

Original Research Article

Evaluation of association of vitamin D level with types of proximal femoral fractures in elderly patients

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ABSTRACT

Background: Proximal femoral fractures are very common in elderly patients. These fractures are thought to be associated with osteoporosis. Vitamin D is a possible risk factor for osteoporosis. So, this study was done to evaluate the association of serum vitamin D level with types of femoral fractures in elderly patients.

Methods: The study was done between September 2013 to August 2016, 75 patients with age >60 years (male and female both) with proximal femoral fractures were studied. Serum 25-hydroxy vitamin D, calcium, phosphate, alkaline phosphatase levels, liver function test, renal function test, hemoglobin and complete blood counts of all the patients were assessed.

Results: On assessment of serum vitamin D in proximal femoral fracture in elderly patients, it shows an increase incidence of proximal femoral fractures in patients with low serum vitamin D level. Fracture of neck of femur was most common among all. Type of fracture has no significant statistical relationship with serum vitamin D levels.

Conclusions: Osteoporosis and serum vitamin D level depends on age and sex of the patient. But type of proximal femoral osteoporotic fracture has no association with either grade of osteoporosis or serum vitamin D level.

Keywords: Proximal femoral fractures, Vitamin D, Elderly, Fracture neck of femur, Osteoporosis

INTRODUCTION

Hip fractures and related disabilities are important public health issues for elderly people around the world including developing nation like India. actual numbers of fractures are increasing steadily due to the increasing proportion of the elderly population.¹ Despite the resources of modern medicine, there is a high mortality rate, around 25-30% yearly.^{2,3} However, since the density of population is higher in Asia, by 2050, the incidence of hip fractures is estimated to contribute more than 50% in the world.⁴

Among the micronutrients relating to the risk of falls and fractures among elderly people, vitamin D can be highlighted. Low vitamin D levels are commonly associated with because of multiple factors such as decreased sun exposure with reduced skin production of vitamin D and low dietary D2/D3 intake. The skin's ability to produce vitamin D3 from the pre-vitamin 7-dehydrocholesterol also declines with advancing age.⁵

It has been presumed that Indians are vitamin D sufficient as Indian subcontinent is situated between 8.4N and 37.6N latitude and has adequate sunshine and UV-B rays (290-315 nm) reaching the earth's surface throughout the

year. However a recent study has suggested a high prevalence of subnormal 25-hydroxy vitamin D concentration among healthy Indians.⁶

In the present study, it was planned to assess serum vitamin D levels and routine bone biochemistry in elderly patients who presented with proximal femoral fractures and to study association of serum vitamin D with osteoporotic proximal femoral fractures in elderly patients and also to study association of type of proximal femoral fracture with grade of osteoporosis and serum vitamin D level.

METHODS

Present cross-sectional study was conducted in the Department of Orthopaedic Surgery, B. R. D. Medical College and Nehru Hospital, Gorakhpur, during the period between September 2013 and August 2016, after getting approval from research & ethical committee for the study.

Patients were selected having inclusion criteria age>60 years, type of fracture – proximal femoral fractures (neck of femur, intertrochanteric, subtrochanteric fracture), patient having pathological fracture were excluded from study.

Pelvis with both hip –AP view were taken to evaluate diagnosis and classification of fracture. Routine blood

investigations including serum vitamin D level, serum calcium level, serum phosphate level, serum alkaline phosphatase level, liver function test, renal function test, were carried out. Serum vitamin D level was tested with 25-hydroxy vitamin D ELISA /chemiluminiscence Macropartite Enzyme Immunoassay method.

Chi square test was used for analysis data and get the p value to know the significance.

RESULTS

In our study proximal femoral fractures were more common in females 41/75 (54.6%) and among the females, fracture neck of femur 28/41 (68.2%) was more common than other proximal femoral fractures 13/41 (31.7%). Fracture neck of femur (both male and female) was more common 44/75 (58.6%) among proximal femoral fractures.

Most of the patients >70 years of age with proximal femoral fractures have serum vitamin D levels <20 ng/ml (10/12). Serum vitamin D levels have significant relationship with age.

39 patients out of 75 patients were having serum vitamin D Level<20 ng/ml, but patients having >20 ng/ml were (36/75). Type of fracture has no statistical relationship with serum vitamin D levels.

Table 1: Relationship between sex and types of fractures.

Sex	Fracture neck of femur N (%)	Intertrochanteric fracture N (%)	Subtrochanteric fracture N (%)	Total N (%)
Male	16 (47.05)	17 (50)	01 (2.94)	34 (45.34)
Female	28 (68.29)	11 (26.82)	02 (4.87)	41 (54.67)
Total	44	28	03	75

Table 2: Relationship between age and vitamin D3 level.

Age (in years)	Serum vitamin D3 level (ng/ml)			Total
	<20	20-100	>100	
60-70	29	29	04	63
71-80	07	02	00	09
>80	03	00	00	03
Total	39	31	04	75

Table 3: Relationship between serum vitamin D3 level and type of fractures.

Serum vitamin D3 level (ng/ml)	Fracture neck of femur	Intertrochanteric fracture	Subtrochanteric fracture	Total n (%)
<20	24	15	00	39 (52)
20-100	18	11	03	32 (42.67)
>100	02	02	00	04 (5.33)
Total	44	28	03	75

Proximal femoral fractures are slightly more common in patients having serum vitamin d3 level<20 ng/ml (39/75)

as compared to patients having serum vitamin d3 level >20 ng/ml (36/75). Distribution of type of fracture is

almost same in both the groups. Type of fracture has no significant relationship with serum Vitamin D3 levels ($\chi^2=1.025$, $df=2$, $p>0.05$).

DISCUSSION

The role of vitamin D in maintaining musculoskeletal health is already evident. It does so by its role in regulation of calcium absorption, mineralization of bone and its effect on muscle function physiology.^{7,8}

In our study, I have studied 75 patients of proximal femoral fractures which include fracture neck of femur, intertrochanteric fractures and subtrochanteric fractures. 58.67% had fracture neck of femur, 34.67% had fracture intertrochanteric and 6.67% had fracture subtrochanteric. Out of those patients 45.34% patients were male and 54.67% were female, which comes to 1:1.2 of male to female ratio, study conducted by Ramalho, Lazaretti-Castro, found male female ratio for elderly patients with proximal femoral fractures to be 1:3.1 and by Bartoníček, Dzupa, Fric, 1:2.5.^{9,10}

In my study 52% of patients have serum vitamin D level <20 ng/ml, 42% have serum vitamin D level 20-100 ng/ml, and 6% have serum vitamin D level >100 ng/ml. In study done by Kristine, Ensrud, Brent, Taylor, Misti, Paudel, they found serum vitamin D level of 110 men (9%) had a 25 (OH) D level below 15.0 ng/ml, 184 (14%) had a 25 (OH) D level of 15.0–19.9 ng/ml, 605 (47%) had a 25 (OH) D level of 20.0–29.9 ng/ml, and 376 (29%) had a 25 (OH) D level of at least 30.0 ng/ml. Our results are very similar to those recently reported from an Italian study of Isaia et al.^{11,12}

Harinarayan et al found 18% of patients serum vitamin D level >20 ng/ml, 52% patients have serum vitamin D level 10-20 ng/ml, and 30% patients have serum vitamin D level <10 ng/ml.¹³

We did not find any difference in the 25 (OH) D levels between patients with femoral neck and trochanteric fractures, in agreement with a previously published study.¹⁴

In contrast, a study done in Crete found that patients with trochanteric fractures had lower levels of 25 (OH) D.¹⁵

CONCLUSION

Osteoporosis and serum vitamin D level depends on age and sex of the patient. But type of proximal femoral osteoporotic fracture has no association with either grade of osteoporosis or serum vitamin D level.

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Kanis JA, Odén A, McCloskey EV, Johansson H, Wahl DA, Cooper C. IOF Working Group on Epidemiology and Quality of Life. A systematic review of hip fracture incidence and probability of fracture worldwide. *Osteoporos Int.* 2012;23(9):2239–56.
2. Fernandes RA, Araújo DV, Takemoto MLS, Sauberman MV. Fraturas do fêmur proximal no idoso: estudo de custo da doença sob a perspectiva de um hospital público no Rio de Janeiro, Brasil. *Physis.* 2011;21(2):395-416.
3. Ricci G, Longaray MP, Gonçalves RZ, Ungaretti Neto AS, Manente M, Barbosa LBH. Avaliação da taxa de mortalidade em um ano após fratura do quadril e fatores relacionados à diminuição da sobrevida no idoso. *Rev Bras Ortop.* 2012;47(3):304-9.
4. Cooper C, Campion G, Melton LJ., 3rd Hip fractures in the elderly: A world-wide projection. *Osteoporos Int.* 1992;2:285–9.
5. MacLaughlin J, Holick MF (1985) Aging decreases the capacity of human skin to produce vitamin D3. *J Clin Invest.* 1985;76:1536-8.
6. Goswami R, Gupta N, Gosami D, Marwaha RK, Tandon N, Kochupillai N. Prevalence and significance of low 25-hydroxyvitamin D concentration in healthy subjects in Delhi. *AMJ Clin Nutr.* 2000;72(2):472-5.
7. Holick MF. McCollum award lecture 1994. Vitamin D: new horizons for the 21st century. *Am J Clin Nutr.* 1994;60:619-30.
8. Holick MF. Environmental factors that influence the cutaneous production of vitamin D. *AmJ Clin Nutr.* 1995;61(Suppl 3):638S-645S.
9. Ramalho AC, Lazaretti-Castro M, Hauache O, Kasamatsu T, Brandão C, Reis AF, et al. Brazilian Fractures of the proximal femur- correlation with Vitamin D Receptor gene polymorphism. *J Med Biological Res.* 1998;31(7):921-7.
10. Bartoníček J, Dzupa V, Fric V, Pacovský V, Skála-Rosenbaum J, Svatos F. Epidemiology and economic implication of fractures of proximal femur, proximal humerus, distal radius and fracture dislocation of ankle. 2008;87(4):213-9.
11. Ensrud KE, Taylor BC, Paudel ML, Cauley JA, Cawthon PM, Cummings SR, et al. Serum 25-hydroxyvitamin D levels and rate of hip bone losing older men. *J Clin Endocrinol Metab.* 2009;94(8):2773-80.
12. Isaia G, Giorgino R, Rini GB, Bevilacqua M, Maugeri D, Adami S. Prevalence of hypovitaminosis D in elderly women in Italy: clinical consequences and risk factors. *Osteoporos Int.* 2003;14:577-82.
13. Harinarayan CV, Joshi SR. Vitamin D status in india-It's implications and remedial measures. *J Assoc Physicians India.* 2009;57:40-8.

14. Bruce DG, St John A, Nicklason F, Goldswain PR. Secondary hyperparathyroidism in patients from Western Australia with hip fracture: Relationship to type of hip fracture, renal function and vitamin D deficiency. *J Am Geriatr Soc.* 1999;47:354-9.
15. Fisher A, Srikusalanukul W, Davis M, Smith P. Hip fracture type: Important role of parathyroid hormone

(PTH) response to hypovitaminosis D. *Bone.* 2010;47(2):400-7.

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