RESEARCH ARTICLE

30-day morbidity and mortality after hip surgery – A single-centre study.

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Abstract

Objective: To evaluate the 30-day morbidity and mortality after hip surgery in a low-resource setting, and to identify the key risk factors.

Method: The retrospective study was conducted in January 2023 at the Department of Orthopaedic Surgery, Aga Khan University Hospital, Karachi, and comprised data of patients having undergone elective and emergency hip surgeries from January 1, 2015, to December 31, 2019. Data regarding demographics, comorbidities, surgical details and postoperative outcomes was noted to identify patient and surgery-related risk factors. Data was analysed using STATA 17.

Results: Of 1,221 patients with median age 67 years (interquartile range: 54-76 years), 759(62.2%) were male, and 23(1.9%) died within 30 days. Mortality cases were significantly older (p=0.018) and had a higher burden of comorbidities (p<0.001) than the rest. Dynamic hip screw fixation was the most common procedure 447(36.6%). Mortality was significantly higher for patients requiring intensive care (p=0.003). Increased Charlson Comorbidity Index score, length of hospital stay, failed dynamic hip screw, re-intubation, septic shock and cardiac arrest were independent predictors of 30-day mortality (p<0.05).

Conclusion: Advanced age and higher Charlson Comorbidity Index scores were significant associated with 30-dat mortality following hip surgery.

Key Words: Hip surgery, 30-day mortality, Comorbidities, Postoperative complications, LMIC.

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Introduction

Age-related osteoarthritis, especially hip and knee osteoarthritis, is considered the fourth leading cause of disability worldwide.[1] Also, hip fracture is often the first clinical presentation of osteoporosis.[2] In Pakistan, the rapidly increasing population with a gradually increasing proportion of individuals aged 65 and above, osteoarthritis and osteoporosis add a heavy disease burden and the associated need for hip surgeries.[3]

The geriatric population is significantly affected and vulnerable due to reduced reserves, and more physical and neurological deficits that make them susceptible to falls and the resulting low-impact hip fractures.[4] Post-menopausal women are also more susceptible to fall-related fractures, with Asian women being more prone compared to their Western counterparts, and having a reported female-to-male hip fracture ratio of 8:1.[5,6] Furthermore, hip fractures, related hip pathologies and resultant hip fracture surgeries not only result in significant disability and even mortality, but also place a high financial burden on the patients and their families.[7,8]

Over the years, several surgical options, like total hip arthroplasty (THA), dynamic hip screw (DHS) etc., have become available to manage patients with hip pathologies. In a systematic review, THA showed a greater return of function compared to those who underwent total knee replacement (TKR).[9] In addition, with the introduction of new surgical techniques, modern design implants and different anaesthesia techniques, especially regional anaesthesia, hip surgeries have become safer.[9] Nonetheless, these surgeries are not risk-free, and the 30-day mortality after surgery for hip fractures has been reported to be 13.3%.[10] A study comparing the 30-day mortality after DHS fixation for hip fractures among octogenarians and those age <80 reported a mortality rate of 22% compared to 7.8%, respectively.[11] Several factors have been implicated in the high morbidity and mortality associated with hip surgeries. The majority of the patients belong to the geriatric population with underlying comorbid conditions,[12] the predominant cause of mortality being cardiopulmonary complications.[13] A systematic review identified the American Society of Anaesthesiologists (ASA) risk score >3, Charlson Comorbidity Index (CCI) score >3, use of general

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anaesthesia (GA) and prior cardiovascular disease as prominent risk factors for mortality.[14-16]

Research in low- and middle-income countries (LMICs) has its own dimension because developing countries face distinct challenges, such as varying patient demographics, limited resources, and differing levels of surgical expertise, which can significantly impact treatment outcomes.[17]

The current study was planned to evaluate the 30-day morbidity and mortality after hip surgery in an LMIC setting, and to identify the key risk factors.

Materials and Methods

The retrospective study was conducted in January 2023 at the Department of Orthopaedic Surgery, Aga Khan University Hospital (AKUH), Karachi, and comprised data of patients having undergone elective and emergency hip surgeries from January 1, 2015, to December 31, 2019. After exemption was obtained from the institutional ethics review committee, fully de-identified data was retrieved.

Patients aged >50 years who underwent elective and emergent surgery for hip fractures, hip osteoarthritis and avascular necrosis, as well as surgeries for proximal femur fracture, including head of the femur fracture, neck of femur fracture, intertrochanteric fracture and subtrochanteric fracture were included. Patients who had active infections, open fractures, pathological fractures, revision surgery, and those with incomplete data were excluded. The primary outcome of interest was 30-day morbidity and mortality. Patient documents were reviewed and data, including age, gender, body mass index (BMI), ambulation status before surgery, American Society of Anaesthesiologists (ASA) grade[15], and comorbidities, like hypertension (HTN), diabetes mellitus (DM) and ischaemic heart disease (IHD), was recorded. Pathology-related details, like the mechanism of injury, such as fall/road traffic accident (RTA) and osteoarthritis, was identified. The operative information and outcomes, like duration of surgery in hours, type (emergent and elective) of procedure, type of surgery (fixation or replacement), length of hospital stay (LOS), and postoperative intensive care unit (ICU) stay in days were recorded.

Postoperative complications, including both medical and surgical complications, were identified. In-hospital complications mortality was included along with other 30-day complications, such as retroperitoneal bleeding, gastrointestinal (GI) bleeding, arrhythmia, urinary tract infection (UTI), surgical site infection (SSI), peri-prosthetic fracture, pulmonary embolism (PE), deep vein thrombosis (DVT), myocardial infarction (MI), new onset congestive heart failure (CHF), pneumonia, hypoxia and renal insufficiency, were also included.

Data was analysed using STATA 17. Descriptive statistics were used to report frequencies and percentages for parametric categorical variables, and median with interquartile range (IQR) for non-parametric continuous variables. Data normality was checked using the Shapiro-Wilk test and histograms. Independent sample t-test for parametric and Mann-Whitney U for non-parametric continuous dependent variables were used. Chi-square and Fisher's Exact tests were used for categorical variables. Univariate and multivariable binary logistic regression analyses were also conducted. $P<0.05$was considered significant.

Results

Of 1,221 patients with median age 67 years (IQR: 54-76 years), 759(62.2%) were male, and 23(1.9%) died within 30 days. Mortality cases were significantly older (p=0.018) and had a higher burden of comorbidities (p<0.001) than the rest. ASA score was also significantly different between mortality and no-mortality groups (Table 1).

Table-1: Demographic and clinical characteristics of the patients.

n = 1,221	No Mortality 1,198 (98.1%)	Mortality n = 23 (1.9%)	P-Value
Gender			0.76
Male	744 (62.1%)	15 (65.2%)	
Female	454 (37.9%)	8 (34.8%)	
Age	67 [54 – 76]	74 [65 – 83]	0.018
BMI (Kg/m^2)	25.4 [22.9 – 28.6]	25.4 [22.2 – 27.7]	0.691
Smoking			0.642
Yes	70 (5.8%)	2 (8.7%)	
No	1,128 (94.2%)	21 (91.3%)	
mFI-5			0.077
< 2	639 (53.4%)	8 (34.8%)	
≥ 2	558 (46.6%)	15 (65.2%)	
CCI	2 [0 – 3]	5 [2 – 6]	<0.001
ASA	3 [2 – 3]	3 [3 – 3]	0.002

BMI: Body Mass Index, CCI: Charlson Comorbidity Index, ASA: American Society of Anaesthesiologists classification, mFI-5: Modified Frailty Index.

DHS fixation was the most common procedure 447(36.6%), followed by THA 324(26.5%) (p>0.05). Difference in mortality based on elective or emergency surgery was not significant (p=0.570). Patients needing intensive care and those with extended LOS were more likely to experience mortality (Table 2).

Failed DHS fixation, re-intubation, PE and cardiac arrest

Table-2: Surgical procedures and post-surgical care data.

n = 1,221	No Mortality 1,198 (98.1%)	Mortality n = 23 (1.9%)	P-Value
Name of Surgery			0.326
Total Hip Arthroplasty (THA)	321 (26.8%)	3 (13.0%)	
Hemiarthroplasty	183 (15.3%)	6 (26.1%)	
Dynamic Hip Screw (DHS)	436 (36.4%)	11 (47.8%)	
Intra Medullary Nailing	157 (13.1%)	2 (8.7%)	
Others	101 (8.4%)	1 (4.4%)	
Duration of Surgery (hours)	3.0 [1.8 – 3.5]	3.0 [1.5 – 3.4]	0.455
Anaesthesia			0.406
General Anaesthesia	998 (83.3%)	21 (91.3%)	
Spinal Anaesthesia	200 (16.7%)	2 (8.7%)	
Nature of Surgery			0.57
Elective	874 (73.0%)	18 (78.3%)	
Emergency	324 (27.0%)	5 (21.7%)	
Blood Loss (ml)	130 [100 – 200]	125 [100 – 200]	0.892
Blood Transfusion			0.093
Yes	204 (17.1%)	7 (30.4%)	
No	991 (82.9%)	16 (69.6%)	
Shifting of Patient			0.003
Ward	941 (78.5%)	11 (47.8%)	
SCU	227 (19.0%)	11 (47.8%)	
ICU/CCU	30 (2.5%)	1 (4.4%)	
Days in SCU/CCU/ICU	0 [0 – 0]	0 [0 – 2]	<0.001
Length of Stay	5 [4 – 8]	10 [6 – 14]	<0.001
Pre-op haemoglobin	11.7 [10.2 – 13.0]	11.0 [9.3 – 11.0]	0.005
Post-op haemoglobin	10.0 [9.0 – 11.0]	9.6 [9.0 – 11.0]	0.416
Pre-op Creatinine	1.0 [0.9 – 1.0]	1.3 [1.0 – 3.0]	<0.001
Post-op creatinine	1.0 [1.0 – 1.2]	1.5 [1.0 – 2.0]	<0.001
Pre-op sodium	137.0 [134.0 – 140.0]	136.0 [133.0 – 141.0]	0.431
Post-op sodium	136.0 [132.0 – 139.0]	133.0 [129.0 – 140.0]	0.282

SCU: Special care unit, ICU: Intensive care unit, CCU: Critical care unit.

Table-3: Outcomes and complications following hip surgery.

n = 1,221	No Mortality 1,198 (98.1%)	Mortality n = 23 (1.9%)	P-Value
Reoperation			>0.999
Yes	55 (4.6%)	1 (4.4%)	
No	1,143 (95.4%)	22 (95.7%)	
Loosening			0.073
Yes	3 (0.3%)	1 (4.4%)	
No	1,195 (99.8%)	22 (95.7%)	
Failed Dynamic Hip Screw (DHS)			0.055
Yes	2 (0.2%)	1 (4.3%)	
No	1,196 (99.8%)	22 (95.7%)	
Pneumonia			0.016
Yes	26 (2.2%)	3 (13.0%)	
No	1,172 (97.8%)	20 (87.0%)	
Re-intubation			0.002
Yes	2 (0.2%)	2 (8.7%)	
No	1,196 (99.8%)	21 (91.3%)	
Pulmonary Embolism			0.02
Yes	10 (0.8%)	2 (8.7%)	
No	1,188 (99.2%)	21 (91.3%)	
Acute Renal Failure			<0.001
Yes	61 (5.1%)	5 (21.7%)	
No	1,137 (94.9%)	18 (78.3%)	
Sepsis			0.002
Yes	12 (1.0%)	3 (13.0%)	
No	1,186 (99.0%)	20 (87.0%)	
Septic Shock			<0.001
Yes	9 (0.8%)	8 (34.8%)	
No	1,188 (99.2%)	15 (65.2%)	
Urinary Tract Infection			0.03
Yes	34 (2.8%)	3 (13.0%)	
No	1,164 (97.2%)	20 (87.0%)	
Cardiac Arrest			<0.001
Yes	2 (0.2%)	7 (30.4%)	
No	1,196 (99.8%)	16 (69.6%)	
Myocardial Infarction			0.007
Yes	19 (1.6%)	3 (13.0%)	
No	1,179 (98.4%)	20 (87.0%)	
30-day re-admission			0.07
Yes	81 (6.8%)	4 (17.4%)	
No	1,117 (93.2%)	19 (82.6%)	

were among the post-surgery complications that were significantly different between the mortality and no-mortality groups (Table 3).

Table-4: Binary logistic regression with 30-day mortality as outcome.

N = 1,221	Univariable	Multivariable
Gender		
Male	REF	
Female	0.87 (0.37 – 2.08)	
Age	1.03 (1.00 – 1.06) *	
Body mass index (BMI) (Kg/m^2)	0.98 (0.89 – 1.07)	
Smoking		
Yes	1.53 (0.35 – 6.68)	
No	REF	
mFI-5		
< 2	REF	
≥ 2	2.15 (0.90 – 5.10) *	
CCI	1.38 (1.19 – 1.61) *	1.37 (1.10 – 1.69) $
ASA	2.31 (1.30 – 4.09) *	
Name of Surgery		
THA	REF	
Hemiarthroplasty	3.51 (0.87 – 14.19)	
DHS	2.70 (0.75 – 9.76)	
IM Nailing	1.36 (0.23 – 8.24)	
Other	1.06 (0.11 – 10.30)	
Duration of Surgery (hours)	0.84 (0.57 – 1.23)	
Anesthesia		

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General Anaesthesia	REF	
Spinal Anaesthesia	0.48 (0.11 – 2.04)	
Nature of Surgery		
Elective	REF	
Emergency	0.75 (0.28 – 2.03)	
Blood Loss (ml)	1.00 (1.00 – 1.00)	
Blood Transfusion		
Yes	2.13 (0.86 – 5.23) *	
No	REF	
Shifting of Patient		
Ward	REF	
SCU	4.15 (1.77 – 9.68)	
ICU/CCU	2.85 (0.36 – 22.81) *	
Days in SCU/CCU/ICU	2.09 (1.55 – 2.82) *	
Length of Stay	1.16 (1.10 – 1.22) *	1.12 (1.03 – 1.21)$
Pre-op haemoglobin	0.71 (0.56 – 0.91)	
Post-op haemoglobin	0.92 (0.71 – 1.18) *	
Pre-op creatinine	1.58 (1.26 – 1.99) *	
Post-op creatinine	1.39 (1.06 – 1.83) *	
Pre-op sodium	0.95 (0.88 – 1.03) *	
Post-op sodium	0.96 (0.90 – 1.03) *	
Reoperation		
Yes	0.94 (0.13 – 7.14)	
No	REF	
Loosening		
Yes	18.11 (1.81 – 180.9) *	
No	REF	
Failed DHS		
Yes	27.18 (2.38 – 310.9) *	54.29 (4.30 – 686.14) $
No	REF	REF
Pneumonia		
Yes	6.76 (1.89 – 24.18) *	REF
No		
R-intubation		25.02 (2.39 – 261.44) $
Yes	56.95 (7.65 – 423.7) *	REF
No	REF	
PE		
Yes	11.31 (2.33 – 54.74) *	
No	REF	
ARF		
Yes	5.18 (1.86 – 14.41) *	
No	REF	
Sepsis		
Yes	14.83 (3.88 – 56.62) *	
No	REF	
Septic Shock		27.37 (7.03 – 106.54) $
Yes	70.40 (23.9 – 207.3) *	REF
No		
UTI		
Yes	5.14 (1.46 – 18.11) *	
No	REF	
Cardiac Arrest		275.77 (41.07 – 1851.79) $
Yes	261.63 (50.39 – 1358.28) *	REF
No	REF	

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MI		
Yes	9.31 (2.55 – 34.00) *	
No	REF	
30-day re-admission		
Yes	2.90 (0.96 – 8.74) *	
No	REF	

* p < 0.250 at Univariate Level $ p < 0.05 at Multivariate Level

SCU- Special Care Unit, ICU- Intensive Care Unit, CCU- Cardiac Care Unit, PE- Pulmonary Embolism, ARF-Acute Renal Failure, UTI-Urinary Tract Infection

Multivariable binary logistic regression model showed that CCI score, LOS, failed DHS, re-intubation, septic shock and cardiac arrest were independent predictors of 30-day mortality (Table 4).

Discussion

The current study presents a comprehensive overview of 1,221 patients who underwent hip surgery, with a particular focus on 30-day morbidity and mortality after surgery. Hip fractures needing hip surgeries are expected to increase significantly in the coming years due to increase in geriatric population.[18]

The current study found that age was a significant predictor of 30-day mortality after hip surgery, with older patients facing a higher risk of mortality. This finding is consistent with literature.[19] Aging is associated with a decline in physiological reserves and an increased likelihood of comorbidities, both of which can contribute to poorer surgical outcomes.

The CCI was identified as a significant predictor of mortality, with a unit increase in CCI associated with an increase in the odds of 30-day mortality. The finding underscores the importance of assessing and managing comorbidities in the preoperative period. The CCI is a validated tool for predicting postoperative mortality and morbidity.[14] It reflects the cumulative effect of multiple comorbid conditions and aids in risk stratification.

The current study did not find a significant difference in mortality based on the type of hip surgery (THR, DHS, hemiarthroplasty, etc.). This finding is consistent with a previous study.[20] Surgical technique and expertise may play a more crucial role than the specific procedure in determining outcomes.

Multivariable analysis in the current study identified key predictors of 30-day mortality following hip surgery, particularly clinical severity markers and critical postoperative complications. Notably, cardiac arrest, septic shock and re-intubation were associated with substantially elevated odds of early mortality. Although these complications were relatively uncommon, their

occurrence had a profound impact on patient outcomes, as reflected by the large point estimates and wide confidence intervals (CIs) (Table 4). These findings underscore the need for heightened vigilance in the postoperative period, with early recognition and aggressive management of high-risk events being crucial to reducing mortality. Despite continued advancements, post-operative complications remain a significant problem in LMICs.[21], with previous research reporting a high burden of severe postoperative complications among orthopaedic patients.[22]

The 30-day postoperative mortality observed in the current study (1.9%) appears relatively low when compared to data from some developing and developed countries. In a previous study on THA conducted[9], a similar mortality rate was noted, reinforcing the internal consistency of the findings. In contrast, a study done in the United Kingdom reported a 30-day mortality rate of 7.5%, while Espinosa et al. from Colombia, a developing country, reported a notably higher rate of 14.4%.[23, 24] A more comparable figure was seen in a recent study from India (2.4%).[25]

Several contextual factors may contribute to the relatively lower 30-day mortality observed in the current study. First, the lack of a robust national mortality tracking system may result in underreporting, particularly for deaths that occur after discharge. In LMICs like Pakistan, where patients often pay out-of-pocket and access to universal health insurance is limited, early discharge is common, and subsequent deaths at home are frequently not communicated back to the treating hospital. Second, hospitals do not have systems in place for consistent post-discharge follow-up, especially for patients from remote regions, further limiting mortality capture. Lastly, cultural factors and preferences for end-of-life care at home may also lead to underestimation of true postoperative mortality. These systemic gaps in death reporting and follow-up likely contributed to the lower figures seen in this and other regional studies, and should be considered when comparing outcomes across different healthcare settings.

The current study has limitations as data represented a single-centre experience, and findings may not be universally applicable. Additionally, the study did not assess certain variables that could potentially impact outcomes, such as surgical experience and postoperative rehabilitation. While the observed 30-day mortality rate in the cohort appeared low, this may partly reflect underreporting due to systemic limitations in mortality tracking in LMICs. Furthermore, some predictors of mortality (e.g., cardiac arrest, septic shock) showed wide CIs in multivariable analysis, reflecting low event frequencies. While these associations are clinically meaningful, the imprecision of the estimates warrants cautious interpretation. Future research should explore these factors in more detail to better understand their influence on hip surgery outcomes.

Conclusion

Age, comorbidities and postoperative complications were found to be critical determinants of patient outcomes after hip surgeries. Healthcare providers should consider these findings when assessing patients' preoperative risks, and implement due strategies to reduce postoperative complications.

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