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Factors Contributing to Delay in Fixation of Hip Fracture in Low and Middle-Income Country (LMIC)

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Abstract

Objective: Hip fractures are common among the aging population and delay in operative repair increase the risk of morbidity and mortality. This study aims to determine the frequency of operative delay and anaesthetic and non-anaesthetic factors that contribute to this delay.

Methods: Patients between 55 to 85 years of age who presented with hip fracture within 72 hours of onset and were scheduled for either elective or emergency procedures were included after obtaining informed consent. Patient's demographics, time of injury, time from admission to surgery and factors leading to delays (anaesthetic and non-anaesthetic) in surgery were recorded. Data was analyzed SPSS version 19. Frequency and percentage were computed for categorical observations and means with standard deviation (SD) were estimated for continuous data.

Result: A total of 236 patients with mean age of 73 years SD +8.3 years (55-85) were included. The mean time to surgery was 56.86 (±50.37) hours. Around 42.79% patients faced delays in repair initiation (after 48 hours) with 85.20% showing contribution of both anaesthetic and non-anaesthetic factors. The most common non-anaesthetic factor causing delay was unavailability of the operating room (83.2%). Seventy-one per cent of cases responsible for delay due to anaesthetic factors were anaesthesia consultation and speciality-based consultation and optimization requested by an anaesthetist (p-value 0.004).

Conclusion: Almost half of the Patients with hip fracture face delays in surgical repair, mostly due to avoidable systemic factors. Increasing resource capacity can help these patients achieve good post-surgical outcomes and reduce the risk of morbidity and mortality.

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Introduction

Hip fracture is one of the most common injuries among the ageing population [1]. This is partly due to age-related vulnerability leading to increased risk of falls and partly due to associated comorbidities. It limits mobility and affects the quality of life in this group. Some common complications of hip fracture include pain, bleeding, profound disability, venous thromboembolism, bed sores, urinary tract infections, pneumonia and a decrease in muscle mass [2]. Most of these complications result from prolonged immobility rather than the fracture itself. In order to mobilize patients and improve functional independence, an early surgical repair is encouraged. Additionally, an early fixation also helps prevent complications and is associated with increased survival, shorter hospital stays, and lesser costs [2,3]. Despite these recommendations, most patients are still operated on with delays in most of the countries [4]. This is compounded further due to limited resources in the Low Middle-Income Countries (LMIC).

The literature demonstrates that delay of operative repair of hip fracture beyond 48 hours is associated with increased morbidity and mortality [5,6]. However, it is still uncertain if surgery within 24 hours results in significantly different outcomes than surgery between 24 and 48 hours [7]. Although the exact definition of delay is still debated, most of the literature favors 48 hours as a cut-off for the delay in surgery for hip fracture [5-11]. Being elderly, these patients are particularly prone to have multiple comorbidities which warrants a thorough preoperative anaesthesia evaluation. Depending on the severity of the comorbid condition, preoperative anaesthesia evaluation can also lead to consults for risk stratification or optimization. Of the various reasons for the delayed repair of hip fracture, preoperative medical optimization accounts for 33-50% of the delay [12-14]. Although these studies are conducted in developed countries, where various integrated pathways of hip fracture care are implemented, they do highlight an important factor contributing to the delay. However, factors leading to operative delays in LMICs, particularly in Pakistan, have not been explored yet.

This study aims to determine the frequency of operative delay in the administration of anaesthesia after scheduling hip fracture fixation. Operative Delay was defined as a delay of more than 48 hours after presenting in hospital [5-6]. It also aims to determine the anaesthetic and non-anaesthetic factors that contribute to this delay.

Methods

After receiving approval from the hospital ethical committee, all patients coming to the emergency department in the next 6 months with a history of fall or hip pain were reviewed and those with a confirmed (by radiology and orthopaedic surgeon) diagnosis of hip fracture were screened for inclusion. Inclusion criteria included patients between 55 to 85 years of age, patients with an isolated hip fracture within the last 72 hours and both elective and emergency procedures. Patients who left against medical advice, planned for conservative management of fracture, those who were referred from other hospitals and those with pathological fracture confirmed by the orthopaedic surgeon were excluded.

Cases were enrolled by the research officer after obtaining written informed consent. Patient's demographics, ASA physical status, comorbidities, time of injury, time from admission to surgical repair initiation along with anaesthetic and non-anaesthetic factors causing delayed repair were marked in the proforma. Proforma with incomplete data were excluded from statistical analysis. Data analysis was performed using Statistical Packages for Social Science version 19 (SPSS Inc, Chicago, IL). Frequency and percentage were computed for categorical observations like gender, co-morbid, ASA physical status and factors (anaesthetic and non-anaesthetic) causing delay. Mean and standard deviation (SD) were estimated for age, duration of fracture in hours and time to surgery after presentation. Stratification was performed to observe the effect of co-morbid and time till surgery on the outcome. The Chi-square test was applied to compare effect modifiers and outcome variables. $P \leq 0.05$ was considered significant.

Results

A total of 245 patients were screened for inclusion in the study. Out of these, 236 were scheduled for fixation of fracture and were included in the final sample. Among nine patients who were dropped, 4 patients did not meet inclusion criteria, 2 patients refused to participate, 1 patient was conservatively managed, 1 patient died before surgery and 1 patient had incomplete data. The mean age of patients was 73 years SD $\pm$8.3 years (55-85). ASA II and III patients contributed 91.53% and the rest of the 3% and 5.5% patients were ASA I and ASA IV, respectively. Forty-five patients (19%) had no comorbidities, 54 (22.9%) had one comorbid and 137 (58.1%) patients had more than two comorbidities. The number of females (133) was higher than males (103). The mean time to surgery was 56.86 hours with SD of ±50.37hours **(Table 1)**.

We observed that 101 patients (42.79%) had delayed administration of anaesthesia for hip fracture surgery (after 48 hours) while 135 patients (57.20%) were given anaesthesia for hip fracture surgery without delay (within 48 hours). Out of 101 patients, 2 (2%) cases were delayed exclusively due to anaesthetic factors, 14 cases (13.8%) due to non-anaesthetic factors and 85 cases (85.20%) showed the contribution of both anaesthetic and non-anaesthetic factors.

The most common non-anaesthetic factor which contributed to delay was the unavailability of the operating room (83.2%) **(Table 2)**. The timing of surgery and unavailability of the surgeon was found to be statistically significant (P-value 0.003). Seventy-one per cent of cases responsible for delay due to anaesthetic factors were anaesthesia consultation and speciality-based consultation by an anaesthetist for risk stratification, optimization, and review afterwards (p-value 0.004).

Among patient factors, ASA-physical status and burden of comorbidity were significantly associated with delayed administration of anaesthesia (p-values: 0.0005 and 0.0005 respectively). The relationship between anaesthetic factors that caused delays like delay due to speciality-based consultation and investigation suggested by anaesthetists and the number of comorbidities were found to be statistically significant (p-values of 0.001 and 0.033, respectively) as shown in **Table 3**.

Table 1: Characteristics of patients (n=236).

Variables	Point Estimate
Age (years)	72.36 ± 8.34
Duration of hip fracture (Hours:minutes)	12:47 ± 10:25
Time taken from hospital admission to surgery (hours)	56.86 ± 50.37
Gender	
Male	103(43.6%)
Female	133(56.4%)
ASA-Status	
ASA-I	7(3%)
ASA-II	106(44.9%)
ASA-III	110(46.6%)
ASA-IV	13(5.5%)
Co-morbidities	
Hypertension	165(69.9%)
Diabetic Mellitus	89(37.7%)
Ischemic Heart Disease	64(27.1%)
Chronic Obstructive Pulmonary Disease	8(3.4%)
CVS	15(6.4%)
CKD	14(5.9%)
Hypothyroid	13(5.5%)
Asthma	10(4.2%)
Others	44(18.6%)

Discussion

The vast majority of patients with hip fractures are offered surgical treatment and time to surgery determines morbidity and mortality. In the last two decades, this issue has been extensively studied from multiple aspects in the developed world, however time to surgery remained the most controversial issue [7]. Many systematic reviews recommend early surgical repair, preferably within 48 hours of admission [15-19].

In the current study, we found 57.2% of our surgical repair rate within 48 hours. The mean age of our population was 72.36 years, somewhat lower than what has been mentioned by other studies [20-21]. This variation can be explained by the difference in patient population and life expectancy in our country. A higher proportion of females suffering from a fractured hip (i.e., 56.36%) have been found in this study. Similarly, literature from the developed world has shown it to be even higher by Sanz-Reig et al [22], (75%) and Cha et al (72.5%) [23]. Age related hormonal changes, hormonal replacement therapies and low mineral density could be the reason for the higher representation of females.

The main aim of our study was to determine the proportion of the population receiving surgical care within 48 hours and we found that only 57.2% of patients underwent surgical repair without delays. This percentage is marginally better when compared with the observations made by Fantini et al (53.1%), Sanz-Reig et al (44.4%) and Cha et al (31.2%) [22-24]. However, Jain et al [25], in their study found that almost 60.5% of patients

Table 2: Non anaesthetic factors (24 hours clock) resulted in delayed repair (n=101).

Non anaesthetic factors †	Time of surgery			P-Value
	0800-1700	1700-MN	MN-0800	
	n=54	n=36	n=11	
Unavailability of operating room				
Yes	47(87%)	29(80.6%)	8(72.7%)	0.447
No				
Unavailability of ward bed/special care unit	38(70.4%)	28(77.8%)	8(72.7%)	0.738
Unavailability of surgeon	41(75.9%)	8(50%)	6(54.5%)	0.003
Logistic issues Intra hospital transportation	10(18.5%)	7(19.4%)	1(9.1%)	0.721
Delay in review by emergency department physician	1(1.9%)	2(5.6%)	1(9.1%)	0.442
Delay in review by orthopedic team	1(1.9%)	5(13.9%)	0(0%)	0.041
Delay due to patient consent	3(5.6%)	1(2.8%)	0(0%)	0.623

Results are presented as n (%), **MN** stands for midnight, † Total of **non anaesthetic factors** is not equal to 100% because more than 80% of the cases have multiple factors.

Table 3: Association of Co-morbidities and Anaesthetic Factors resulted in Delayed repair (n=101).

Factors causing delayed repair	Number of Co-morbid			P-Value
	Zero	1-2	3-6	
	n=10	n=40	n=51	
Anaesthetic factors †	**6 (60%)**	**32 (80%)**	**49 (96.1%)**	**0.004**
Delay due to anesthesia consultation for risk stratification and optimization	3(30%)	26(65%)	43(84.3%)	0.001
Delay review by anesthesiologist after optimization of patient	3(30%)	17(42.5)	30(58.8%)	0.13
Delay due to investigation suggested by anesthesiologist	1(10%)	9(22.5%)	22(43.1%)	0.033
Delay anaesthesia evaluation of patients	2(20%)	10(25%)	11(21.6%)	0.905
Unavailability of anesthesiologist	0	0	0	NA

Results are presented as n (%), † Total of **Anaesthetic factors** is not equal to 100% because more than 80% of the cases have multiple factors.

received surgical correction within 24 hours of presentation to the hospital, slightly better than the findings of our study.

Our institute is a major tertiary care centre, providing health care services to patients presenting with various illnesses including trauma and fractures. Patients with hip fractures usually belong to the geriatric age group with multiple comorbidities. These patients are also referred from other institutes which require optimization prior to fracture fixation. In LMIC, most institutions, including ours, are limited by a lack of resources. This is compounded by the unavailability of organized primary care and general practitioner system in the country which leads to limited access to patient's past medical history and baseline investigation, as available in developed countries. This results in assessing patients in detail before considering surgical repair. Furthermore, low literacy rates and language barriers make the primary evaluation a difficult task. All these factors result in more investigations, consultations, and optimization of patients before scheduling for surgical fixation leading to unavoidable delays.

The non-anaesthetic factors noted in our study were unavailability of operating room (83.2%), delayed admissions and non-availability of surgeons which were the most common avoidable factors. These figures are higher in comparison to Vidan et al [14] and Sanz-Reig et al [22], who observed delays due to unavailability of the operating room in 60.7% and 23.3% cases, respectively. Cha et al [23] found that delay due to unavailability of ward beds accounted for 24.6% of cases of delayed provision of care. Therefore, the availability of a speciality-based dedicated team in the emergency room, ward bed for urgent surgeries and quick access to the operating room are the major factors providing urgent care to these patients. Unavailability of these facilities along with delayed admission and slow discharge can lead to increased patient load and delay in the surgical management of this patient population.

Other important factors causing surgical delays are the preoperative status and the overall health of the patients. The number of comorbidities play an important part in delay as these patients require more consultation and optimization. In our study, we found that the most common anaesthetic factors that cause delays include consultations and optimization of patients and accounted for 72/101 cases (71.3%). This finding is significantly higher as compared to White et al [13] and J. Sanz-Reig et al [22] where medical reasons accounted for 45% and 18.3%, respectively. Cher et al [26] studied the association of the Charlson Comorbidity Index (CCI) and delay in surgery on risk of mortality. They concluded that CCI is dominant for short and long-term mortality in comparison to delay in surgery and emphasized greatly on preoperative optimization in case of higher CCI. In case of a lower CCI score, the surgical delay should be avoided to reap the benefits of early surgical repair [26]. In our study, consultations from medical specialists were requested in 72 cases which were followed by a consultant specialist within 24 hours in accordance with our institutional policy. The majority of the consultations were requested for cardiology and further cardiac testing (e.g., echocardiography, stress echocardiography). Due to limited hospital resources, these investigations took more than a day on average and may have accounted for the delay. However, it is interesting to note that only (4%) 3 out of these 72 patients required a change in management based on the result of the findings of cardiac workup but for each of them, there was a 100% change in management to ensure safety. These three patients required concomitant coronary artery bypass grafting along with hip fracture surgery. It is an important point to consider, raising the possibility of improved triaging in context of timely provision of care for this patient population as the practice of requesting consultation has been found to be variable amongst practicing anesthesiologists at our institution. It shows a desperate need for focused group including surgical colleagues, anaesthetists and other medical experts to encourage coordination to minimize these stratification/optimization delays.

The study however had several limitations which include the absence of long-term follow-up to determine outcomes of our patients in terms of mortality. We did not include patients older than 85 years, which could have potentially introduced selection bias in the study. Although adequately powered, our study population is a single center cohort with standardized peri-operative care, so the results cannot be generalized to the entire population.

Conclusion

Our study found that approximately 43% of the patients presenting to our hospital with hip fracture experience delays in surgical repair. The most common anaesthetic factors that contribute to delays include consultation for risk stratification and optimization and review by anaesthesiologist after optimization. The non-anaesthetic factors that cause delays include unavailability of operating room, ward bed and surgeon during working hours. Patient outcomes can be improved by addressing these avoidable factors that cause delays in provision of timely care. Increasing upon our resource capacity including ward beds, having dedicated operating rooms for emergency orthopedic patients and improving our system of consultation and investigations are a few steps for the way forward which can be explored.

Future Directions

We recommend that an integrated care pathway for hip fracture patients should be developed and followed to enhance patient satisfaction and providing a better chance at recovery. In addition, a multicenter study is needed in both private and public sector hospitals, which will enable us to find out other possible factors contributing delays in LMIC centers and in devising national guidelines for the provision of better and targeted integrated care for our geriatric population.

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