

A observational study on the relationship between vitamin d level and hip fractures**Jhathoth Dhoom Singh***Associate Professor, Department of Orthopedics, Dr VRK Womens Medical College & Research Centre, Hyderabad, Telangana, India***Received: 25-11-2021 / Revised: 09-12-2021 / Accepted: 08-01-2022****Abstract**

Background: Vitamin D (25OHD) is essential for maintaining calcium homeostasis and inadequate levels have been associated with negative musculoskeletal as well as extraskelatal effects. Individuals at especially high risk of developing hypovitaminosis D are the elderly. 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.

Aims: To identify patients with hip fractures and to attain the vitamin D levels in these patients. To correlate the between the hip fractures and levels of vitamin D and evaluate factors associated with the same study subjects. **Materials and methods:** The study was a descriptive type of study and was conducted between October 2019 and July 2021 in Dr VRK Womens Medical College and Hospital & SIMS, Hyderabad. Patients who fulfilled the inclusion criteria, were included in the study. Once the diagnosis of hip fractures were made then following test were done on day one of admission -Haemoglobin, Calcium, Phosphate, ALP, Vit D by CLIA method. **Results:** In this study we found that male were 39 patients and female of 41 patients, this shows almost equal prevalence of hip fractures in both males and females. The age in this study showed a mean of 69.91 overall, 68.51 and 70.74 for male and female patients respectively. Range was between 51 to 94 for both male and female patients. This study shows that the frequency of hip fracture in males and females were comparable and most of the patients presented to the hospital between 2nd to 7th day post injury .the most common co-morbidity was Diabetes Mellitus and many had more than one co-morbidity. It was also noted that anaemia was prevalent in both male and female patients and the overall vitamin D deficiency was 79% of the total no of patients with more predominant (51.25%) in female patients. **Conclusion:** The vitamin D status and other parameter were studied in this study which was conducted in Dr VRK Womens Medical College and Hospital. Treatment of the vitamin D deficiency decreases the chances of fall, morbidity condition and financial burden on the patient when fractures occur. The treatment of vitamin D deficiency will improve the quality of life overall. Hence the need for food fortification and supplementation in elderly indian population[1-5].

Keywords: Vit D, Vitamin D deficiency, Hip fractures

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Introduction

Vitamin D (25OHD) is essential for maintaining calcium homeostasis and inadequate levels have been associated with negative musculoskeletal as well as extraskelatal effects. Individuals at especially high risk of developing hypovitaminosis D are the elderly. The aim of this thesis was to investigate the association between 25OHD insufficiency (25OHD <50 nmol/L) and fractures, frailty and mortality. Additionally, we described the normal distribution of parathyroid hormone (PTH) in older women in relation to 25OHD and kidney function (eGFR) and investigated whether PTH was an independent predictor of frailty and mortality[1].

The association between low vitamin D levels and fracture risk, in particular the risk of hip fractures, has been shown repeatedly[85-89]. This is also true for the association between vitamin D and muscle function. However, questions remain whether the risk of fractures can be lowered by reversing vitamin D insufficiency or deficiency. Results from randomized controlled trials testing the effects of vitamin D supplementation are import randomized controlled trials investigating the fracture preventive effect of vitamin D supplementation. The following limitations of interventional studies may be of importance for this discrepancy seen between observational data and randomized controlled trials. Insufficient dosage, low adherence to supplementation and short treatment periods may have influenced the outcome. Moreover, 25OHD was not routinely assessed in all patients, and if so, most studies relied on single measurements at baseline, hence, missing information on whether

participants reached sufficient vitamin D levels. In most studies, vitamin D supplementation was administered in conjunction with calcium which makes it difficult to interpret the effects of vitamin D solely. A dosage of at least 800 IU per day seems to be required in order to achieve a significant risk reduction of fractures. The aspect of age seems to be important since the fracture- and fall-preventive effect of vitamin D appears to be highest in elderly, institutionalized individuals. Whether this can be explained through the impact of age per se or the fact that older individuals presumably have lower vitamin D levels compared to a younger population is debatable[2-4].

Aims and objectives

1. To identify patients with hip fractures and to attain the vitamin D levels in these patients.
2. To correlate the between the levels of vitamin D and hip fractures
3. To evaluate factors associated with the same study subjects

Materials and methods

The study was a descriptive type of study and was conducted between October 2019 and July 2021 in Dr VRK Womens medical College & SIMS. Patients, who fulfilled the inclusion criteria mentioned below, were included in the study.

Inclusion criteria

All patients with hip fractures and with patients fulfilling the following criteria:

1. Age more than 45yrs
2. Both male and female
3. History of trivial fall

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4. Clinical symptoms suggestive of hip fractures (hip pain, painful limp, inability to walk, swelling) and clinical Signs (swelling, ecchymosis, tenderness, painful range of movements)
5. Radiological confirmation of fracture by x-rays

Exclusion criteria

1. Open fractures of hip
2. Age < 45 yrs
3. Pathological fractures
4. Patient on chronic medication like steroids, antiepileptics
5. Patient on treatment for vit d deficiency
6. Patient with liver cell failure, cirrhosis and chronic renal failure
7. Fractures due to Road Traffic Accident

Patients were assessed clinically, with a thorough history and physical examination. The symptoms and signs elicited were recorded in a Performa.

Once the diagnosis of hip fractures were made then following test

were done on day 1 of admission

Haemoglobin Calcium Phosphate ALP

Vit D

CLIA method: Chemiluminescent Immunoassay

In this study CLIA method was used to estimate the vit d status was estimated and recorded. The data acquired was analysed by program like SPSS version 17 and using test like **Fischer exact test, Chi square test, Pearson correlation** test the data was analysed.

Results

A total number of 80 patients were admitted and analysed between October 2019 and July 2021 in the department of Orthopaedics in Dr VRK Womens Medical College Hospital & SIMS, Hyderabad. The patient blood parameters were estimated and recorded. The age of the patients ranged between 52 years to 93 years.

Table 1: Sex Distribution

| Sex | |
|------------|------------|
| Male | Female |
| 39(48.75%) | 41(51.25%) |

Table 2: Religion

| Religion | | |
|----------|------------|----------|
| Hindu | Christian | Muslim |
| 64(80%) | 11(13.75%) | 5(6.25%) |

Table 3: Diet

| Diet | |
|---------|---------|
| Mixed | Veg |
| 64(80%) | 16(20%) |

Table 4: Time of presentation to hospital

| Time of presentation to hospital | | |
|----------------------------------|-----------|----------|
| First day | 2-7 days | >7days |
| 33(41.25%) | 42(52.5%) | 5(6.25%) |

Most of the patient presented on 2nd to 7th day post injury to the hospital (52.5%)

Table 5: Comorbidity

| Comorbidity | |
|-------------|----------------|
| Comorbidity | No of patients |
| DM | 31(38.75%) |
| HTN | 30(37.5%) |
| CAD | 13.75(14%) |
| CVA | 5(7.5%) |
| BA | 2.5(1.3%) |

Co morbidity noticed were predominantly DM which was 38.75% off the patient and quite a few had more than 1 co morbidity.

Table 6: Fracture type

| Fracture type | | |
|----------------|------|-----|
| | NOF# | IT# |
| No of patients | 41 | 39 |

In this study from total no of patients NOF # were 41 and IT# were 39

Table 7: Intertrochanteric Fractures

| Intertrochanteric fractures | |
|-----------------------------|--------|
| Male | Female |
| 23 | 16 |

From total of 39 IT# patients, 23 were males and 16 were female patients

Table 8: Neck of Femur Fractures

| Neck of femur fractures | |
|-------------------------|--------|
| Male | Female |
| 17 | 24 |

From total of 41 NOF # patients, 24 were females and 17 were male patients

Table 9: Age Groups

| Age groups | |
|------------|----------------|
| Age groups | No of patients |
| 50-60 yrs | 22(27.5%) |
| 61-70 yrs | 26(32.5%) |
| 71-80 yrs | 12(15%) |
| 80-90 yrs | 15(18.75%) |
| >91 yrs | 5(6.25%) |

From data the maximum patient were from the age group between 61 to 70 yrs and least was found in age group more than 91 years. Further the mean was found to be 69.91 and mean ± SD was 69.64 ± 11.53. Range was between 52 to 93. In males, Range was 52 to 93, and mean was 68.51. The mean ± SD was 68.51 ± 11.73. In females, Range was 52 to 93, and mean was 70.74. The mean ± SD was 70.74 ± 11.41.

Table: 10 Age Groups Vs Fracture Type

| Age groups VS fracture type | | |
|-----------------------------|------|-----|
| Age group | NOF# | IT# |
| 51-60 yrs | 10 | 11 |
| 61-70 yrs | 13 | 14 |
| 71-80 yrs | 7 | 6 |
| 81-90 yrs | 8 | 7 |
| >91 yrs | 3 | 1 |

Age group versus type of fractures showed that the maximum incidence of fractures was seen in age group 61 to 70 yrs for both NOF and IT fractures.

Table 11: NOF # type

| NOF # type : | |
|---|----------------|
| Type of NOF # (garden's classification) | No of patients |
| Type 1 | 3 (7.3%) |
| Type 2 | 15(36.5%) |
| Type 3 | 21(51.2%) |
| Type 4 | 3(7.3%) |

The study revealed that most common type of Neck of Femur fractures was type 3 and followed by type 2.

Table 12: Anaemia

| Anaemia | |
|------------|-----------|
| Male | Female |
| 31 (79.4%) | 33(80.4%) |

Using the WHO guidelines the cut off for females was 12gm% and 82% were found to be anaemic. (WHO Blanc et al)

Vitamin D levels

Table 13: Vitamin D levels

| Vitamin D Levels | | |
|------------------|------------|-----------|
| <20ng/ml | 21-29ng/ml | >30ng/ml |
| 62(77.5%) | 9(11.25%) | 9(11.25%) |

Vitamin D analysis showed that 77.5% of Hip Fractures patients had Vitamin D deficiency and 12% patients had normal vitamin D levels

Sex versus vitamin D levels

Table 14: Vitamin D levels in males 39

| Vitamin D Levels In Males | | |
|---------------------------|------------|----------|
| <20ng/ml | 21-29ng/ml | >30 |
| 27(69.2%) | 6(15.3%) | 6(15.3%) |

Vitamin D Levels In Females

Table 15: Vitamin D levels in females 41

| Vitamin D Levels In Females | | |
|-----------------------------|------------|----------|
| <20ng/ml | 21-29ng/ml | >30ng/ml |
| 35(85.3%) | 3(7.3%) | 3(7.3%) |

Vitamin D levels in females found to be deficient in 84% of the total female patients and 9% had normal values.

Table 16: Type of fractures and Vit D levels

| Type Of Fractures And Vit D Levels | | | |
|------------------------------------|-------------|---------------|-------------|
| | <20ng/ml(1) | 21-29ng/ml(2) | >30ng/ml(3) |
| NOF # | 31(38.75%) | 4(5%) | 6(7.5%) |
| IT# | 30(37.25%) | 5(6.25%) | 4(5%) |

From the above analyses, in Neck of Femur fractures 38% of total no of fractures had vitamin D deficiency and in Intertrochanteric fracture 37% of total no of fractures had vitamin deficiency.

Table 17: NOF # Type Vs Vit D levels

| NOF # Type Vs Vit D Levels | | | |
|----------------------------|-----------|------------|----------|
| | <20ng/ml | 21-29ng/ml | >30ng/ml |
| Type 1 | 2(4.8%) | 0(0%) | 1(2.4%) |
| Type 2 | 11(28.2%) | 2(4.8%) | 1(2.4%) |
| Type 3 | 15(36.5%) | 2(4.8%) | 4(10.2%) |
| Type 4 | 3(7.6%) | 0(0%) | 0(0%) |

While comparison between type of fracture and vitamin D deficiency was seen maximum in Neck of Femur type 3 fracture and followed by type 2 fracture.

Table 18: Proportion of Vit D deficiency in IT # types

| Proportion of Vit D deficiency in IT # types | | |
|--|----------|------------|
| | <20ng/ml | Proportion |
| Type 1 | 2 | 66.7 |
| Type 2 | 12 | 79.6 |
| Type 3 | 15 | 70.4 |
| Type 4 | 3 | 100 |

Table 19: ALP levels

| ALP levels | | |
|------------|-----------|------------|
| | Frequency | Percentage |
| <100 | 33 | 44 |
| 101-200 | 43 | 54 |
| >201 | 4 | 5 |

53% off the total no of Hip Fracture patients had ALP levels between 101 to 200 IU

Table 20: Calcium levels

| Calcium Levels | | |
|----------------|-----------|------------|
| | Frequency | Percentage |
| <8.5 | 45 | 56.25 |
| 8.6-10.2 | 35 | 43.75 |

Calcium levels was found to be lower than normal(<8.5) in 57.1% of total no of Hip Fractures patients.

Table 21: Phosphate levels

| Phosphate levels | | |
|------------------|-----------|------------|
| | Frequency | Percentage |
| <2.5 | 4 | 5 |
| 2.6-4.9 | 74 | 92.5 |
| >5 | 2 | 2.5 |

Table 22: Treatment given

| Treatment Given | | |
|-----------------|-----------|------------|
| | Frequency | Percentage |
| MBHA | 38 | 47.5 |
| PFN | 34 | 42.5 |
| RECON NAIL | 5 | 6.25 |
| CCS | 2 | 2.5 |
| Conservative | 1 | 1.25 |

Most common treatment given was Modular Bipolar Hemiarthroplasty (MBHA) and followed by Proximal Femoral Nail (PFN)

Discussion

This study was conducted in Dr VRK Womens medical College & SIMS where 80 patients with Hip Fractures were admitted and analysed between October 2019 and July 2021.

In this study we found that male were 39 patients and female of 41 patients, this shows almost equal prevalence of hip fractures in both males and females. A study by Johnell et al studies shows that the world female and male ratio was 2.3. Some studies showed slightly high female to male ratio as similar to this study. Hence this implies that the incidence of male hip fractures is comparable to female. Hence preventive and treatment for male patients are equally important in male patients [6].

The age in this study showed a mean of 69.91 overall, 68.51 and 70.74 for male and female patients respectively. Range was between 51 to 94 for both male and female patients. Further age at which hip fractures were encountered in this study showed maximum incidence at age of 61 to 70 years in both male and female patients but study by

Johnell et al showed world studies have showed highest incidence between 70 to 80 years. Similar study in world showed max incidence in the age group 61 to 70 yrs, range of 50.5-74.2 years and mean age for male was 62±13.4 and for female was 62.3±12.4 [5-7].

Religion of the patient were compared with maximum incidence in hindu community and least in muslim community. While diet was compared 80% were mixed diet and remaining 20% vegetarian diet. Previous showed that high prevalence of vitamin D deficiency and high phytate consumption. This study had similar results. Further they was no significant co-relation between religion and diet to the type of fracture using pearson correlation test [6].

In this study in was found that the most common co morbidity was diabetes mellitus (31%) and second was hypertension (30%). Some findings showed the importance of hip fractures, comorbidity which can affect the hamper quality of life of the patient. Further this study showed that quite a patients had more than one co- morbidity, which can make the treatment and rehabilitation difficult [5,6,7].

The Intertrochanteric fractures were found most common seen in the age group of 61 to 70 yrs and similarly was Neck of Femur fracture, but in united states of america the incidence of Intertrochanteric fractures is associated with elderly age. Hence this shows that the indian population is quite different from other parts of the world. It is to be noted that the age at which Intertrochanteric fractures occur is earlier. Also all the fractures in this study were encountered with fall or trivial trauma[6,7].

The most common type of Intertrochanteric fractures when classified by Boyd and Griffin was that of the type 2 and Neck of Femur fracture was type 3 as per garden's classification. Further Neck of Femur fracture was commonly seen in female patients and Intertrochanteric fractures was commonly seen in male patients.

While diagnosing anaemia as per WHO guidelines (Blanc et al) anaemia in males cut-off value was 13 gm% and incidence was 79%. Similarly in females cut-off value was 12 gm% and incidence was 80% almost comparable. Due importance has to be given to this because the mainstay in hip Fracture treatment is surgery. The incidence of anaemia is comparable with both sexes. This also implies the nutritional status of both male and female patients are comparable. Further nutrition status of both males and females are low predominantly which indirectly indicated by haemoglobin levels[8].

In this we found most of the patients were from falls sustaining the fracture. predominant patients presented to the hospital during 2nd to 7th day- 42% and 33% by the first day of injury.

When parameter like calcium was noted, 45% were below normal (<8.5) and was not significantly associated with type of fractures. Similarly when phosphate level were compared the 93.5% were found to be normal (2.6-4.9) and no significant relationship with the type of fractures using Pearson correlation. It is to be noted that ALP was between 101 to 200 IU in 54% of cases analysed which also had no significant correlation with the type of fracture.

In this study surgery was the mainstay of treatment. Among the surgical modality modular bipolar hemiarthroplasty was the most common modality used for neck of femur fracture and Proximal Femoral nail was the most common modality of treatment for intertrochanteric fractures.

Vitamin D was found to be deficient in 79% of the total no of cases analysed which is significant. In this study the range was found to be 4 to 44.48 ng/ml and mean as 15.19±10.33. In a similar study by Khadagawat et al it was found 96.7% of the total no of cases. The range was 5-21.5 ng/ml and mean of 9.9±4.8. By comparison of the two studies we derive that vitamin D deficiency is very much prevalent in Indian population. Hence need for further evaluation and studies[41]. When vitamin D was compared with other parameter like ALP, Calcium and Phosphate the p value was found to be 0.249, 0.084 and 0.105 respectively. This confirms no significant correlation between them (p<.005) while using Pearson correlation test.

Conclusion

The vitamin D status and other parameter were studied in this study which was conducted in Dr V.R.K. Women's Medical College and Hospital & SIMS, Hyderabad. We have come to the following conclusion based on this study.

1. The frequency of hip fracture in males and females are comparable
2. most of the patients presented to the hospital between 2nd to 7th day post injury

3. most common co-morbidity was Diabetes Mellitus and many had more than one co-morbidity
4. the incidence of neck of femur fracture was comparable with intertrochanteric fractures
5. the Neck of Femur was more common in female patients and Intertrochanteric fracture was common in male patients
6. most common age group was between 61 to 70 years of age for hip fractures
7. both Intertrochanteric and Neck of Femur fracture was common in 61 to 70 yrs age group
8. most common type in Neck of Femur fracture based on Garden's classification was type 3. Most common type in Intertrochanteric fracture based on Boyd and Griffin was type 2
9. anaemia was prevalent in both male and female patients
10. overall vitamin D deficiency was 79%
11. female patients had more no of vitamin D deficiency as compared to male patients
12. in neck of femur fracture and Intertrochanteric fracture- type 4, 100% vitamin D deficiency was present
13. the levels of calcium, ALP and Phosphate does not correlate with vitamin D deficiency

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Conflict of Interest

None

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