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Epidemiological Profile and Risk Factors of Hip Fractures in Elderly Patients: A Retrospective Study

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ABSTRACT

Background: Hip fractures in the elderly, predominantly due to osteoporosis and trivial falls, remain a leading cause of disability, morbidity, and mortality in developing countries. This study aimed to analyze the epidemiological and clinical profile of patients presenting with hip fractures at a General District Hospital.
Materials and Methods: A retrospective study was conducted by reviewing 200 patient case files with radiologically confirmed hip fractures between January 2024 and December 2024 at the General District Hospital. Data on age, gender, mode of injury, comorbidities, type of fracture, and Singh's Index grading for osteoporosis were collected and analyzed using SPSS.
Results: Out of 200 patients, 102 were males (51%) and 98 females (49%), with a mean age of 61.3 years. The highest incidence (46%) was observed in patients aged 60–75 years. Among those aged >60 years, 89% sustained fractures due to low-energy falls. Intertrochanteric fractures were the most common (58%), followed by neck of femur (34%) and subtrochanteric fractures (8%). Osteoporotic changes (Singh's Grade 3 or lower) were present in 77% of patients. Comorbidities such as hypertension, diabetes, visual impairment, and neurological conditions were common in elderly patients.
Conclusion: Hip fractures among elderly patients are rising and are closely associated with osteoporosis and preventable falls. Comprehensive preventive strategies targeting bone health and environmental modifications are urgently needed to reduce the fracture burden in rural and semi-urban populations.

Keywords: Hip Fracture, Osteoporosis, Epidemiology, Singh's Index, Elderly Trauma

INTRODUCTION

Hip fractures are a major public health concern, especially among the elderly population, due to their association with osteoporosis, high morbidity, and increased mortality[1]. With the rapid aging of populations worldwide, the incidence of hip fractures is projected to rise dramatically in the coming decades. The lifetime risk of hip fractures in individuals over 50 years is significantly high, with considerable social and economic implications for healthcare systems globally[2]. This trend has been similarly noted in countries such as Argentina and Iran, increasing hip fracture

incidences, suggesting a universal pattern tied to aging and bone fragility[3,4].

In India, the burden is even more profound due to the large elderly population, limited awareness, and inadequate preventive measures[5]. Hip fractures not only lead to hospitalization and surgery but also contribute to long-term disability and dependence. Hall et al. emphasized that hip fracture outcomes are strongly linked to quality of life and functional status, particularly in community-dwelling older adults[6]. Similarly, Haleem et al. noted significant mortality trends following hip fractures, which vary across geographical regions but consistently remain high[7].

Several well-known risk factors for hip fractures include advancing age, female sex, postmenopausal status, osteoporosis, low bone mineral density, and environmental hazards. Studies by Kanis et al. and Cummings et al. have shown that habits such as smoking, alcohol use, lack of sunlight exposure, and certain medications (e.g., corticosteroids) further exacerbate the risk[8,9]. Yet, despite this knowledge, India still lacks comprehensive epidemiological data on hip fractures, particularly in semi-urban and rural areas. Dhanwal et al. and Bhat et al. attempted to fill this gap by studying the incidence of hip fractures in North India and Kashmir, respectively, but data from general hospitals remain sparse[10,11].

The Singh's Index, a radiographic tool to assess trabecular patterns in the proximal femur, remains a valuable and cost-effective method to grade osteoporosis, especially in resource-limited settings. Introduced by Singh et al., this index allows clinicians to identify osteoporotic changes without advanced imaging technology[12].

Given this background, our study aims to evaluate the epidemiological profile of hip fractures in a general district hospital setting. It seeks to determine the distribution of fracture types, associated risk factors, and the prevalence of osteoporosis using Singh's Index. Such data is essential to develop targeted prevention and management strategies, especially in underserved regions where tertiary care access is limited.

MATERIALS & METHODS

This retrospective observational study was conducted in the Department of Orthopedics at a General District Hospital over a one-year period from January 2024 to December 2024. The study aimed to evaluate the epidemiological characteristics and contributing risk factors of hip fractures in the adult population. Ethical approval was obtained from the institutional ethics committee prior to data collection. A total of 200 patients admitted with radiologically confirmed hip fractures during the study period were included in the analysis.

Inclusion criteria for the study were all patients aged 18 years and above who sustained hip fractures involving the femoral neck, intertrochanteric region, or subtrochanteric region. Patients with pathological fractures due to malignancy or metabolic bone disease other than osteoporosis, or those with incomplete records, were excluded from the study.

Patient data were collected retrospectively from hospital case files obtained from the Medical Records Department using Central Registration (CR) numbers. A structured data collection format was used to extract relevant demographic and clinical variables, including age, gender, place of residence (rural or urban), mode of injury (low-energy falls or high-energy trauma such as road traffic accidents or falls from height), and presence of comorbidities such as hypertension, diabetes, neurological disorders, and visual impairment. Radiographic reports were reviewed to classify the fracture type as either femoral neck, intertrochanteric, or subtrochanteric. Osteoporotic changes were assessed using Singh's Index, a radiological grading system based on trabecular patterns in the proximal femur[12].

All collected data were entered into Microsoft Excel and statistically analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics

were used to calculate frequencies, percentages, and mean values for demographic and clinical variables. The findings were interpreted to identify trends in fracture patterns and associated risk factors among different age groups.

RESULT

This retrospective study analyzed a total of 200 patients who were admitted with hip fractures at the General District Hospital between January 2024 and December 2024. The findings are presented below in terms of demographic distribution, mechanism of injury, fracture types, osteoporosis grading (Singh's Index), and associated comorbidities.

1. Gender Distribution:

Among the 200 patients, 102 (51%) were males and 98 (49%) were females, showing a nearly equal gender distribution.

Table 1: Gender-wise Distribution of Patients

Gender	Number of Patients	Percentage (%)
Male	102	51%
Female	98	49%

2. Age-wise Distribution:

The mean age of the patients was 61.3 years, ranging from 15 to 85 years. The highest incidence of hip fractures was observed in the 60–75 years age group (46%), followed by the 40–60 years group (22%).

Table 2: Age-wise Distribution of Patients

Age Group (Years)	Number of Patients	Percentage (%)
<20	6	3%
20–40	30	15%
40–60	44	22%
60–75	92	46%
>75	28	14%

3. Mechanism of Injury:

Among patients aged >60 years**,** low-energy falls (e.g., fall from standing height) were the primary cause of fractures in **89%** of cases. In contrast, among patients aged <60 years**,** high-energy trauma such as road traffic accidents or falls from height accounted for 93% of the injuries.

Table 3: Mechanism of Injury by Age Group

Age Group (Years)	Low-Energy Falls	High-Energy Trauma
<60 (n=80)	6 (7%)	74 (93%)
≥60 (n=120)	107 (89%)	13 (11%)

4. Fracture Type Distribution:

The most common fracture type was intertrochanteric fractures (116 patients; 58%), followed by femoral neck fractures (68 patients; 34%) and subtrochanteric fractures (16 patients; 8%).

Table 4: Anatomical Location of Hip Fractures

Type of Fracture	Number of Patients	Percentage (%)
Intertrochanteric	116	58%
Neck of Femur	68	34%
Subtrochanteric	16	8%

5. Singh's Index (Osteoporosis Grading):

Radiographs were evaluated using Singh's Index to assess the presence and severity of osteoporosis. 77% of the total patients had Singh's Grade 3 or lower, indicating significant osteoporotic changes.

Table 5: Singh's Index Distribution

Singh's Grade	Description	Number of Patients	Percentage (%)
Grade 6	Normal trabecular pattern	12	6%
Grade 5	Early osteoporosis	16	8%
Grade 4	Moderate osteoporosis	18	9%
Grade 3	Marked trabecular resorption	76	38%
Grade 2	Severe osteoporosis	58	29%
Grade 1	Advanced osteoporosis	20	10%

6. Associated Comorbidities:

Many patients, especially those over 60 years of age, had multiple comorbid conditions. The most common were hypertension (41%), diabetes mellitus (36%), neurological disorders including prior stroke and Parkinson's disease (19%), and visual impairments (13%).

Table 6: Frequency of Comorbidities

Comorbidity	Number of Patients	Percentage (%)
Hypertension	82	41%
Diabetes Mellitus	72	36%
Neurological Disorders	38	19%
Visual Impairment	26	13%

DISCUSSION

The present study highlights the epidemiological profile and risk factors associated with hip fractures in a general district hospital setting over a two-year period. Our findings show that majority of patients (46%) were aged between 60–75 years, with a nearly equal gender distribution. This is consistent with the findings of Clark et al., who reported that the lifetime risk of hip fractures significantly increases with age, especially after the age of 50, leading to substantial healthcare burdens in aging population[13].

Although some global studies, such as those by Morosano et al. in Argentina and Eghbali et al. in Iran, have documented a higher proportion of female patients due to postmenopausal osteoporosis, our study found a slight male predominance (51%)[3,14]. This finding aligns with the observations by Nordin, who suggested that in Indian men, osteoporosis may develop earlier than expected due to lower baseline bone mass and nutritional factors[15]. Furthermore, studies from India, such as those by Dhanwal et al. in North India and Bhat et al. in Kashmir, have also reported region-specific gender variations in fracture incidence, supporting the need for localized data collection[10,11].

Our study showed that intertrochanteric fractures were the most common type (58%), followed by femoral neck fractures (34%). This distribution is in line with the results of Ahuja et al., who also observed a predominance of intertrochanteric fractures in elderly Indian patients due to structural vulnerability in osteoporotic bones[16]. Singh's Index grading revealed that 77% of our patients had grades ≤3, indicating moderate to severe osteoporosis. This confirms the trabecular deterioration described by Singh et al., who developed the index as a radiographic tool for evaluating bone quality in resource-limited settings[12].

Low-energy trauma, such as falls from standing height, was the leading mechanism of injury in patients aged >60 years in our study (89%). This finding supports the work of Jarnlo & Thorngren, who emphasized that most elderly hip fractures occur due to minor falls, often indoors, triggered by instability, poor vision, or cognitive impairments[17]. In contrast, patients aged <60 years mostly sustained hip fractures due to high-energy trauma, a trend that matches the epidemiological patterns noted by Kanis et al. and Cummings et al. in their studies on risk factors for hip fractures in younger adults[8,9].

Comorbidities such as hypertension, diabetes, neurological disorders, and visual impairment were highly prevalent in our elderly cohort. These comorbidities are known to contribute to instability and increase fall risk, as highlighted by Hall et al., who demonstrated that health status significantly affects post-fracture outcomes and quality of life[6]. The high mortality and complication rates associated with hip fractures, particularly in elderly populations with multiple comorbidities, were similarly emphasized by Haleem et al[7].

Importantly, despite increasing awareness of hormone replacement therapy (HRT) for osteoporosis prevention in postmenopausal women, our study population showed no consistent use of such measures. This is consistent with the findings of Karl Michaëlsson et al., who highlighted that while HRT may reduce fracture risk, its acceptance remains limited in many regions due to concerns about side effects and limited access[18].

In summary, our findings reaffirm that hip fractures in the elderly are closely associated with osteoporosis and preventable low-energy trauma. The patterns observed in our district hospital population are comparable to those reported in both Indian and international literature. However, the slightly higher fracture rates in males and the high prevalence of intertrochanteric fractures point to unique demographic and lifestyle factors at the local level, emphasizing the importance of community-based preventive strategies and early osteoporosis screening.

CONCLUSION

This study emphasizes the growing burden of hip fractures in elderly populations, particularly in resource-limited settings such as district hospitals. Majority of fractures occurred in individuals aged over 60 years, predominantly due to low-energy falls, and were strongly associated with moderate to severe osteoporosis as per Singh's Index grading. Intertrochanteric fractures were the most frequent type observed, and a high prevalence of comorbidities further compounded the risk.

These findings are in concordance with national and international data, though regional differences such as higher male fracture incidence were noted, underscoring the need for localized preventive strategies. Simple, cost-effective measures like early screening using Singh's Index, comorbidity management, fall-prevention education, and infrastructure modifications can significantly reduce the incidence of hip fractures. Public health efforts aimed at osteoporosis awareness and risk factor modification are essential to mitigate future healthcare burdens related to fragility fractures in aging populations.

Declaration by Authors
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