



ORIGINAL RESEARCH PAPER

Orthopaedics

A COMPARATIVE STUDY OF VITAMIN D LEVELS IN TRAUMATIC AND NON-TRAUMATIC PATIENTS ABOVE 50 YEARS OF AGE.

KEY WORDS: Vitamin D; Femur fracture; Elderly

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ABSTRACT	Objective: To compare the Vitamin D levels in an elderly patient with fragility fractures of the proximal femur and non-fracture patients above 50 years of age.
	Method: Present study was conducted in the MGMCH Jaipur between November 2015 and October 2016. Our sample size was taken as 100. The subjects were divided into two groups: a traumatic group having patients with fragility fractures of the hip and a non-traumatic group comprising patients coming with musculoskeletal complaints in our OPD. Blood samples were evaluated for vitamin D levels. The Values of Vitamin D obtained are shown in three groups as 0-20ng/ml-deficiency, 21-30ng/ml as insufficiency and >30ng/ml as normal Reference.
	Result: 67 of all the 100 subjects i.e. 67% had a deficiency of Vitamin D among them whereas 17% of all the subjects had an insufficiency of Vitamin D. The mean serum levels of Vitamin D among fracture group cases is 17.2 ng/ml compared to control group who had a much higher mean level of 22.6ng/ml.
	Conclusion: Even though both study groups had lower levels of Vitamin D, the levels estimated were much less in case of the group in comparison to control group. (P value=0.033)

Introduction

Fragility fractures of proximal femur have a high incidence in elderly age group. Despite significant advances in medicine, there is high mortality rate among these people. Mortality is mainly because of advancing age, comorbidities and a delay in surgery. Vitamin D plays an important role in calcium metabolism, and consequently in bone mineralization and the osteoporotic picture. Vitamin D deficiency is associated with increased muscle weakness and pain leading to reduced strength, balance, and function; increased bone turnover^{2,3} and increased risk of falls and hip fractures⁴ in older adults. Its deficiency is, therefore, an important risk factor for proximal femoral fracture in the elderly. 25 hydroxyvitamin D (25(OH) D) is the serum marker for this vitamin and the subsequent metabolic product is vitamin D3; values equal to or above 30ng/mL are considered sufficient⁵. Although fragility fracture of the hip is a very common clinical health problem among elderly, data pertaining to its association with Vitamin D is sparse. Vitamin D deficiency is now recognized as a worldwide health problem, associated with poor dietary intake and inadequate exposure to sunshine, affecting upwards of a billion people^{6,7}.

This study aimed to evaluate any association of Vitamin D level with proximal femur fractures.

Method

Present study, approved by institutional review board, was conducted in the department of Orthopaedics at Mahatma Gandhi Medical College and Hospital, Jaipur between November 2015 and October 2016. This was prospective study in which all patients were presenting in the emergency or OPD of our department.

Selection Criteria

Inclusion Criteria

1. Male and female patients above 50 years of age being treated for fracture were taken in the traumatic group.
2. Patient above 50 years of age coming with the complaint of low back ache, generalized weakness or malaise or chronic fatigue were taken in non-traumatic group.

Exclusion Criteria

1. Patients taking HRT or anti consultants

2. Patients having a chronic debilitating illness
3. Renal disease patients (Creatinine level >1.5mg/dl)
4. Liver disease patients (Bilirubin >2.0mg/dl)
5. Malabsorption syndrome/Gastrectomy/Steroid dependency.

A valid informed consent in English and Vernacular language was taken in the format approved by the institute ethical committee.

Blood samples of the patients fitting our inclusion criteria were taken prior to surgery and were processed for 25 hydroxyvitamin D3 levels through VITROUS ECI analyser (CLIA) present in the clinical Biochemistry laboratory of our institute. We classified our patients as per Holick classification: Deficiency <20ng/mL, Insufficiency 21-30ng/mL, Adequate/ Normal > 30ng/mL⁸.

Statistical Analysis

The total sample size was found to be 100 patients. The analysis was performed using Microsoft Excel 2013 version, SPSS-PASW-18.0 trial version statistical software. The categorically presented data was shown as numbers (in percentage) and were analysed among cases and controls using Pearson Chi square test. Quantitative data was presented as mean +/- SD (Standard Deviation) and analysed using Student's T test.

Result

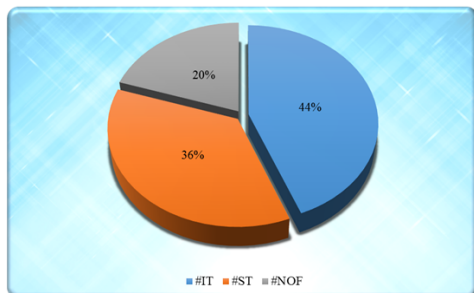
Table 1: Distribution Based on Age of Case and Control Group

Distribution According to Age of Case and Control Group							
			Age				Total
			50-60	60-70	70-80	>80	
Group	Traumatic	Count	8	19	14	9	50
		% of Total	8.00%	19.00%	14.00%	9.00%	50.00%
	Non traumatic	Count	15	18	16	1	50
		% of Total	15.00%	18.00%	16.00%	1.00%	50.00%
Total	Count	23	37	30	10	100	
	% of Total	23.00%	37.00%	30.00%	10.00%	100.00%	

Pearson Chi-Square = 8.691 , df=3, p value = 0.034

- Most of the subjects belong to 60-80 year age in case group and below 70 years age in control group.
- On application of Chi square test there was significant association (P < 0.05) found among the case and control group.

Figure 1: Distribution on Type of Fracture in Cases

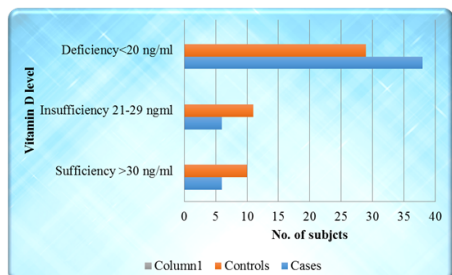


- Our results show that out of the total 50 fracture cases, most of them had Inter-trochanteric fracture(44%) followed by Sub-trochanteric fracture (36%) and 20% had fracture neck of femur.

Table 2: Vitamin D Level among Cases and Controls

Vitamin D Level Among Cases and Controls						
Vitamin D level	Cases		Controls		Total	
	No.	Percent	No.	Percent	No.	Percent
Sufficiency >30	6	12.0	10	20.0	16	16.0
Insufficiency 21-29	6	12.0	11	22.0	17	17.0
Deficiency <20	38	76.0	29	58.0	67	67.0
Total	50	100.0	50	100.0	100	100.0

Figure 2: Vitamin D Level among Case and Control Group



The percentage of cases and controls with respect to different cut-off levels were:

1. >30 ng/ml-optimal levels were found in 12% cases and 20% controls.
2. 21-20 ng/ml-insufficiency was found in 12% cases and 22% controls.
3. <20ng/ml-deficiency was found in 76% cases and 58% controls.

- From table 2 and figure 2 it is evident that most of the subjects had a deficient level of Vitamin D in the body.
- 67 of all the 100 subjects i.e.67% had a deficiency of Vitamin D among them whereas 17% of all the subjects had an insufficiency of Vitamin D. Only 16% of all the subjects had optimal level of Vitamin D.

Table 3: Comparison of Vitamin D among Study Groups

Comparison Between Cases and Controls									
Variables	Group	N	Mean	Std. Deviation	Std. Error Mean	t	df	P value	Inference
VITAMIN - D LEVEL	Traumatic	50	17.30	8.500	1.202	-2.166	98	0.033	Significant
	Non traumatic	50	21.78	11.901	1.683				

- The above table state that the mean Vitamin D level among cases was 17.2ng/ml and among controls was 22.6ng/ml.
- Our data show that the mean Vitamin D level in cases is 17.30 ng/ml which is significantly lower than control group (21.78 ng/ml)(P<0.05).
- T test was applied and the inference was found to be significant. Hence although both study groups have lower levels of Vitamin D, the levels estimated are much more lower in case group in comparison to control subjects.

Discussion:

The role of Vitamin D in maintaining musculoskeletal health is already evident. It does so by its role in regulation of calcium absorption, mineralisation of bone and its effect on muscle function physiology^{9,10}. We use serum 25(OH) D estimation to measure the Vitamin D status of a person.

The most recent and widely accepted classification is of *Michael Holick*, a famous American endocrinologist, specialising in the field of Vitamin D research. According to the classification Serum 25(OH) D levels above 30ng/ml is considered sufficient. Serum 25(OH) D between 21-29ng/ml is considered insufficient and levels less than 20ng/ml is considered deficient.

Table 4 : Adapted from *Michael F. Holick. Vitamin D for Health: A Global Perspective 2013.*

Vitamin D level classification	
Grade	Level
Sufficiency >30	>30 ng/ml
Insufficiency 21-29	21-29 ng/ml
Deficiency <20	<20 ng/ml

In our study we found that the Vitamin D levels in both the case and control groups are comparable with regards to number of subjects in terms of age and gender. Most of the subjects in our study were found to be retired elderly or housewives who usually remain indoors and have suboptimal exposure to sunshine.

Our study revealed that there was a high prevalence of Vitamin D deficiency in both the cases and control groups. However the fracture group subjects had a higher prevalence of Vitamin D deficiency (76%) compared to controls (58%).The overall Vitamin D deficiency among all the subjects turned out to be 67%.The mean serum levels of Vitamin D among fracture group cases is 17.2 ng/ml compared to control group who had a much higher mean level of 22.6ng/ml.(P value=0.159)

Sanjay Kalra et al evaluated 234 female subjects coming to their OPD with musculoskeletal complaints and found that there was Vitamin D deficiency in 55.55% subjects and 38.46% insufficiency in subjects. Deficiency criteria was less than 10 ng/ml and insufficiency criteria was 10-30 ng/ml. The combined values goes up to 94.01% in all of the subjects.

P Lips et al evaluated the effect of Vitamin D supplementation for a year among 72 and 70 people living in a nursing home and old age home respectively. Three categories were created comprising controls and taking 400 and 800 IU Vitamin D3 per day. Initial Vitamin D status of all the subjects was classified as deficient, inefficient and optimal. It turned out that serum Vitamin D increased to 3 times in the two groups receiving supplementation and serum PTH levels decreased by 15% in these groups¹.

Bruce DG et al evaluated 283 patients with fragility fractures for secondary hyperparathyroidism and Vitamin D deficiency and concluded 31.70% of all patient had Vitamin D deficiency and 17.7% subjects had secondary hyperparathyroidism. They concluded that Vitamin D deficiency is a cofactor in causing secondary hyperparathyroidism that leads to increased bone resorption and fragility fractures of hip. Vitamin D deficiency is found in mainly indoor and elderly people despite having desired climate.

Conclusion:

Even though both study groups had lower levels of Vitamin D, the

levels estimated were much more less in case group in comparison to control group (P value=0.033). Keeping all of these considerations in mind we indicate the optimal levels of Vitamin D required should be above 30ng/ml. Low levels of Vitamin D caused by either due to remaining indoors most of the time or low dietary intake activates parathyroid glands causing higher PTH levels in serum leading to increased bone resorption and weak bones. Inadequate mineralisation and skeletal muscle dysfunction causes osteoporosis and increased risk of frequent falls aggravating the problem.

REFERENCES

1. Hollick MF. Vitamin D deficiency. *N Engl J Med.* 2007;357(3):266–281 [PubMed]
2. Mezquita-Raya P, Muñoz-Torres M, Luna JD, et al. . Relation between vitamin D insufficiency, bone density, and bone metabolism in healthy postmenopausal women. *J Bone Miner Res.* 2001;16(8):1408–1415 [PubMed]
3. Ooms ME, Roos JC, Bezemer PD, van der Vigh WJ, Bouter LM, Lips P. Prevention of bone loss by vitamin D supplementation in elderly women: a randomized double-blind trial. *J Clin Endocrinol Metab.* 1995;80(4):1052–1058 [PubMed]
4. Cauley JA, LaCroix AZ, Wu L. Serum 25-Hydroxyvitamin D Concentrations and Risk for Hip Fractures. *Ann Intern Med.* 2008;149(4):242–250 [PMC free article] [PubMed]
5. Holick MF. Vitamin D deficiency. *N Engl J Med.* 2007;357(3):266–81
6. Michael F Holick and Tai C Chen. Vitamin D deficiency: a worldwide problem with health consequences. *Am J Clin Nutr* 2008;87(4):1080S–6S. [PubMed]
7. Lehmann B, Meurer M. Vitamin D metabolism. *Dermatol Ther.* 2010 Jan-Feb;23(1):2–12. [PubMed]
8. Holick MF. Vitamin D deficiency. *N Engl J Med.* 2007;357(3):266–281 [PubMed]
9. Holick MF 1994 McCollum award lecture 1994. Vitamin D: new horizons for the 21st century. *Am J Clin Nutr* 60:619–630
10. Holick MF 1995 Environmental factors that influence the cutaneous production of vitamin D. *Am J Clin Nutr* 61(Suppl 3):638S–645S.
11. Lips P, van Ginkel FC, Jongen MJM, Rubertus A, van der Vijgh WJF, Netelenbos JC 1987 Determinants of vitamin D status in patients with hip fracture and elderly control subjects. *Am J Clin Nutr* 46:1005–1010.