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Original Research Article

One month and one year mortality of hip fractures in a tertiary care hospital in south India- A retrospective cohort study

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ABSTRACT

Background: Worldwide incidence of hip fractures is estimated to increase by 4.50-6.26 million by 2050 and half of that being in Asia. With a 30-day death rate between 5% and 10% and a one-year mortality rate as high as 40%. This should be a great health burden to India. Our aim is to look at 1 month and 1 year mortality rate in this high-risk group and factors which might influence them.

Materials and Methods: This 2-year retrospective cohort analysis was carried out at our hospital which is a Level III Trauma Care Hospital in South India. Case notes were analyzed, and telephone interview was done to check one year mortality.

Results: 167 patients in total, with a mean age of 70.8, were evaluated; 90 of these patients (53.9%) were men, and 77 (46.1%) were women. Of the 167 patients, 51 (30.53%) underwent hemiarthroplasty, 84 (50.29%) proximal femur nails, and 24 (14.37%) Total hip replacements (THR). In our study 4 patients (2.4%) died within 30 days of admission, and 25 (14.9%) died within a year following surgery. As the patients' ASA grade increases, the mortality rate also increases. Postoperative complications were another one of the strongest predictors of death. The most significant contributing factor to mortality in hip fractures is found to be timing of surgical intervention.

Conclusion: Our mortality rate is comparable to or lower than that of developed nations. ASA grade, Presence of postoperative complication, time delay to surgery were significant contributing factors in our study.

1. Introduction

Proximal femur or Hip fractures are those that are occurring between the edge of the femoral head and lesser trochanter.[1] Worldwide incidence of hip fractures is estimated to increase by 4.50-6.26 million by 2050 and half of that being in Asia.[2] United States with a population of 332 million reported 300000 hip fractures annually according to CDC data. Hip fractures in the United Kingdom were expected to increase from 79000 in 2010 to 104,000 by 2025 costing £2 billion a year.[3] The incidence of hip fractures in China plateaued from 2012 to 2016 and is expected to decline like in other developed countries. Although the total number of hip fractures has increased because of the ageing population.[4]

Scientific data regarding hip fractures are not available in India, but according to population data by World Bank in 2019, India is estimated to have 9% aged 60 years and above which is corresponding to 116 million approximately. This is four times than that of United States and the incidence should be twice or thrice of 300000 hip fractures that occur in United States. Improving life expectancy will also increase the ageing population in India. Meanwhile, there

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are some literatures which had made some projections on incidence of hip fractures in India. Asian projective study for hip fractures projected India's number in 2018 to be around 330000 which may increase to 800000 in 2050.[5] Approximate incidence of hip fractures in India is 129 /100000[6] and is 278 per 100000 between 2013 and 2016 in China.[7]

Similar trends in the incidence of hip fractures as in developed countries and with the developed nations having a 30-day mortality rate between 5% - 10% and a one-year mortality rate between 15% and 40%, will burden the already fragile health infrastructure in rural India. Proper data about mortality is lacking in India. Our aim is to look at the 1 month and 1 year mortality rate and possibly look at the factors influencing them.

2. Materials and Methods

This is a retrospective cohort study performed at our hospital which is a Level III Trauma Care Hospital, in South India over a 2-year period between January 2017 and December 2018. All hip fractures - neck of femur and inter trochanteric-fractures aged 60 and above were included. Patients with pathological fractures, polytrauma, and recent contralateral lower limb fractures were excluded from the study. Institutional ethical committee approval was obtained for the study.

We collected eight parameters from case notes retrospectively (Table 1). Neck of femur fractures were treated with hemiarthroplasty or total hip replacement and most of the intertrochanteric fractures were treated with Proximal Femoral Nailing (PFN). All patients were ambulated postoperatively within 48 hours patients. Subcutaneous thromboprophylaxis with low molecular weight heparin of 2500 I.U. was given while in the hospital and after discharge Aspirin 150mg was continued for 4 weeks. Patients were reviewed from 6 weeks to 3 months. One month mortality was ascertained from case notes and telephone interview. A telephone follow-up after a year was conducted regarding the survival of the patient and if there was a mortality, information regarding the date and cause of death was collected in local vernacular language.

Table 1: Parameters collected

S.No	Parameters
1	Time Taken for admission from fall
2	Time to Surgery
3	Co-Morbidities
4	Preoperative Haemoglobin
5	ASA Grade
6	Anaesthesia
7	Type of surgery
8	Post-operative complications

3. Results

A total of 167 patients were evaluated (Table 2), with a mean age of 70.8; 90 of these patients (53.9%) were male, and 77 (46.1%) were female. A total of 65 patients (38.1%) had more than one co-morbidity. Eighty-two had (49.1%) hip fracture and eighty-five (50.9%) had an intertrochanteric fracture. Of 167 patients 30.53% (n=51) were treated with hemiarthroplasty, 84 (50.29%) underwent proximal femur nail (PFN), and 24 (14.37%) total hip replacement (THR). The mean (±SD) duration from injury to surgery was 2.9 (±3.6) days, and the mean (±SD) duration of hospital stay was 11.8 (±4.3) days. Several postoperative complications were noted (Table 3) and it was observed that anaemia (10%) was the most common postoperative complication.

A total of four patients (2.4%) died within 30 days of admission, and 25 patients (14.9%) died within one year. Statistical analysis was done using SPSS software to find factors influencing mortality.

The factors significantly associated and found to be predictor of mortality (P<0.001 by Chi-square test) were:-

1. Timing of surgical intervention from injury: For one day increase between injury and surgery, the chance of mortality is likely to be 11% more or about 1.11 times higher compared to those who undergo surgery on the same day of injury. (Tables 5 and 6)
2. ASA grade of more than 2 : Among 167 patients, ASA grade was more than 2 for 57 patients (34%). Forty-seven patients had two co-morbidities, sixteen patients had three co-morbidities and 2 patients had more than 3 comorbidities. There is increase in mortality rate as the ASA grade increases in patients. The overall mortality rate in patients with ASA grades > 2 is 24.6 (Table 4).
3. Development of postoperative complications: Twenty-five (15%) of 167 patients developed post-operative complication and the mortality rate was 52%.

Other variables did not have any significant effect on mortality.(Table 4) Since three variables were found to be statistically significant in the univariate analysis, (Table 5) those variables were considered for multivariate logistic regression analysis (Table 6). The results were consistent with that of univariate. However, ASA GRADES of more than 2 and the presence of postoperative complications were stronger predictors of mortality.(Table 6)

4. Discussion

The 30-day mortality varies from 5% to 10% while one-year mortality varies from 15% to 40% in various literatures. The one-year mortality rate has dropped to 22% globally because of recent developments in medical science and early patient surgery.[8] In our study 1 month mortality was 2.4% (4/167) and 1 year mortality was 14.9% (25/167).

Early surgery has consistently decreased mortality and is one of many factors that affect mortality. The National

Table 2: Baseline characteristics of the study sample

Variables	Categories	n	%
Gender	Female	77	46.1
	Male	90	53.9
Age (years) at the time of surgery	Mean ±SD (min-max)	70.8±7.8(60-92)	
Age Distribution	51-60 years	6	3.6
	61-70 years	91	54.5
	71-80 years	47	28.1
	>80 years	23	13.8
Distribution by fracture Type	Neck of femur fracture	82	49.1
	Intertrochanteric femur fracture	85	50.9
Distribution by Procedure Type	Hemiarthroplasty	51	30.53
	Proximal femur Nail	84	50.29
	Total Hip Replacement	24	14.37
	DHS	6	3.59
	CC Screw	2	1.19
Distribution by ASA grades	1	37	22.2
	2	73	43.7
	3	53	31.7
	4	4	2.4
Duration (days) admission to discharge	Mean ±SD (min-max)	11.8±4.3(2-30)	
Duration (days) injury to surgery	Mean ±SD (min-max)	2.9±3.6(0-24)	
Admission to Surgery	<48 hours	140 (83.8%)	
Admission to Surgery	>48 hours	27 (16.2%)	
30-day Mortality	2.4% (4/167)		
1 year Mortality	14.9% (25/167)		

Table 3: Postoperative complications

Complications	Number of patients
Heterotrophic ossification	2
Pulmonary oedema	5
Stroke	1
Basal atelectasis with hypoxia	5
Sepsis	1
Surgical site ooze	1
Acute kidney injury	1
Electrolyte imbalance	3
Periprosthetic fracture	2
Anaemia needing transfusion	16
Deep vein thrombosis	1
Oliguria	4
Screw Irritation	3
Peri implant fracture	1
Myocardial infarction	2

Institute of Clinical Excellence (NICE) in the UK advises having surgery the same day or the following day after being hospitalised. According to Nia et al.,[9] individuals who underwent surgery 24 hours after being admitted to the hospital had a higher 30-day death rate. According to the National Hip Fracture Database (NHFD), UK 2019, 68% of patients had surgery the same day they were admitted to the hospital. Scottish standards of treatment for hip fracture, approved by the Association of Anaesthetists from the UK in 2018,[10] advised surgery within 36 hours after hospitalisation. In our study, 83% of patients underwent surgery within 48 hours of admission.

According to our findings, the death rate increases to 17.9% from 13.9% when surgery is postponed for more than two days. Either because patients try native medicine first or because of financial restrictions, hospitalisation in India takes longer. Higher mortality was documented in a study by Ram et al[11] in Chennai, India, when surgery was conducted more than 48 hours after admission. There are no good studies on timing of hip fractures in India.

Table 4: Comparison of mortality rates between the study characteristics

Variables	Death rate (%)	P-value
Gender		
Males (n=90)	16.7	0.506
Females (n=77)	13.0	
Type of procedure		
1 (n=51)	17.8	0.705
2 (n=84)	15.6	
3 (n=24)	5.3	
4 (n=6)	20.0	
5 (n=2)	0.0	
Fracture Type		
1 (n=82)	15.9	0.753
2 (n=85)	14.1	
Comorbidities		
Nil (n=48)	12.5	0.861
One comorbidity (n=54)	14.8	
Two comorbidities (n=47)	19.1	
Three comorbidities (n=16)	12.5	
More than three comorbidities (n=2)	0.0	
ASA grade		
<= 2 grades (n=110)	10.0	0.012
> 2 grades(n=57)	24.6	
Postoperative complications		
Absent (n=142)	8.5	<0.001
Present (n=25)	52.0	

Table 5: Univariate logistic regression analysis to assess the risk factors for mortality among the patients who had surgeries

Variables	Odds ratio	p-value	95% Confidence Limits	
			Lower	Upper
Age	1.03	0.117	0.99	1.08
Gender	1.36	0.488	0.57	3.23
Duration	1.01	0.858	0.92	1.11
The interval between Injury and Surgery	1.11	0.033	1.01	1.22
Fracture Type	0.86	0.728	0.37	2.01
ASA-grade>2	2.93	0.015	1.23	6.97
Comorbidity present	1.33	0.571	0.50	3.56
Postoperative complications present	11.74	<0.001	4.39	31.35
Pre op Hb	0.86	0.127	0.71	104
Post op Hb	0.87	0.231	0.68	1.10

Table 6: Multivariate logistic regression analysis

Variables	Odds ratio	p-value	95% Confidence Limits	
			Lower	Upper
The interval between Injury and Surgery	1.06	0.044	1.02	1.20
ASA-grade>2	4.24	0.007	1.49	12.08
Postoperative complications present	14.11	<0.001	4.63	42.95

Table 7: Comparison of 30-day mortality

Study	30-day Mortality	Number of patients	Mean age
National Hip fracture Database UK 2019	6.5%	67302	NA
Ram et al (India)	10.3% (In hospital)	270	NA
Gupta et al (India)	6.6%	120	72.5
Blanco et al (Spain)	6%	923	86.22
Huette et al (France)	6.1%	309	85
Chia et al (Australia)	8.1%	183	80
Nia et al (Austria)	6.1%	1101	83
Al-Mohrej et al (Saudi Arabia)	5%	99(only NOF)	71
De Joode et al (Netherlands)	7.9%	216	82.2
Meessen et al (Italy)	4.7%	828	83.3
Gundel et al (Denmark)	9.6%	113721(15y)	78.9
Silva et al (Brazil)	7.5% (in hospital)	213	77.7
Makwana et al (India)	7.7%	376	NA
Our study	2.4%	167	70.8

Table 8: Comparison of 1-year mortality

Study	1-year Mortality	Number of Patients	Mean Age
Mohamed et al (UK)	21.5%	1086(only NOF)	78.3
Karademir et al (Turkey)	40%	115	83.3
Harvey et al (Australia)	26%	24500	84.6
Gupta et al (India)	18%	120	72.5
Huette et al (France)	23.9%	309	85
Chia et al (Australia)	21.6%	183	80
Schnell et al (USA)	21.2%	758	84.8
Al-Mohrej etal (Saudi Arabia)	15.6%	99(only NOF)	71
Gurger.M (Turkey)	22%	109	79.3
Aprato et al (Italy)	24.7%	516	83.6
De Joode et al (Netherlands)	37.0	216	82.2
Meessen et al (Italy)	20.7%	828	83.3
Gundel et al (Denmark)	27%	113721 (15 yr. Study)	78.9
Silva et al (Brazil)	25.8%	213	77.7
Our study	13.8%	167	70.8

NOF – Neck of Femur

Advancing age is a significant influencing factor for mortality. The average age of our patients is 70.8 which is significantly lower than developed countries.[12–15] The mean age of our patients who died (72) is comparatively higher than the mean age of patients who survived (67) but it was not statistically significant (p 0.113). In Age-specific mortality study performed in China; the mortality was 2.65% in 50-54 years of age which increased to 28.91% in 95-99 years of age.[16] Most patients with hip fractures have one or more comorbid status which will influence mortality. Patients with three or more co-morbidities have a higher chance of mortality.[17] Lloyd et al[18] reported that a higher age adjusted Charlson co-morbidity index (ACCI) correlated with higher mortality. A Charlson comorbid score of 4 or above is predictive of higher mortality.[19] A long-term follow-up study from Singapore showed a strong Association between mortality and Charlson comorbidity index.[20] Lunde et al[21] who looked at the role of comorbidity in hip fractures in women in Norway showed a strong association between comorbidity and short-term absolute excess mortality and long-term relative excess mortality.

Our findings indicated that patients with more than two comorbid conditions had a higher mortality rate. ASA grade greater than 2 was significant in both the univariate and multivariate analyses (p 0.015), (p 0.007). Numerous literatures worldwide have supported this.[9,22–24] Postoperative complications are well-known to increase mortality. Arrhythmia, hypokalaemia, and respiratory insufficiency were associated with increased 30-day mortality in a study from Spain.[24] Postoperative oliguria was found to be a significant factor in an Australian study.[22] Acute renal impairment and post-operative oliguria were significant factors in the study from Saudi Arabia.[25] In our analysis, postoperative complications were significantly linked to higher mortality.

One month mortality in our study was 2.4% (4/167). This is far less than the rate quoted in western literature. (Table 7)

The 1-year mortality rate in our study was 14.9% (25/167). According to a study performed by Downey et al[8] the 1-year mortality worldwide was quoted as Europe (23.3%), Asia (17.89%), Oceania (Australia) (24.9%), North America 21%, South America 26.8% and worldwide 1-year mortality overall as 22%. Our 1-year mortality compared to similar studies is tabulated below (Table 8).

1-month and 1-year mortality in our study are low when compared to developed countries . This may be because our hospital has all specialities on-site and usually, we operate the next day of admission. Although we don't have geriatric service in our hospital this doesn't reflect in the results. In India patients are not discharged into a community setup, all patients go home where they are taken care of by their families.

With the Covid-19 pandemic, the 30-day mortality has increased in this group of patients with hip fractures confounding an already difficult problem. A meta-analysis by Kumar et al[26] has shown that 30-day mortality in patients with concomitant Covid-19 with hip fracture is around 34.7%. The national hip fracture database in the UK has also shown that hospital mortality increased to 30% in March 2020.

Limitations of our study, it is a retrospective cohort study and data was collected by going through the notes. When compared to literature worldwide, our numbers are not significant. But our key strength was obtaining all patient data on mortality which was our major goal.

5. Conclusion

Timing of Surgical intervention is found to be the most important factor for mortality in hip fractures while ASA grade 2 and development of post-operative complication were strong predictors of mortality. Our mortality rate is on par with or even better than the developed countries which gives us confidence for the best patient care. 83% of patients were operated within 48 hours, and we have immediate access to various specialities for management of post-operative complications which may have played a role in reducing our mortality rate.

6. Source of Funding

None.

7. Conflict of Interest

None.

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