

Demographic Insights into One-Year Mortality Following Proximal Femur Fracture Surgery in India

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Learning Point of the Article:

The current study provides data on the demographics and the one-year mortality to the clinicians, health policymakers, and health administrators.

Abstract

Introduction: Proximal femur fractures are a significant public health issue and a leading cause of morbidity and mortality in the elderly. It poses a remarkable burden on healthcare resources.

Materials and Methods: Records of patients with proximal femur fracture operated during the study period (July 01, 2017–May 31, 2020) in our institution were obtained from hospital management system and analyzed retrospectively.

Results: Out of 1189 patients, 1101 met the inclusion criteria. About 66.21% were intertrochanteric, 28.52% were neck femur, and 5.26% were sub-trochanteric fractures. About 60.85% of patients were female. The mean age was 74.1 ± 9.22 years. Most injuries were domestic falls (89%) and left-sided (55%). The average delay in presentation to the hospital was 2.5 ± 6.62 days with mean length of stay being 11.34 ± 6.22 days and average pre-operative wait being 6.89 ± 3.34 days. Hypertension was the most common comorbid condition associated (45%) followed by diabetes (27%). About 4% also sustained other fractures; most common were distal end radius and proximal humerus fracture. Majority (63.7%) were operated between 3 and 7 days post-admission and the most common surgery performed was osteosynthesis with proximal femoral nail (39.69%). For mortality assessment, 34 patients died during hospital stay, 785 patients could be assessed and 282 were lost to follow-up. In-hospital mortality was 3.08%, 30-day mortality was 8.05% and 1-year mortality was 18.92%.

Conclusion: An integrated multidisciplinary approach with fall prevention awareness should be promoted to decrease the overall morbidity and mortality rate.

Keywords: One-year mortality, proximal femur fracture, demography.

Introduction

Osteoporotic or fragility fractures around hip, spine, and wrist are a major health concern in the elderly population. Hip fractures contribute to significant morbidity and have a high rate of mortality (16–27%) in 1st year after fracture [1-4]. Elderly patients with hip fracture constitute the single largest group of emergency orthopedic admissions and significant department workload [5, 6]. Proximal femur fracture comprises neck femur and intertrochanteric fractures (over 90%) and sub-trochanteric

fractures (5–10%). Most of these occur following a fall with a lifetime risk being 23.3% in men and 11.2% in women [7]. The incidence of fracture and their economic impact on public health are necessary to assess and devise preventive strategies [8, 9]. Unlike other countries, India lacks data for fragility hip fractures, thus incidence and the magnitude of this public health issue are not known, the treatment is not standardized and there is no universal treatment protocol [10]. According to report in 2004 estimated an annual incidence of 600,000 osteoporotic hip

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Table 1: Gender-based data

Variable	Males	Females	Total/average	P-value
Number of patients (%)	431 (39.15)	670 (60.85)	1101	-
Yearly cases				
i) 2017–2018	179	227	406	
ii) 2018–2019	140	242	382	0.036*
iii) 2019–2020	112	201	313	
Type of fracture				
i) Intertrochanteric	273	456	729	
ii) Neck of femur	141	173	314	0.023*
iii) Sub-trochanteric	17	41	58	
Mean age±SD (in years)	74.9±10.46	73.6±9.35	74.1±9.22	0.034*
Mean LOS±SD (in days)	11.59±6.56	11.19±5.88	11.34±6.22	0.294
Mean pre-operative wait±SD (in days)	7.08±3.46	6.76±3.21	6.89±3.34	0.116
One-year mortality (%)	22.1	16.8	18.9	0.056

Note: * P<0.05 (significant), LOS: Length of stay, SD: Standard deviation

Table 2: Mode of injury

Mechanism of injury	Number of cases
Fall at home	982
Slip and fall outside home	29
Hit/fall from cycle/2-wheeler	72
Fall from height	5
Fall from hospital bed	3
Physical assault	3
Animal attack	7
Total	1101

fractures, and this was expected to increase significantly by 2026, as the share of people over 60 years rises to 12.4% of 1.36 billion population [11]. It has been estimated that by 2030, 45.4% of the health burden in India is expected to be of older adults [12]. By 2050, 323 million people in India are expected to be 60 years and older and half of hip fractures will occur in Asia [8-15]. Most of the expenses are paid out of pocket and not through insurance. According to the National Family Health Survey-3, the private medical sector remains the primary source of healthcare for 70% and 63% of households in urban and rural areas, respectively and public sector for the poor [11]. In the present study, we have assessed the demographics of proximal femur fractures of the last 3 years (June-2017-May-2020) in a 983-bedded primary-referral-center located in East Singhbhum district of Jharkhand state of India. The aim is to provide information on the demographics in play and the 1-year mortality to the clinicians, health policymakers and administrators.

Materials and Methods

Between June 01, 2017 and May 31, 2020, patients aged 50 years or more, diagnosed with proximal femur fractures (neck,

intertrochanteric and sub-trochanteric) and operated in our hospital were included in the study. The data acquisition is from the hospital management system after taking clearance from the institutional ethics committee. Patients were excluded from the study if the fracture was pathological due to metastatic disease or primary bone tumors. Patients <50 years of age, operated for implant failure/revision surgeries, managed conservatively on traction owing to very high risk associated with surgery, or who did not consent for surgery or died preoperatively due to medical complications were also excluded from the study. Patients who did not visit for regular follow-ups were reached telephonically to calculate 1-month and 1-year mortality. The data collected were entered in Microsoft Excel and Statistical Package for the Social Sciences v23 was used for and statistical analysis. Continuous variables were analyzed using student t-test for two independent groups and analysis of variance for more than two groups. Discrete variables were analyzed using Chi-square where applicable. A P ≤ 0.05 was considered as significant.

Results

During the study period, 1189 patients with proximal femur

Table 3: Fracture based data

Type of Fracture	Mean age (in years±SD)	Length of stay (in days±SD)	Pre-operative wait (in days±SD)	One-year mortality (in percentage)
Intertrochanteric	74.7±9.66	11.01±5.95	6.7±3.18	17
Neck of femur	72.9±9.93	11.75±6.12	7.14±3.56	22
Sub-trochanteric	73.2±10.68	13.43±8.11	7.5±3.39	23

*SD: Standard deviation



Table 4: Associated fractures with proximal femur fractures

Fracture location	Number of cases
Distal radius	18
Proximal humerus	10
Spine	3
Long bone	7
Others	9

Table 5: Comorbidities found in patients with proximal femur fracture

Comorbidities	Percentage of patients
Hypertension	45
Diabetes	27
Lung disease	6.7
Cardiovascular	6.9
Neurological	5.3
Hypothyroidism	5.9
Chronic kidney disease	2.5
Tumors	0.8

fractures were operated. Of these, 1101 patients met the inclusion criteria. About 66.21% were intertrochanteric fractures (n = 729; proximal femoral nailing [PFN] in 387, dynamic hip screw [DHS] in 339, dynamic condylar screw [DCS] in 3), 28.52% neck femur fractures (n = 314; Bipolar hemiarthroplasty in 297, cannulated cancellous screw fixation in 16, total hip replacement in 1) and 5.26% were subtrochanteric fractures (n = 58; PFN in 50, DCS in 5, interlocking nailing in 2, DHS in 1). Thirty-four patients died during the hospital stay, 337 patients had regular follow-ups beyond 1 year, 448 patients who did not follow-up could be contacted and 282 were lost to follow-ups out of 1101 patients, no statistically significant differences were observed among patients.

Wide range of age distribution exists from 50 to 106 years, the average age (and standard deviation) was 74.1 ± 9.22 years with mean being 74.9 ± 10.46 years in males and 73.6 ± 9.35 years in females (P < 0.03) Table 1 & Fig. 1. Among females, a major proportion (41.94%) of patients presented in their 7th decade of life, whereas in males, the presentation was similar in their 7th (32.9%) and 8th decade (33.1%) (Fig. 2). The majority (n = 710, 64.48%) were in the age group of 70–89 years with lowest numbers in 90 and above age group (n = 51, 4.63%). Around 55% (n = 610) sustained injury to the left side (Fig. 3). The most common injuries were domestic falls (89%). Other modes of injury are described in Table 2. The average delay in the presentation of the patient to the hospital after sustaining injury was 2.5 ± 6.62 days, range extending from 0 to 120 days (Fig. 4). During hospitalization, all the patients were managed based on standard institutional protocols for age, type, and location of fracture. The most common surgical procedure performed was

Characteristics of study population

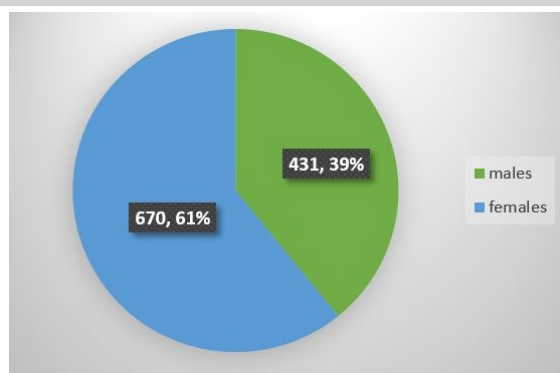


Figure 1: Graph showing gender distribution of cases.

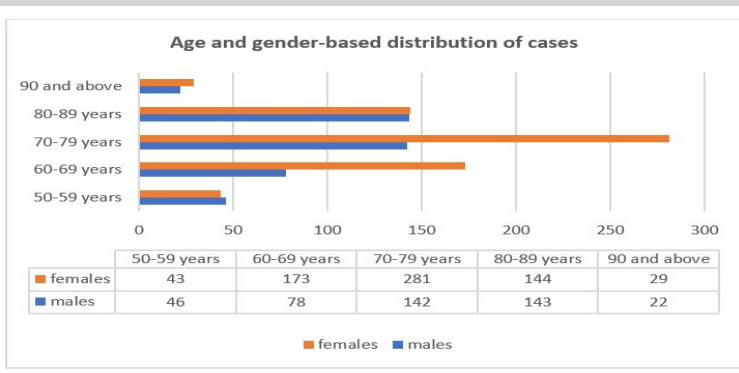


Figure 2: Age specific gender-based distribution of cases.



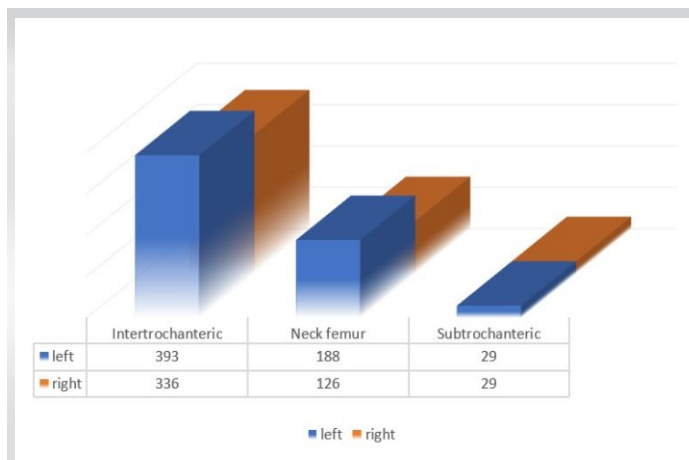


Figure 3: Pattern of laterality in fracture sub-types.

internal fixation with PFN ($n = 437, 39.69\%$). The mean length of stay (LOS) was 11.34 ± 6.22 days with the average pre-operative stay being 6.89 ± 3.34 days. Majority ($n = 702, 63.7\%$) were operated between 3 and 7 days post-admission. The variable-based cumulative figures are entered in Tables 1 and 3. About 4% of patients ($n = 47$) sustained other injuries as well, majority being distal end radius and proximal humerus fracture (Table 4). Hypertension (45%, $n = 496$) and diabetes (27%, $n = 298$) were the most common comorbidities (Table 5). Majority (86.6%) had up to two comorbidities and the rest had more than two. Only 38% ($n = 423$) didn't have any associated comorbid conditions.

Mortality assessment

The in-hospital mortality (death in post-operative phase before discharge) was 3.08% ($n = 34$) with 31 among >65 -year-old group. The average 1-year mortality was 18.92% ($n = 155$) and the 1-month mortality was calculated to be 8.05% ($n = 66$). The 1-year mortality rate was significantly higher in ≥ 65 -years-old age group (Fig. 5). Furthermore, it was more in patients with LOS more than the mean value ($P < 0.0001$). Type of fracture or

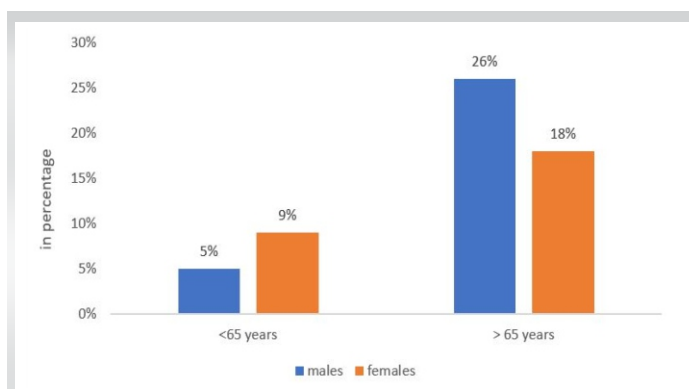


Figure 5: One-year mortality in different age groups and gender.

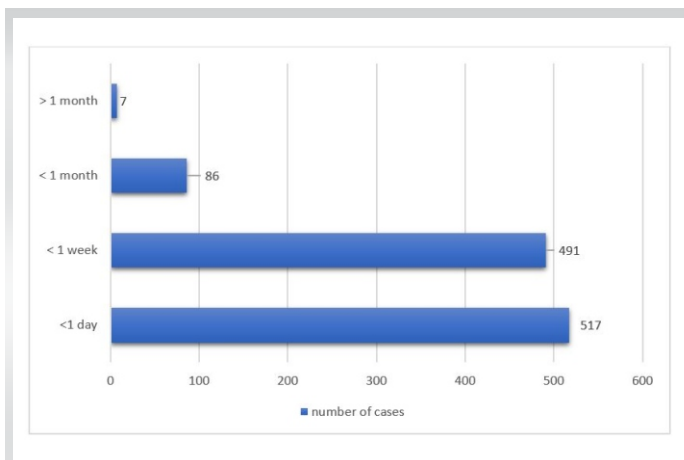


Figure 4: Timing of presentation to hospital.

operative intervention (Table 3), delay in presentation did not have a statistically significant difference over the 1-year mortality. However, the mortality rate in males was high, 22% (Table 1). It was significantly more in males more than 65 years old ($P = 0.01$) and with medical comorbidities ($P = 0.001$) when compared to females. It was also more in patients where the surgery was delayed more than the mean pre-operative period (27%). Older males (>65 years) with medical comorbidities had the highest rates (31%).

Discussion

Incidence of hip fracture differs between and within countries, between rural and urban areas, between different races. We could find only a few epidemiological studies on hip fractures with a sample size of more than 500 patients published from India but none of these have estimated the 1-year mortality in PubMed database [9, 10, 16].

The highest rates in the world were found in studies from Oslo, Norway [10, 17]. India inhabiting 1.2 billion people is expected to overtake China in a decade to become the world's most populous country. 65% of the aged individuals, especially elderly females (more than 80%) are dependent on others for their day-to-day maintenance [10, 18]. A decrease in bone mineral density with aging, particularly in women leads to an increased prevalence of osteoporosis and the highest rate of hip fractures in older women [19]. The demographic of our study is similar to the statistics of the hip fracture globally, average age ≥ 65 years ($n = 915, 83.1\%$) and about two-thirds occurring in women. This is, however, in contrast to other studies from India where the mean age was found under 60 years, and it was postulated that the occurrence of osteoporosis in India occurs a decade earlier compared to Western countries [9, 16].

Most common cause of hip fracture was domestic fall, from a standing height (89%). The various reasons patients

enumerated included slip on a wet or an uneven surface or stairs, fall in bathroom, loss of control while getting up from bed/raising from chair, and giddiness. Many elderly have poor balance, diminished vision, and neurological diseases which cause the fall. Majority (53%, n = 584) presented to the hospital after 24 h of sustaining injury. Several factors contribute to the delayed presentation such as lack of resources including financial and transportation constraints, illiteracy, ignorance, lack of care of elderly, practice of quackery and home-based treatment, and delay in referral to a well-equipped treatment center after initial treatment at local hospitals. The LOS varies significantly by region. Studies from North America reported the shortest mean LOS (6.4 days), whilst studies from Asia had the longest LOS (32.1 days) [19]. There are conflicting studies which associate increased LOS to an increased 1-year mortality [20-22]. In our study, patients with a shorter LOS had a significantly lower 1-year mortality. Furthermore, it has been observed that males with hip fracture are usually older, with more medical comorbidities, and thus, have an increased LOS and cost of treatment [19, 23].

We did not find any gender based statistical difference in average LOS ($P = 0.29$) but the 1-year mortality was more in males, significantly in above 65-year-old age group. On the contrary, more females were diagnosed to have associated medical comorbidities (65%, n = 435). Dhanwal et al., who conducted the first incidence study from India, found the highest rates of hip fracture in males in 85–90 year age group [9]. We observed that the proportion of males under our study increased in the age group of 80–89 years relative to females. The mean pre-operative wait was 6.89 days, like other studies from India [11, 16]. Factors contributing to delay include medical comorbidities, fixed operative days in a week due to the structural organization of the department, delays in financial clearance by the patient attendants (as many belong to lower and middle-class families lacking medical insurance), etc. A longer time to surgery was associated with an increased LOS. In recent times, studies suggest a decreasing incidence or a plateau of hip fractures, albeit the total proportion of patients is on a rise [4, 24-26]. The patients admitted during the study period show a significant declining trend (Table 1) but we attribute the decrease in 3rd year to SARS-CoV-2 pandemic when the total number of admissions and surgeries was drastically reduced.

The in-hospital mortality rate in our study was 3%. Nikkel et al. and Schnell et al. reported similar rates [20, 27]. The 1-month mortality rate was comparable to other published data [28]. Older adult patients with hip fractures are 3–4 times more likely to die within 1-year after surgery than the general population [29]. Increasing age above 65, male sex with associated comorbidities, prolonged LOS and excessive delay in surgery

are the negative predictive factors of the survival 1 year after surgery in our study. International guidelines suggest fixation of proximal femur fractures preferably within 24–48 h and relate it to decreased 1-year mortality. There are studies citing a positive, negative, or neutral correlation of early surgical intervention to 1-year mortality [30]. The timing of surgery in our study was delayed on an average to a week's time, yet the short-term and 1-year mortality rate are comparable to most of the studies published. Proper evaluation and pre-operative optimization were required as the general population is not completely aware of their pre-existing medical conditions. However, undue delay is not warranted. The primary care physicians in the remote locations where the specialists are deficient and who usually are the first line of contact can raise awareness among families to maintain a healthy well-being and good nutrition, educate them on how to minimize the risks of falls, to identify and seek treatment of various comorbidities, diagnose and refer the cases of fracture to prevent unwarranted delays. Multicentric trials and prospective studies are required to assess factors contributing to 1-year mortality and help in framing definitive protocols to decrease the rate in Indian population.

Conclusion

There are limited research articles published in South-Asian countries worked up on osteoporotic hip fractures. The estimation of incidence, prevalence, mortality, and the economic costs incurred are not known. Thus, there is a lack of standardization in methodology to estimate the burden of the disease. With the increasing population, especially the proportion of elderly and unavailability of data, there is a need for more research so that policies can be made to lay out standard protocols and healthcare plans in the management of osteoporotic hip fractures. There is a need to raise awareness to prevent falls in the high-risk population by increasing information accessibility and reducing risk factors. Implementing integrated care in elderly who fell, a thorough evaluation, early intervention, and decreasing in-hospital stay are a few propositions we believe should be considered in a standard healthcare plan for the management.

This study highlights that there is an increasing burden of the geriatric population and with the medical facilities being more accessible, number of such fractures being diagnosed and managed is bound to increase. As these fractures occur following a trivial fall on an osteoporosis skeletal system, there is a need to raise awareness to decrease the incidence of fall, especially domestic injuries. An early diagnosis and management of medical comorbidities by the primary care physicians in the pre-fall status can decrease the pre-operative time and post-operative stay of the patient which has a direct

relation to 1-year survival rate post-surgery. Further multicentric trials are required to help frame definite management protocols.

Clinical Message

Given the significant mortality rates and healthcare burden, a proactive, integrated multidisciplinary approach is essential. Efforts should be focused on early surgical intervention to minimize delays, comprehensive management of comorbidities and fall preventions to enhance survival rates and quality of life among elderly patients with proximal femur fractures.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

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