric population may be one of the necessary steps to decrease incidence of hip fractures and reduce the fracture grade. This justifies Vitamin D correction and fortification of foods with Vitamin D.

**Table 2: Fracture Study**

Vitamin D Level	Male	Female	Hip Fracture	Fracture neck - femur				Inter trochanteric fracture			
				Type 1	Type 2	Type 3	Type 4	Type 12	Type 23	Type 34	Type 45
< 20 ng/ml	26 (68.4%)	33 -84.6%	59 -76.6%	2 -5.1%	11 -28.2%	13 -33.3%	3 -7.6%	3 -7.8%	14 -36.8%	11 -28.9%	2 -5.2%
21-29 ng/ml	6 -15.7%	3 -9.09%	9 -11.7%	0 0%	2 -5.12%	2 -5.12%	0 0%	1 -2.6%	4 -10.5%	0 0%	0 0%
> 30 ng/ml	6 -15.7%	3 -9.09%	9 -11.7%	1 -2.5%	1 -2.56%	4 -10.2%	0 0%	1 -2.6%	0 0%	2 -5.2%	0 0%
<b>Total</b>	<b>38</b>	<b>39</b>	<b>77</b>	<b>3</b>	<b>14</b>	<b>19</b>	<b>3</b>	<b>5</b>	<b>18</b>	<b>13</b>	<b>2</b>

**Conclusion**

Clinical values of Vitamin D above 20 mg/ml may have decreased incidence of hip fractures in geriatric population and also result in milder grades of fractures. This in turn can be helpful in preventing geriatric hip fractures and relatively better outcomes following surgical management in case of its occurrence.

**Clinical Message**

Vitamin D level monitoring and correction if deficient, in geriatric population may be advisable in order to prevent hip fractures.

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