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DEMOGRAPHIC AND LABORATORY PARAMETERS AFFECTING IN-HOSPITAL MORTALITY OF PATIENTS WITH PROXIMAL FEMORAL FRACTURES

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ABSTRACT

Introduction: Proximal femur fractures or hip fractures encompasses intertrochanteric fractures, fracture neck of femur and subtrochanteric fractures. The aim of the present study was to identify the demographic and laboratory parameters affecting mortality rates of in-hospital patients with proximal femoral fractures.

Materials and Methods: A retrospective study was conducted at Government Medical College, Thiruvananthapuram between 01/01/2018 to 31/12/2021. All consecutive patients above 20 years with neck of femur fractures, intertrochanteric fractures and subtrochanteric fractures, admitted in the hospital, were included in the study by searching the patient files.

Results: Total 607 patients were included in the study. Most of the patients belonged to age group 65 to 80 years (40.2%). There were 24 in-hospital deaths during the study period, the mortality rate being 3.95%. Mortality rate of age group 50-65 years was 2.17%, 65-80 years was 4.51, 80-95 years was 6.20 and that of above 95 years was 11.11% (p= 0.082). In urban patients, mortality rate was 0.79% and that of rural was 4.78% (p= 0.019). Ambulant patients had a mortality rate of 3.60% while that of non-ambulant patients was 12.5% (p=0.045). Patients with total count <4000 had a mortality rate of 100% and with >11000 rate of 3.68% (p=0.019). Patients with <1.5lakh platelet count had a mortality rate of 13.64% and that of >1.5 lakh was 3.2% (p=0.003). Creatinine level <1.4 mg/dL had a mortality rate of 3.61% and >3 mg/dL was 15.38% (p=0.015). Patients who had surgery within one day had no mortality and after 30days had a mortality of 14.29 (p=0.042).

Conclusion: In-hospital mortality of patients with proximal femoral fractures is the result of interaction of multiple factors. Rural patients and non-ambulant patients at admission had higher mortality rate. Patients with total count <4000, platelet count <1.5 lakh and creatinine >3 mg/dL had a higher mortality rate. Time between injury and surgery had an impact on mortality, higher mortality for delays more than 7 days.

INTRODUCTION

Proximal femur fractures or hip fractures encompasses intertrochanteric fractures, fracture neck of femur and subtrochanteric fractures[1,2]. They account for 14% of all fractures [3]. There is a lifetime risk of around 23% for men and 11% for women of hip fractures [4,5]. Due to the high rates of

complications and mortality risk in the early and late postoperative periods, hip fractures raise the cost of acute and rehabilitative care services [6].

Numerous factors have a significant impact on mortality and morbidity, including the time of surgery, the surgical technique and the physical condition as defined by the American Society of Anaesthesiologists (ASA) score[7-9]. Current clinical guidelines recommend that, when patient is medically optimized, surgical intervention be performed within 48 hours [8].

In the first three months following a hip fracture, older persons are five to eight times more likely to die from all causes, with in-hospital deaths accounting for over half of the mortality risk in the first year [10-12]. In-hospital mortality rates as per literature ranges from 1 to 10%[12,13]. There are only few studies of lab parameters affecting mortality during hospital stay of patients with proximal femoral fractures [14,15]. The aim of the present study was to identify the demographic and laboratory parameters affecting mortality rates of in-hospital patients with proximal femoral fractures.

MATERIALS AND METHODS

A retrospective study was conducted at Government Medical College, Thiruvananthapuram between 01/01/2018 to 31/12/2021, after obtaining IEC clearance (HEC No: 06/05/2022/MCT). All consecutive patients above 20 years with neck of femur fractures, intertrochanteric fractures and subtrochanteric fractures, admitted in the hospital, were included in the study by searching the patient files and hospital information system. Patients with open fractures, pathological fractures, multiple trauma and lack of adequate data were excluded.

A total of 607 patients were included in the study. The outcome of the study was an analysis of prevalence of in-hospital mortality after proximal femur fracture in adults. The dataset included death as one of the discharge types. Age, sex, rural or urban, type of fracture, fracture laterality, mechanism of injury, ambulatory status before injury, bed sore at admission, timing of surgery after fracture, lab parameters at admission, were recorded from case files.

Statistical analysis

Data were entered in Microsoft Excel and were analysed using Statistical Package for Social Science(SPSS) software version 22 (IBM Corp; Chicago, USA). Categorical variables were compared using the Chi-square test or Fisher's exact test. Parametric variables were tested using unpaired t-test and Mann-Whitney test was used for non-parametric variables.

RESULTS

Total 607 patients were included in the study. Majority were females (62.9%,n=382) (Table-1). Most of the patients belonged to age group 65 to 80 years (40.2%, n= 244). 91.4% were due to domestic falls. Trochanteric fractures constituted 51.1% (n=310) and 37.9% were neck of femur fractures. Both hips were almost equally affected. Majority (96%) were ambulant before injury. Seven patients (1.2%) had bedsore at time of admission. Majority (80.2%) were from rural areas (Table-1).

Table-1: Demograpy and Mortality

Demography	Category	Deaths	Total Cases	Mortality Rate %)	p-value
Total Mortality		24	607	3.95	
Age group	20-35	0	23	0.0	0.082
	35-50	0	48	0.0	
	50-65	3	138	2.17	
	65-80	11	244	4.51	
	80-95	9	145	6.20	
	>95	1	9	11.11	
Gender	Male	7	225	3.11	0.336
	Female	17	382	4.45	
Urban/Rural	Urban	1	126	0.79	0.019
	Rural	23	481	4.78	
Mechanism of Injury	RTA	3	52	5.77	0.502

	Fall	21	555	3.78	
Type of Fracture	Neck of femur	8	230	3.48	0.650
	Trochanter	14	310	4.52	
	Subtrochanter	2	67	2.98	
Side of Injury	Right	10	309	3.24	0.252
	Left	14	298	4.69	
Ambulant at time of injury	Ambulant	21	583	3.60	0.045
	Non-ambulant	3	24	12.5	
Bed Sore at admission	Present	1	7	14.29	0.167
	Absent	23	600	3.83	

There were 24 in-hospital deaths during the study period, the mortality rate being 3.95% (Table-1). Out of this 45.8% belonged to age group 65-80 years and 37.5% belonged to 80-95 years. There were no deaths below 50 years. Mortality rate of age group 50-65 years is 2.17%, 65-80 years is 4.51, 80-95 years is 6.20 and that of above 95 years is 11.11% (p= 0.082). In urban patients, mortality rate was 0.79% and that of rural was 4.78% (p= 0.019). Patients with injury due to road traffic accident (RTA) had a mortality rate of 5.77% and that due to domestic falls was 3.78% (p =0.502). Neck of femur fractures had a mortality rate of 3.48% and that of trochanteric fractures was 4.52% (p=0.650). Ambulant patients had a mortality rate of 3.60% while that of non-ambulant patients was 12.5% (p=0.045) (Table-1). Patients with bed sore on admission had a mortality of 14.29% and others 3.83% (p=0.167).

Table-2: Lab parameters and Mortality

Lab parameter	Range	Deaths	Total cases	Mortality Rate (%)	p-value
Total Count	<4000	1	1	100	0.019
	4000 - 11000	13	334	3.89	
	>11000	10	272	3.68	
Platelet Count	<1.5 lakh	6	44	13.64	0.003
	>1.5 lakh	18	563	3.2	
Total Protein	<6 g/dL	4	95	4.21	0.794
	>6 g/dL	20	512	3.91	
Albumin	<3.5g/dL	9	174	5.17	0.189
	>3.5g/dL	15	433	3.46	
Creatinine	<1.4 mg/dL	20	554	3.61	0.015
	1.4-3 mg/dL	2	40	5.0	
	>3 mg/dL	2	13	15.38	
Prothrombin time (PT)	<16 s	22	582	3.78	0.287
	>16 s	2	25	8.0	
INR	<1.5	24	601	3.99	1.000
	>1.5	0	6	0.0	
Sodium	<135(mEq/L)	18	437	4.12	0.593
	>135(mEq/L)	6	170	3.53	
Potassium	<3.5(mEq/L)	1	63	1.59	0.384
	>3.5(mEq/L)	23	544	4.23	

Patients with total count <4000 had a mortality rate of 100% and with >11000 rate of 3.68% (p=0.019) (Table-2). Patients with <1.5lakh platelet count had a mortality rate of 13.64% and that of >1.5 lakh was 3.2% (p=0.003). Total protein <6 g/dL had mortality of 4.21% and >6 g/dL of 3.91% (p=0.794). Albumin <3.5 g/dL had a rate of 5.17% and >3.5 g/dL of 3.46%. Creatinine level <1.4 mg/dL had a mortality rate of 3.61% and >3 mg/dL was 15.38% (p=0.015). Those with INR <1.5 had mortality of 3.99% and >1.5 had no mortality (p= 1.0). The p-values of sodium and potassium levels were 0.593 and 0.384 respectively (Table-2). Patients who had surgery within one day had no mortality and after 30days had a mortality of 14.29 (p=0.042) (Table-3).

Table-3: Surgery timing and Mortality

Surgery Timing	Deaths	Total Cases	Mortality Rates (%)	p-value
<1 day	0	45	0	0.042
1-3days	5	141	3.55	
4-7days	5	249	2.1	
8-30days	6	115	5.22	
>30 days	3	21	14.29	

DISCUSSION

Mortality rate of age group 50-65 years was 2.17%, 65-80 years 4.51, 80-95 years 6.20 and that of above 95 years was 11.11% (p=0.082, Chi-square test). There is no statistically significant association between age group and mortality, but trend suggests higher mortality with increasing age. The p-value of mortality rates of males and females was 0.336, which is not statistically significant. In urban patients, mortality rate was 0.79% and that of rural was 4.78% (p= 0.019). There is statistically significant higher mortality in rural patients. The mechanism of injury was not statistically significant (p = 0.502), whether due to RTA or fall. Neck of femur fractures had a mortality rate of 3.48% and that of trochanteric fractures 4.52% (p= 0.650), which shows that there is no statistically significant association between fracture type and mortality. There is no significant association between side of injury and mortality (p=0.252). Those who were ambulant before injury had a mortality rate of 3.60% while that of non-ambulant patients was 12.5% (p=0.045, Fisher's Exact Test). Statistically significant higher mortality in non-ambulant patients at admission. Patients with bed sore on admission had a mortality of 14.29% and those without 3.83% (p=0.167). There is no statistically significant association, but a trend towards higher mortality with presence of bedsore.

Patients with total count <4000 had a mortality rate of 100%, 4000-11000 of 3.89 and with >11000 rate of 3.68% (p=0.019, Fisher's Exact Test). Statistically significant mortality difference; very high in <4000 group (though only 1 case), suggesting clinical relevance. Patients with <1.5lakh platelet count had a mortality rate of 13.64% and that of >1.5 lakh was 3.2% (p=0.003, Chi-square test). This shows significantly higher mortality in patients with platelet count <1.5 lakh. Total protein <6 g/dL had mortality of 4.21% and >6 g/dL of 3.91% (p=0.794, Chi-square test). No statistically significant association between total protein level and mortality. Albumin <3.5 g/dL had a mortality rate of 5.17% and >3.5 g/dL of 3.46% (p = 0.189, Chi-square test). No statistically significant association, though trend towards higher mortality in low albumin group. Creatinine level <1.4 mg/dL had a mortality rate of 3.61% and >3 mg/dL was 15.38% (p=0.015, Chi-square test). There is statistically significant association; higher mortality in patients with creatinine >3 mg/dL. Those with Prothrombin time <16 had a mortality of 3.78% and >16 of 8.0% (p=0.287, Chi-square test). No statistically significant association between prothrombin time and mortality. Those with INR <1.5 had mortality of 3.99% and >1.5 had no mortality (p= 1.0, Fisher's Exact Test). No statistical association due to very few cases in INR >1.5 group. The p-values of sodium and potassium levels were 0.593 and 0.384 respectively. There is no significant difference between hyponatremia and normonatremia groups or between hypokalemia and normokalemia groups.

Patients who had surgery within one day had no mortality, 1-3 days a mortality of 3.55%, 8-30 days a mortality of 5.22% and after 30 days had a mortality of 14.29 (p=0.042) (Chi-square test). This confirms that there is statistically significant difference in mortality based on timing of surgery, with higher mortality for delays >7 days.

In-hospital mortality was 4.2% in a study by Salazar et al [16]. Male sex and older age had higher mortality rate according to their study. In the present study, the in-hospital mortality rate was 3.95% and there is no statistically significant association between age or sex with mortality, but trend suggests higher mortality with increasing age. Vitiello et al; in their study highlighted that early surgery is essential to reduce the risk of mortality [17]. But Smektala et al; in their study on effect of time to surgery on mortality in proximal femoral fractures, concluded that there was no effect of surgery timing on mortality [18]. Present study shows a higher mortality for delays over 7 days. Xiuguo Han et al; in their study concluded that hypoproteinemia and hypoalbuminemia was

associated with 1-year postoperative mortality [19]. In our study, there was no statistically significant association between hypoprotenemia and hypoalbuminemia and in-hospital mortality, though there was a trend towards higher mortality in low albumin group.

The limitations are that the study was a retrospective study at a single centre, which can lead to selection bias. Prospective multi-center studies are needed to confirm the findings. Also, although many variables were included and analysed, some risk factors which affects mortality may have been overlooked.

CONCLUSION

In-hospital mortality in patients with proximal femoral fractures is the result of interaction of multiple factors. The mortality rate was 3.95% and is not affected by age or gender, but trend suggests higher mortality with increasing age. Rural patients and non-ambulant patients at admission had higher mortality rate. Patients with total count <4000, platelet count <1.5 lakh and creatinine >3 mg/dL had a higher mortality rate. Time between injury and surgery had an impact on mortality, higher mortality for delays more than 7 days. Further research is warranted to understand the underlying mechanisms involved and to refine the risk stratification approaches.

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Conflicts of interest- Nil

Ethical approval

Study approval was obtained from the Institutional Review Board (HEC No: 06/05/2022/MCT). Because the study was retrospective and anonymous, informed consent was not required.

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