

Mortality profile after 2 years of hip fractures in elderly patients treated with early surgery



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ABSTRACT

Background: In geriatric age group, hip fractures tend to become a major public health hazard. Due to this high occurrence, there is a need to develop standardized, effective, and multidisciplinary management for treatment. These elderly patients have excessive mortality that can extend ahead of the time of recovery. Early surgery after hip fractures has led to a notable reduction in mortality rates. Still, it is considerably high as compared to other fractures.

Methods: 266 patients of >65 years who were operated within 72 h hours in a tertiary level health care centre for hip fractures were included. They were evaluated with X-rays and grade of Singh's index was noted. Mortality rates and the factors associated with it such as age, sex, co morbidities (using Charlson's co morbidity Index/CCI) were evaluated after 2 year follow up.

Results: The overall 2-year mortality reported in our study population was 11.2%. It was broadly lower as compared to most of the other studies. It was 6.3% in females as compared to 18.1% in males. While it was reported to be only 6% in 65–74 years of age, it was 25% in patients who were 85 years and above. 76.6% of the patients had Singh's index of \leq grade 3 showing osteoporosis. The patients with Low Charlson's score showed only 4.2% mortality while those with high Charlson's score showed 25.5% mortality.

Conclusion: It was concluded that Mortality among elderly patients after early surgery after osteoporotic hip fractures is quite significant. The factors for improvement in long term survival post-hip fracture may include changing treatment patterns, increasing life expectancy and early surgery. Increase in age, female sex, and high CCI Scores were major risk factors of mortality after hip fractures in a 2-year follow-up period.

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1. Introduction

In geriatric age group, hip fractures tend to become a major public health hazard. It has a significant financial impact on the patients and health care systems. The number patients with hip fractures are known to vary by age and gender and are found more frequently in older people. Osteoporosis stands as most important independent cause of fractures in elderly especially in Low Income Asian countries like India.

Worldwide, it is estimated that 1 in 3 women and 1 in 5 men above the age of 50 will experience osteoporotic fractures in their lifetime.¹ In 2013, it was indicated that 50 million people in India are either osteoporotic (T-score lower than -2.5) or have low bone

mass (T-score between -1.0 and -2.5). Hip fractures reported in old osteoporotic individuals mostly result from trivial trauma like falling at home. The literature says that after surviving a hip fracture, the patients experience depletion in functional activity and social independence with an augmentation in psychological disorders like depression, anxiety and attention deficit episodes.²

Due to this high occurrence, there is an urgent need to develop standardized, effective, and multidisciplinary management approach for treatment and rehabilitation of patients. These elderly patients have reported excessive mortality that can continue beyond the period of recovery. Most of these patients are vulnerable and have multiple medical diseases that can hinder rehabilitation and make death non-preventable.

The mortality rates in the previous studies for patients with hip fractures are considerably high, ranging from 15% to 36%.^{3–7} Dubljanin-Raspopovic et al.⁸ reported the death rate among the elderly patients with hip fractures was 4 times as compared to general population.

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Although early surgery has led to a significant 19% reduction in mortality rates, it is still considerably high in comparison to other fractures.⁹ Increase in age, gender, ethnicity, medical comorbidities, cognitive impairment, place of injury, time to surgery and rehabilitation protocols are known predictors of post-operative mortality in hip fracture patients.^{5,6,10–15} Nearly 20% of patients with hip fractures are known to develop some complication during recovery period.¹⁶ Most common post-operative complications known include Lung infections (9%) and cardiac disorders (5%).¹⁵ Other post-operative complications include prolonged immobilization leading to bedsores, failure in the union of bone, and re-fractures due to osteoporosis.

This study aims at predicting the mortality rates at 2 years follow up after early surgery (<72 h after injury) for hip fractures in the elderly.

2. Materials and methods

2.1. Data source

This was a retrospective study that was carried out in the Department of Orthopedics of a tertiary level health care centre. The patients were admitted either from OPD/Emergency rooms or referred from other health centers, identified clinically followed by X-rays (Antero-posterior and lateral) and managed according to standard protocols. Singh's index [17] was used to identify osteoporosis using the Hip x-rays. Informed consent was taken from all patients and were then planned for surgery once they were medically stable and fitness for surgery was obtained from the anesthesia department. The patients were operated according to the set protocols according to the type of fracture with the appropriate implant. Postoperative Rehabilitation and physiotherapy was started the next day of surgery while ambulation of the patient was decided according to the fracture fixation.

2.2. Data collection

Data was collected from the case records of Operation theatre for hip fracture surgery that were operated between April 15, 2017, and May 1, 2018 for CRIF/ORIF with PFN/DHS/Hemi-replacement arthroplasty/Total hip replacement after hip fractures after obtaining clearance from Institutional ethical committee. Admission tickets were then recruited for the cases and studied for diagnosis, timing of surgery, type of surgery, duration of stay, and co-morbid conditions such as DM, Hypertension, COPD or any chronic illness. The patients were then contacted telephonically and data was collected for mortality of all the cases.

2.3. Study group

Patients 65 years of age or older who sustained a hip fracture (including inter-trochanteric and neck of femur fractures) and were operated between April 15, 2017, and May 1, 2018, were included in the study for analysis. We excluded patients who had any pathological fracture, peri-prosthetic fracture, a previous hip fracture, or those who were treated conservatively.

2.4. Variables

We studied the mortality at 2-year follow up from the date of injury. Variables studied related to mortality included age, race, gender, postoperative complications, and any co morbidity associated with patients. We used Charlson co morbidity index (CCI)¹⁸ to study the role of co morbidities in mortality of hip fracture patients. It is a weighted score that takes various co morbid medical

conditions into account. In the original study by Charlson, a patient with a CCI between 1 to 2 and 3 to 4 had mortality rates (after 1 year follow up) of 26% and 52%, respectively. Charlson co morbidity score was calculated using the medical history at the time of injury and classified into low (0 or 1), medium,^{2,3} and high (4 or more). Chi-Square tests and multiple logistic regression analysis were performed to determine statistical significance.

At the time of admission, all the patients were also screened for osteoporosis using Singh's Index in standard hip x-rays. The patients diagnosed with osteoporosis were treated with Calcium and Vit D supplements and bisphosphonate drugs.

3. Results

We studied 312 patients operated for hip fracture (neck of femur, inter-trochanteric, and sub-trochanteric fractures) out of which we could not get data of 46 patients, and thus we included 266 patients in our study (Table 1). The mean age was 74.7 years. 58.6% of patients were females and 41.3% were males. 74% of patients presented with a history of fall at home while doing the household activity.

Of the total 266 patients enrolled for study, 204 (76.6%) patients had Singh's index of less than grade 3. Among these, 157 (59%) patients had it less than grade 2 thus establishing that osteoporosis is very prevalent in Old Indian population above 65 years of age. Among females, Osteoporosis was reported in 65% of the cases while 50% males had Singh's index of less than grade 3.

Of the 266 patients, 86 (32.3%) had a neck of femur fracture and the remaining 180 (67.7%) had a trochanteric fracture of femur. The patients had surgery under spinal (82.7%), general (5.6%), and combined spinal epidural (7.8%) anesthesia. The surgical techniques performed were hemiarthroplasty in 65 (24.4%), total arthroplasty in 21 (7.8%), intra-medullary nailing (IMN) in 160 (62.4%) cases and Dynamic Hip Screw in 14 (5.2%).

The overall 2-year mortality reported was 11.2% in our study population. It was 6.3% in females as compared to 18.1% in males (Table 2). The mortality rate was 1.7% for the initial inpatient hospital stay. The mortality rates saw a rise with increment in the age of the patient at time of injury. While it was reported to be only 6% in 65–74 years of age group, it was as high as 25% in patients who were 85 years and above.

Mean Charlson score was 2.54 with 125 patients having medium score.^{2,3} Low CCI (0–1) was found in 94 patients and high (≥ 4) was reported in 47 patients. The patients with Low Charlson score showed only 4.2% mortality, with medium Charlson score showed

Table 1
Characteristics of patients.

Total (n)	266	
Gender, %		
Female	156	58.64%
Male	110	41.36%
Age, y		
Overall (mean)	64.47	
65–75	133	50%
76–85	95	35.71%
85 and above	35	14.29%
SINGH'S INDEX		
>Grade 3	62	23.3%
<Grade 3	204	76.6%
<Grade 2	157	59%
Charlson score		
Overall (mean)	2.54	
Low (0–1)	94	35.3%
Medium (2–3)	125	46.9%
High (3–4)	47	17.66%

Table 2
–Factors associated with mortality.

Characteristic	n	Mortality	Mortality Rate	Co-efficient	t-stat	p-value
Overall mortality	266	30	11.2%			
Age, y				0.08	3.20	0.001
65-74	133	8	6.0%			
75-84	95	13	13.6%			
85-94	35	9	25.7%			
Gender				0.102	2.74	0.006
Male	110	20	18.1%			
Female	156	10	6.3%			
Charlson Score				0.09	3.74	0.0002
Low (0–1)	94	4	4.2%			
Medium (2–3)	125	14	11.2%			
High (>4)	47	12	25.5%			

11.2% mortality and with high Charlson score showed 25.5% mortality.

In Our study, Out of 30 patients who died, 17 died in the first year and 13 in the second year. 2 patients died during the hospital stay of initial seven days. Cause of death of both the cases was reported to be pulmonary embolism. 38 of the patients developed peri-implant re-fractures during the course of our study. Maximum mortality was reported to be in the initial 6 months (Fig. 1) and the most common cause of mortality was chest infections followed by cardiac failure. 38 of the patients developed peri-implant re-fractures during the course of our study.

4. Discussion

Osteoporosis is one of the major causes of fractures in the elderly population and currently leads to approximately 9 million fractures annually around the world.¹⁹ Also, these are increasing with an excess of 6 million added per year. 59% patients in our study has Singh's Index of less than grade 2 thus establishing that osteoporosis is very prevalent in Old Indian population above 65 years of age. We found that Osteoporosis was reported in 65% females and 50% males with hip fractures. It is highly prevalent in females because of marked increase in bone loss during perimenopause and post-menopause. While men experience only Age related linear bone loss, women in addition to age-related bone loss also experience menopausal bone loss.

The greatest increment of osteoporosis is predicted to be in Asian countries like India and China.²⁰ So, there is an urgent need for a plan for optimization of this expected rise. Extensive studies are required to examine the patterns for mortality and morbidity among elderly to bear with an impending surge of hip fractures.

The overall mortality rate observed in our study (11.2%) was broadly lower as compared to most of the older studies, but only slightly lower when compared to latest studies. [3–8,13,21–25 Mortality rates and variables considered for various studies are mentioned in the table (Table 3).

The factors for improvement in long term survival post-hip fracture may include the ethnicity of population, changing treatment patterns, increasing life expectancy, early surgery, and adoption of secondary prevention and current best practices for care of patients. The mortality rates after one year follow up of hip fractures has traditionally been reported in literature as 30%.²² Various studies states that this mortality was 23.3% in Europe and 17.9% in Asia.²⁶ In a study by Dhanwal DK²⁷ in New Delhi, India, it was reported to be 30.4% after 1 year follow up. Oya kilci²⁸ in 2016, reported mortality in 36.7% after 3 year study period.

Our study reports positive co-relation between mortality rates and increase in age of patient. While the patients of the age group 65–75 years reported only 6.03% mortality, those with age more than 85 years reported it as 25.7%. Various other studies in the literature have also shown the same, Aharonoff²⁹ in a study of 612 patients found >85 years age as a significant predictor of mortality in hip fracture patients. Scott schnell²³ proved mortality of 27% for >90 years and only 2% in patients less than 70 years of age. Berry et al.³⁰ also reported that there was a 30% increase in mortality with every 5 years of advancing age after hip fractures. Bolton³¹ in a very recent study evaluated hip injuries in the individuals over 90 years of age and found 38.1% mortality among them, which is close to 25.7% reported by our study (>85 years of age). All these findings are conclusive with the regular trends of increase in mortality with increasing age.

Various studies have tried to establish a relationship with mortality rates and gender and the results are varied. Most studies claim that men have higher death rate after hip fractures. We also found that men have a higher mortality rate (18.1%) in comparison to women (6.3%) at our 2 year follow up. The study done by Endo et al.³² in 983 patients with hip fractures (206 men) found that men had an increased postoperative complication risk and almost double 1-year mortality as compared to women. No significant difference was determined between the genders in respect of mortality rates by Oya kilci (28) in his study. The reason for this disparity in mortality between the sexes is unclear and warrants further studies.

Charlson's co morbidity index (CCI) was used to assess role of co-morbidities in mortality among hip fracture patients. Various

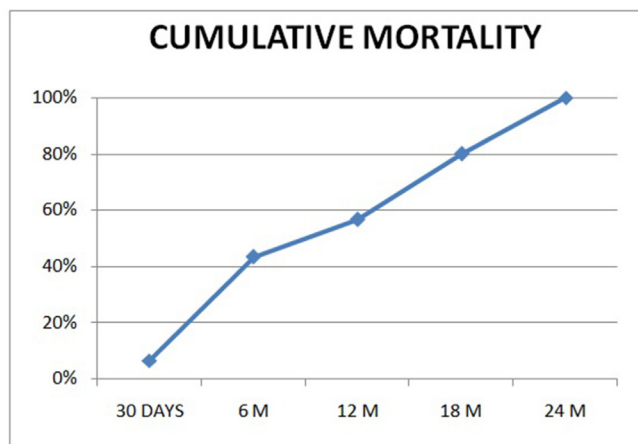


FIGURE 1

Fig 1. Cumulative Mortality over time.

Table 3
Changes in mortality rates over time.

YEAR OF STUDY	AUTHOR	TYPE OF STUDY	VARIABLES WITH INCREASED MORTALITY	FOLLOW UP	MORTALITY RATE
2005	Christopher G Moran et al. ²²	Prospective	Delay in surgery (>4 days)	1 year	30%
2010	Scott Shnell ²³	Retrospective	High CCI score (>4), Male, Increased Age	1 year	21.2%
2019	Eric Wei LiangCher ²⁴	Prospective	High CCI score	1 year	13.3%
2020	Toshihiro Higashikawa et al. ²⁵	Retrospective	Age, Sex, Albumin levels	1 year	12.2%

studies have previously used the CCI to assess risk and predict 1-year mortality [28–30]. Charlson's Index uses a cumulative score of co morbidities to provide prognostic data for the survival of patients after hip fractures.¹⁸ Patients with low CCI (0–1) had only 4.2% mortality rates while patients having high CCI (4 or more) had 5 times more (25%) mortality rates. This shows that co-morbid conditions (CCI) continue to be the most significant factor for hindering the recovery of the patient and leading to mortality after hip region surgery. Various other authors have found similar results. Roche et al.¹⁵ in their study of 2448 hip fractures found that higher complication rate and mortality were found in patients having 3 or more medical co morbidities. Bentler et al.^[30] replicated his results where he reported that patients with 3 or more co morbid conditions were 65% more likely to die than those with fewer conditions. Scott Schnell²³ found an average CCI Score of 2.7 and reported that segment of the population who may have severe or multiple medical co morbidities presumed a higher 1-year mortality rate.

The timing of surgery, type of fractures, route of anaesthesia administered, and type of surgical technique were not found significant for mortality rates observed after hip fractures. Allen Tenner II et al.³³ in his 3 year retrospective cohort study recently evaluated if earlier intervention is associated with improved mortality, hospital length of stay or cost of treatment after hip fractures. Similar to our study, they found that surgery within 24 h of admission was not associated with lower odds of death when compared to surgery after 24 h of admission. However, a significant decrease in cost and length of hospital stay was observed for early surgery.

In Our study, Out of 30 patients who died, 17 died in the first year and 13 in the second year. 2 patients died due to post-operative complications during the hospital stay of initial seven days. Cause of death of both the cases was reported to be pulmonary embolism. In a recent systematic review by Istianiah [34] it was concluded that at 30 days after hip surgery, complications of chest infection were 9% while complications of UTI were 4% and wound infection or deep infection were 1.1% and 1% respectively.

This study was not without limitations. We lost follow up of 46 patients during our study and could not evaluate their mortality status in results. This could have affected our mortality rates leading to lower or higher mortality rates. Since 32 of these patients were from age group 65–74 with average CCI score of 2 among these patients, we can assume that they also must have followed the same trend as the mortality rates exhibited by others. Also, we analyzed short term results and thus longer duration studies are required in future.

5. Conclusion

Hip fracture among elderly is a major public health concern and needs attention for proper management and early rehabilitation as there is quite significant mortality associated. It was concluded that increasing age, female sex, and high CCI Scores due to comorbidities were major risk factors of mortality after hip fractures.

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Declaration of competing interest

None.

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