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Original Research

Post-Operative Mortality Prevalence and Associated Factors Among Adult Patients Admitted to Surgical Ward in Hiwot Fana Comprehensive Specialized Hospital: Retrospective Cross-Sectional Study

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Abstract

Background: Post-operative mortality is a critical factor in evaluating the quality of surgical care and its outcomes within healthcare facilities. No surgical procedure is without risk, as complications following surgery can lead to disability, extended hospital stays, or even death. Despite increasing research on post-operative mortality in Ethiopia, significant gaps remain especially regarding the Harari Region. Although national statistics offer a broad overview, locally focused studies are essential to inform targeted interventions.
Methods: A retrospective cross-sectional study design was employed from January 10 to February 10, 2025. A total of 602 participants were selected using a simple random sampling technique. Data were collected using Kobo Toolbox and subsequently exported to SPSS statistical software for analysis. Variables that showed associations in the bivariate analysis were entered into multivariate logistic regression. Statistical significance was determined at a p-value < 0.05, with adjusted odds ratios and 95% confidence intervals reported. Model fitness was evaluated using the Hosmer and Lemeshow goodness-of-fit test, and multicollinearity was assessed via the Variance Inflation Factor.
Results: This study shows that, prevalence of post-operative mortality in Hiwot Fana Comprehensive Specialized Hospital (HFCSH) was 14 (2.3%). The odds of death among patients with a low platelet count were five times higher (AOR = 5.71; 95% CI: 1.12, 29.17) than those with normal platelet counts. Similarly, the odds of death among patients admitted to the ICU were fourteen times higher (AOR = 14.45; 95% CI: 3.22, 64.70) than those not admitted to the intensive care unit.
Conclusion: The magnitude of postoperative mortality in this study was higher than the global average but lower than that reported in some African countries and national studies. ICU admission and low platelet count were significantly associated with increased postoperative mortality. These findings emphasize the need for thorough preoperative assessments particularly focusing on platelet count and underscore the importance of providing optimal care in the ICU to improve surgical outcomes.

Keywords: Hiwot Fana, Mortality, Post-Operative, Prevalence, Surgery

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1. Introduction

Post-operative mortality is one of the essential factors for evaluating the quality of surgical care and its outcomes in healthcare facilities. The World Health Organization (WHO) defines postoperative mortality as the death of a patient occurring within 30 days after a surgical procedure, regardless of the cause of death [1]. Surgical procedures are not risk-free and always carry the potential risk of death due to the procedure itself, the anesthesia administered, or postoperative complications, particularly considering the patient's condition at the time of surgery [2, 3].

Surgical care affects the lives of millions of people. Studies indicate that complications following surgery result in disability or prolonged hospital stay in 3–25% of hospitalized patients, depending on the complexity of the surgery and the hospital setting [4, 5]. An estimated 4.2 million people die worldwide within 30 days of surgery each year, and postoperative deaths account for approximately 8% of all deaths, making it the third leading cause of death globally, after ischemic heart disease and stroke [6].

In Africa, a multicenter study involving 11,193 surgical patients across 25 countries reported 239 deaths, with 225 occurring within the first 24 hours after surgery. This highlights a significant burden of early postoperative mortality, linked to inadequate perioperative and critical care services. The study also found that the risk of postoperative mortality in Africa is about twice as high as the global average, despite patients generally being younger and having lower risk profiles [7].

The global incidence of post-operative mortality varies significantly from country to country and region to region, depending on several factors. These include the resources of the healthcare facility, the health status of the patient, the diagnosis, and the type of surgery performed. Compared to emergency surgeries, elective surgeries generally carry a lower incidence of post-operative mortality. Major surgeries, such as those for abdominal cancers or cardiovascular diseases, are associated with higher risks, with mortality rates ranging from 5% to 10% in certain cases [8]. Additionally, emergency surgeries tend to have higher mortality rates due to the often-compromised health status of patients requiring urgent intervention [9].

Morbidity and mortality in surgery are common scenarios encountered by surgeons and healthcare providers in clinical practice. Hospitals and surgical departments regularly review mortality reports to understand potential causes and contributing factors, enabling them to devise strategies aimed at prevention or risk reduction [10]. Surgical mortality occurs for various reasons, and studying its

causes and patterns can help bridge knowledge gaps in surgical settings. It also identifies areas needing improvement, practice modification, or policy development [11].

Ethiopia has made efforts to address gaps in life-saving surgical services by promoting safe surgery and improving access to essential anesthetic and surgical interventions in hospitals [12]. Previous studies have indicated that identifying factors associated with postoperative mortality serves as an indirect measure of surgical quality and can help determine reasons for increased mortality and inform practical intervention strategies [13, 14].

2. Methods and Materials

2.1. Study Area and Study Period

The study was conducted at Hiwot Fana Comprehensive Specialized Hospital, located in Harar town, Harari Region, Eastern Ethiopia. Harar is situated 526 km east of the capital city, Addis Ababa. Hiwot Fana Comprehensive Specialized Hospital serves as a referral and teaching hospital for Haramaya University. Its catchment area includes Eastern Ethiopia, covering the Harari, Somali, and Oromia regions. The hospital provides a wide range of medical services, including both inpatient and outpatient care. It offers 24-hour comprehensive services in emergency treatment, internal medicine, general surgery, orthopedics, neurosurgery, obstetrics and gynecology, pediatrics, dermatology, pathology, oncology, anesthesiology, and neonatal intensive care. The surgical ward, where the study was conducted, has seven rooms and 45 beds, with an annual average of around 1,200 surgeries performed. The study period was from January 10, 2025, to February 10, 2025.

2.2. Study Design

Hospital based retrospective cross sectional study design was conducted using review of patients' medical records.

2.3. Source Population

All medical records of patients admitted to surgical ward from September 12, 2019 to September 11, 2024.

2.4. Study Population

All adult patient's medical records admitted to surgical ward from September 12, 2019 to September 11, 2024 and fulfills inclusion criteria.

2.5. Sample Size Determination

Single population proportion formula was used to calculate the sample size. The sample size for the study was determined by taking critical value at 95% confidence level and p=0.057 (from study done at Wolaita Sodo teaching and referral hospital) [15], q=0.943, d=0.03.

$$n = \frac{(Z\alpha_{/2})^2 P(1-P)}{d^2} = \frac{(1.96)^2(0.057)\,(1-0.057)}{(0.03)^2} = \underline{229}$$

In the study period mentioned above some of the medical records may be missing or incompletely filled so to avoid such bias we consider the non-response rate to be 10% and add on the sample size. Sample size determined above: 229, non-response rate: 10%

Total sample size = Non response rate + Sample size determined

= (10%(229)) + 229= <u>252</u>

A sample size is taken from the second objective (using study done at Wolayita Sodo teaching and referral hospital) [15] (Table 1): 562 +56 (10%) = <u>618</u>

Table 1: Sample size determination for the second objective to determine the post-operative mortality prevalence and associated factors among adult patients admitted to surgical ward in HFCSH from September 12, 2019 to September 11, 2024.

Variables (associated factors)	AOR	Confidence Interval	Power	Sample size
Surgical checklist	0.18	95%	80%	562
comorbidity	4.45	95%	80%	176
Blood transfusion	0.07	95%	80%	406
General Anesthesia	4.37	95%	80%	213

Note: AOR – Adjusted Odd Ratio

2.6. Sampling Technique

From a total of 7,559 medical cards (which was a total of surgeries done from September 12, 2019 - September 11, 2024) and a simple random sampling technique was used by generating a random number using Microsoft Excel.

2.7. Eligibility Criteria

2.7.1. Inclusion Criteria

- Medical records of patients who underwent surgery in surgical ward from September 12, 2019 - September 11, 2024.
- Age >18

2.7.2. Exclusion Criteria

- Medical records of patients' undergone surgery elsewhere and admitted to surgical ward in HFCSH for other health issue (like post-operative complication).

2.8.Study Variables

2.8.1. Dependent Variable

- Post-operative mortality

2.8.2. Independent Variables

- **Sociodemographic characteristics**: Age, sex, area of residency,
- **Clinical and laboratory status:** Co-morbid illnesses, diagnosis, duration of symptom, previous surgery, type of surgery, pre-operative sepsis, laboratory test results, surgical decision or exploration time, previous surgery, type of surgery, type of anesthesia, amount of blood loss, blood transfusion, presence of ICU, admission to ICU, length of stay…
- **Prevalence and factors of post operative mortality:** Cause of death, post-operative complication …

2.9. Data Collection Procedure

Medical records of study subjects were reviewed retrospectively to determine the prevalence of postoperative mortality and its associated factors among patients admitted to the surgical ward at Hiwot Fana Comprehensive Specialized Hospital from September 12, 2019, to September 11, 2024. All data were collected using Kobo Toolbox. The data collection was carried out by two nurses after they received proper orientation, and the process took place from January 10 to February 10, 2025.

2.10. Data Quality Control

Data quality was ensured throughout both the data collection and analysis processes. Prior to the main study, data collectors received appropriate training. A pretest was conducted on 5% (31 medical records) of the total sample size outside the actual data collection area, and necessary modifications were made based on the findings. The principal investigator conducted daily on-site supervision throughout the entire data collection period. At the end of each day, the completed questionnaires were reviewed and checked for completeness and accuracy, and any necessary corrections were made collaboratively by all members of the research team.

2.11. Data Processing, Analysis and Management

The data were cleaned, coded, and entered using KOBO Toolbox, then exported to SPSS version 20 for analysis. Descriptive analysis was performed to summarize the data, and the final results were presented in the form of text, figures, and tables. Binary logistic regression analysis was conducted by computing the odds ratio (OR) with a 95% confidence interval (CI)

to assess the crude association between each independent and dependent variable. Model fitness was evaluated using the Hosmer and Lemeshow goodness-of-fit test, which yielded a p-value of 0.23 in this study. Multicollinearity was assessed using the Variance Inflation Factor (VIF), with values ranging from 2 to 8, to examine the interrelationships among independent variables. Finally, all independent variables with a p-value < 0.25 in the bivariate analysis were included in the multivariate logistic regression model. Variables showing a p-value < 0.05 and adjusted odds ratio (AOR) with 95% CI were considered significantly associated with the dependent variable.

2.12. Operational Definitions

A. **Post-operative mortality:** Refers to the death of a patient occurring within 30 days after a surgical procedure, regardless of the cause of death [1].

B. **Emergency surgery:** A surgical procedure performed immediately to address a life-threatening condition or to prevent serious complications [16].

C. **Post-operative complication:** Adverse events or conditions that occur following a surgical procedure, which can affect the patient's recovery and overall outcome [17].

D. **Elective surgery:** A type of surgical procedure that is scheduled in advance because it does not involve a medical emergency [18].

E. **Sepsis:** A life-threatening condition that arises when the body's response to infection causes widespread inflammation, leading to tissue damage, organ failure, and potentially death [19].

F. **Length of stay (LOS):** Refers to the duration of a patient's hospitalization, measured from the time of admission to the time of discharge [20].

G. **Comorbidity:** The presence of one or more additional medical conditions co-occurring with a primary condition in an individual [21].

H. **Type of anesthesia:** Broadly classified into general and regional anesthesia.

- **General anesthesia** refers to medically induced state of unconsciousness, accompanied by a loss of sensation and reflexes, ensuring that the patient remains completely unaware of the surgery and does not experience pain or distress [22].
- **Regional anesthesia** involves the injection of anesthetic agents near a cluster of nerves to block sensation in a specific area of the body while the patient remains awake or lightly sedated [23].

3. Results

3.1. Socio-Demographic Characteristics

Out of the total 618 medical records reviewed, 16 were excluded due to incompleteness, resulting in a response rate of 97.5%. The majority of patients were in the age group of 21–40 years, accounting for 334 (55.5%), followed by those aged 41–60 years at 113 (18.8%). Patients aged below 20 years and above 60 years accounted for 92 (15.3%) and 63 (10.5%), respectively. Among the 602 included cases, 251 (41.7%) were female. Most of the patients, 442 (73.4%), were from the Oromia Region, followed by 116 (19.3%) from the Harari Region. Additionally, 25 (4.2%) were from Dire Dawa, and 19 (3.2%) were from the Somali Region. Regarding residence, 463 (76.9%) patients were from rural areas, while 139 (23.1%) were from urban areas (Table 2).

Table 2: Socio-demographic characteristics of adult patients admitted to surgical ward in HFCSH from September 12, 2019 - September 11, 2024. (n=602)

Socio-demographic Variables		Frequency (n=602)	Percent(%)
Age	< 20	92	15.3
	21-40	334	55.5
	41-60	113	18.8
	> 60	63	10.5
Sex	Female	251	41.7
	Male	351	58.3
Address	Dire Dawa	25	4.2
	Harari Region	116	19.3
	Oromia Region	442	73.4
	Somali Region	19	3.2
Area of residency	Rural	463	76.9
	Urban	139	23.1

Note: HFCSH – Hiwot Fana Comprehensive Specialized Hospital

3.2. Clinical and Laboratory Status

The most common chief complaint among patients admitted to the surgical ward of HFCSH was abdominal pain, reported in 215 cases (35.7%). Regarding the duration of symptoms, 321 patients (53.3%) presented to the hospital within 7 days of symptom onset, whereas 281 patients (46.7%) presented after 7 days (see Table 3).

Table 3: Clinical and laboratory status of adult patients admitted to surgical ward in HFCSH from September 12, 2019 - September 11, 2024. (n=602)

Clinical and laboratory variables		Frequency (n=602)	Percent (%)
Duration of symptom	≤7 days	321	53.3
	>7 days	281	46.7
Presence of pre-operative sepsis	Yes	112	18.6
	No	490	81.4
Blood transfusion	Yes	144	23.9
	No	458	76.1
Hemoglobin	<11mg/dl	391	65
	11-18mg/dl	203	33.7
	>18mg/dl	8	1.3
White Blood Cell Count	<4,000/mm3	12	1.9
	4,000-11,000/mm3	348	57.8
	>11,000/mm3	242	40.2
Platelet count	<150,000/l	33	5.5
	15,000-450,000/l	515	85.5
	>450,000/l	54	9
Surgical decision time	With in 24 hrs	307	51
	After 24 hrs	295	49
Type of surgery	Elective	269	44.7
	Emergency	333	55.3
Type of surgery (according to Diagnosis related Groups, DRG)	Gastrointestinal	341	56.6
	Urologic	57	9.5
	Neurosurgery	40	6.6
	Vascular	5	0.8
	Orthopedic	73	12.1
	Pulmonary	1	0.2
	Hepato-biliary	24	4.0
	Pancreases and spleen	4	0.7
	Breast	34	5.6
	Thyroid	23	3.8
Type of anesthesia	General	508	84.4
	Regional	94	15.6
Blood loss (amount)	≤500ml	570	94.7
	>500ml	32	5.3
Previous surgery(repeated emergency surgery)	Yes	141	23.4
	No	461	76.6
Post-operative complication	Yes	52	8.6
	No	550	91.4
Length of stay	≤1 week	282	46.8
	>1week	320	53.2
Admission to ICU	Yes	45	7.5
	No	557	92.5

A total of 470 patients (78.1%) admitted to the surgical ward had at least one comorbidity, with anemia being the most common, affecting 391 patients (65%) (Figure 1). Among those with anemia, only 144 (23.9%) received a blood transfusion.

Laboratory findings showed that 242 patients (40.2%) had leukocytosis (>11,000/mm³), and 12 patients (2.0%) had leukopenia (<4,000/mm³). In addition, 33 patients (5.5%) had

thrombocytopenia (<150,000/L), and 54 (9%) had thrombocytosis (>450,000/L). Preoperative sepsis was identified in 112 patients (18.6%).

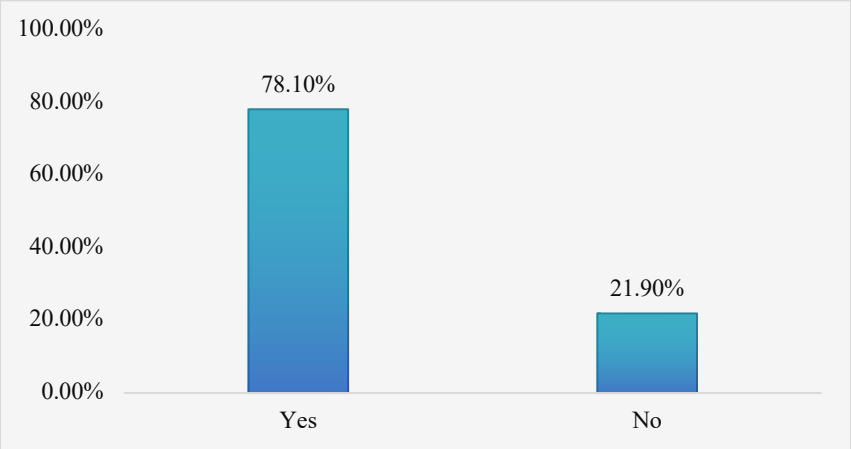

Figure 1: Comorbidity among adult patients admitted to surgical ward in HFCSH from September 12, 2019 - September 11, 2024 G.C.

Based on the type of surgery, 333 cases (55.3%) were emergency surgeries, while 269 (44.7%) were elective. Among the emergency surgeries, only 307 (51%) were performed within 24 hours of hospital presentation. Including both emergency and elective cases, 295 surgeries (49%) were performed after 24 hours of presentation. General anesthesia was the most commonly used type of anesthesia, administered in 508 cases (84.4%), compared to regional anesthesia used in 94 cases (15.6%). An estimated blood loss of ≤500 ml during surgery was reported in 570 cases (94.7%). Postoperative complications occurred in 52 cases (8.6%). Additionally, 141 patients (23.4%) had a history of either previous surgery or repeated emergency surgery (Figure 2).

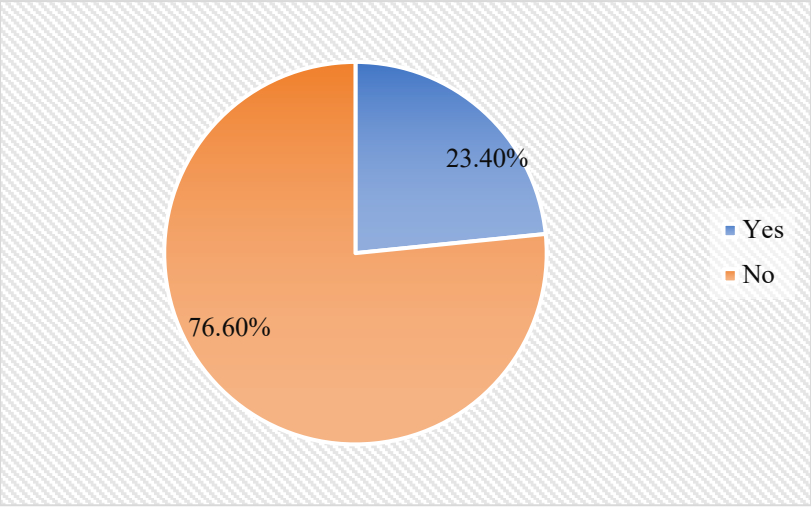

Figure 2: History of Previous Surgery/Repeated Emergency Surgery among adult patients admitted to surgical ward in HFCSH from September 12, 2019 - September 11, 2024 G.C.

According to Diagnosis-Related Group (DRG) classifications, the most frequent surgeries were gastrointestinal procedures (341 cases, 56.6%), followed by orthopedic (73 cases, 12.1%),

urologic (57 cases, 9.5%), neurosurgery (40 cases, 6.6%), breast surgeries (34 cases, 5.6%), hepatobiliary (24 cases, 4.0%), thyroid (23 cases, 3.8%), vascular (5 cases, 0.8%), pancreas and spleen (4 cases, 0.7%), and pulmonary surgeries (1 case, 0.2%).

Regarding length of hospital stay, 320 patients (53.2%) were admitted for more than one week, while 282 patients (46.8%) stayed for one week or less. A total of 45 patients (7.5%) required ICU admission. Among the postoperative deaths, multiple organ failure was the most commonly reported cause, accounting for 11 cases (78.6%), followed by respiratory failure in 2 cases (14.3%) (Figure 3).

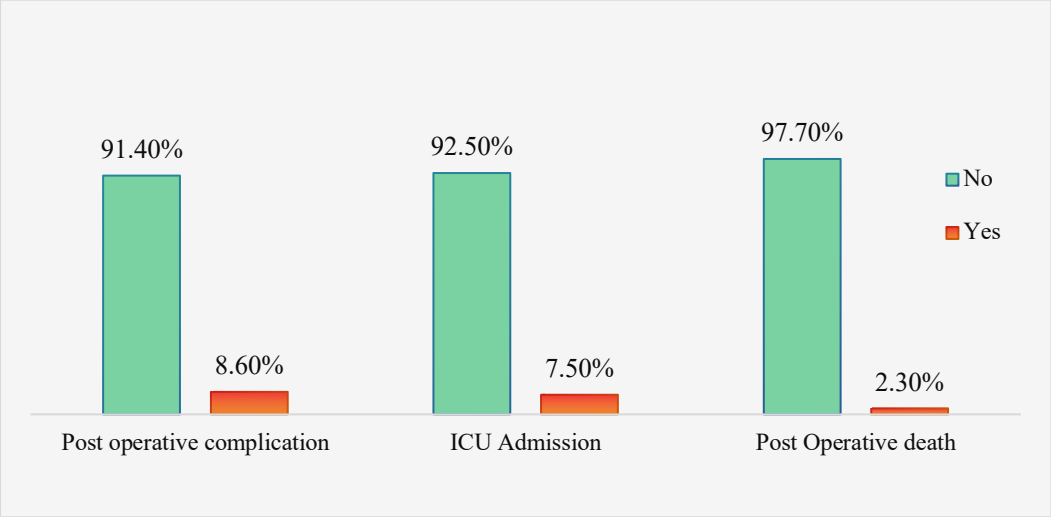

Figure 3: Percentage of Post operative complication, ICU admission and Post operative Mortality among adult patients admitted to surgical ward in HFCSH from September 12, 2019 - September 11, 2024.

3.3. Prevalence of Post Operative Mortality

According to this study, the prevalence of postoperative mortality at Hiwot Fana Comprehensive Specialized Hospital from September 12, 2019, to September 11, 2024, was 14 out of 602 cases (2.3%) (95% CI: 1.10, 3.50).

3.4. Associated Factors of Post-Operative Mortality

In bivariate logistic regression, socio-demographic variables such as age, sex, and area of residence were not significantly associated with mortality. Although patients aged 41–60 years (COR = 5.10, 95% CI: 0.60, 43.17) and those older than 60 years (COR = 4.55, 95% CI: 0.46, 44.77) had higher crude odds of death compared to those younger than 20 years, the associations were not statistically significant ($p > 0.05$).Clinical and laboratory variables demonstrated stronger relationships.

The presence of preoperative sepsis was significantly associated with increased postoperative mortality (COR = 6.20, 95% CI: 2.10, 18.26, $p<0.001$). Patients who received blood

transfusions were also at markedly higher risk of death (COR = 20.72, 95% CI: 4.58, 93.77, p<0.001). Similarly, thrombocytopenia (<150,000/L) was strongly associated with mortality (COR = 10.06, 95% CI: 3.16, 32.01, p < 0.001).A history of previous surgery was another significant predictor of death (COR = 12.91, 95% CI: 3.55, 46.99, p < 0.001). Furthermore, patients admitted to the ICU had substantially higher odds of mortality compared to those who were not (COR = 27.60, 95% CI: 8.79, 86.64, p < 0.001). Other factors such as anemia (HGB <11 mg/dl), high blood loss (>500 ml), type of surgery (emergency vs. elective), surgical decision time, symptom duration, and length of hospital stay showed elevated crude odds but were not statistically significant (Table 4).

Table 4: Bi-variate analysis of socio-demographic, clinical and laboratory status of adult patients admitted to surgical ward in HFCSH from September 12, 2019 - September 11, 2024 G.C. (n=602)

Variable	Category	Post operative mortality		COR, 95% CI	P-value
		No	Yes		
Age category	<20	91 (15.1%)	1 (0.2%)	1	
	21-40	330 (54.8%)	4 (0.7%)	1.10 (0.12, 9.99)	0.930
	41-60	107 (17.8%)	6 (1.0%)	5.10 (0.60, 43.17)	0.135
	>60	60 (10.0%)	3 (0.5%)	4.55 (0.46, 44.77)	0.194
Sex	Male	341 (56.6%)	10 (1.7%)	1.81 (0.56, 5.84)	0.320
	Female	247 (41.0%)	4 (0.7%)	1	
Area of residency	Rural	451 (74.9%)	12 (2.0%)	1.82 (0.40, 8.24)	0.436
	Urban	137 (22.8%)	2 (0.3%)	1	
Duration of Symptom	<=7 days	316 (52.5%)	5 (0.8%)	1	
	>7 days	272 (45.2%)	9 (1.5%)	2.09 (0.69, 6.31)	0.191
Comorbidity	No	132 (21.9%)	0 (0.0%)	0.00	0.996
	Yes	456 (75.8%)	14 (2.3%)	1	
Presence of pre-operative sepsis	No	484 (80.4%)	6 (1.0%)	1	
	Yes	104 (17.3%)	8 (1.3%)	6.20 (2.10, 18.26)	0.001
Blood transfusion	No	456 (75.7%)	2 (0.3%)	1	
	Yes	132 (21.9%)	12 (2.0%)	20.72 (4.58, 93.77)	0.000
HGB	<11 mg/dl	379 (63.0%)	12 (2.0%)	6.92 (0.90, 53.34)	0.063
	11-18 mg/dl	202 (33.6%)	1 (0.2%)	1	
	>18 mg/dl	7 (1.2%)	1 (0.2%)	28.85 (1.63, 51.18)	0.146
WBC	<4000/mm3	11 (1.8%)	1 (0.2%)	1	
	4000-11000/mm3	343 (57.0%)	5 (0.8%)	0.16 (0.01, 1.49)	0.108
	>11000/mm3	234 (38.9%)	8 (1.3%)	0.37 (0.04, 3.27)	0.376
Platelet	<150000/L	28 (4.7%)	5 (0.8%)	10.06 (3.16, 32.01)	0.000
	150000-450000/L	507 (84.2%)	8 (1.3%)	1	
	>450000/L	53 (8.8%)	1 (0.2%)	1.19 (0.14, 9.74)	0.176
Surgical decision (exploration) time	With in 24hr	300 (49.8%)	7 (1.2%)	1	
	After 24hr	288 (47.8%)	7 (1.2%)	1.04 (0.36, 3.00)	0.940
Type of surgery	Elective	264 (43.9%)	5 (0.8%)	1	
	Emergency	324 (53.8%)	9 (1.5%)	1.46 (0.48, 4.42)	0.497
Type of Anesthesia	General	494 (82.1%)	14 (2.3%)	1	
	Regional	94 (15.6%)	0 (0.0%)	0.00	0.997

Amount of Blood loss	<=500 ml	558 (92.7%)	12 (2.0%)	1	
	>500 ml	30 (5.0%)	2 (0.3%)	3.10 (0.66, 14.48)	0.150
Previous surgery	No	458 (76.1%)	3 (0.5%)	1	
	Yes	130 (21.6%)	11 (1.8%)	12.91 (3.55, 46.99)	0.000
Post operative complication	No	550 (91.4%)	0 (0.0%)	0.00	0.991
	Yes	38 (6.3%)	14 (2.3%)	1	
Length of stay	=<1 week	277 (46.0%)	5 (0.8%)	1	
	>1 week	311 (51.7%)	9 (1.5%)	1.60 (0.53, 4.84)	0.403
Admission to ICU	No	552 (91.7%)	5 (0.8%)	1	
	Yes	36 (6.0%)	9 (1.5%)	27.60 (8.79, 86.64)	0.000

In the multivariate logistic regression model, most socio-demographic and clinical factors did not retain statistical significance after adjustment. Although older age, prolonged symptom duration, blood transfusion, preoperative sepsis, anemia, and previous surgery showed increased odds of postoperative mortality, their associations were not statistically significant ($p > 0.05$). These findings suggest that while these factors may contribute to increased risk at the crude level, their independent effect on mortality was limited when controlling for potential confounders.

Two factors emerged as significant independent predictors. Patients with thrombocytopenia (<150,000/L) were nearly six times more likely to die postoperatively compared to those with normal platelet counts (AOR = 5.71, 95% CI: 1.12, 29.17, p = 0.036). Similarly, ICU admission was strongly associated with mortality, with patients admitted to ICU having over 14 times higher odds of death (AOR = 14.45, 95% CI: 3.22, 64.70, $p < 0.001$). These results highlight the critical role of perioperative hematologic status and severity of illness in predicting postoperative outcomes.

Table 5:Multivariate analysis of socio-demographic, clinical and laboratory status of adult patients admitted to surgical ward in HFCSH from September 12, 2019 - September 11, 2024 G.C.(n=602)

Variable	Category	Post-op. mortality		COR, 95% CI	AOR, 95% CI	p-value
		No	Yes			
Age category	<20	91 (15.1%)	1 (0.2%)	1	1	
	21-40	330	4 (0.7%)	1.10 (0.12, 9.99)	0.78 (0.05, 11.65)	0.857
	41-60	107	6 (1.0%)	5.10 (0.60, 43.17)	2.13 (0.14, 31.31)	0.581
	>60	60 (10.0%)	3 (0.5%)	4.55 (0.46, 44.77)	2.38 (0.12, 45.79)	0.565
Duration of Symptom	≤7 days	316	5 (0.8%)	1	1	
	>7 days	272	9 (1.5%)	2.09 (0.69, 6.31)	2.14 (0.46, 9.99)	0.329
Presence of pre-op. sepsis	No	484	6 (1.0%)	1	1	
	Yes	104	8 (1.3%)	6.20 (2.10, 18.26)	4.11 (0.71, 23.73)	0.113
Blood transfusion	No	456	2 (0.3%)	1	1	
	Yes	132	12	20.72 (4.58,	6.31 (0.65, 60.92	0.111
	<11	379	12	6.92 (0.90, 53.34)	0.42 (0.02, 7.62)	0.562

HGB in mg/dl	11-18	202	1 (0.2%)	1	1	
	>18	7 (1.2%)	1 (0.2%)	28.85 (1.63, 51.18)	3.63 (0.01, 731.05)	0.633
WBC in mm^3	<4000	11 (1.8%)	1 (0.2%)	1	1	
	4000-11000	343 (57.0%)	5 (0.8%)	0.16 (0.01, 1.49)	0.49 (0.00, 28.68)	0.737
	>11000	234 (38.9%)	8 (1.3%)	0.37 (0.04, 3.27)	0.14 (0.00, 7.85)	0.34
Platelet/L	<150000	28 (4.7%)	5 (0.8%)	10.06 (3.16, 32.01)	5.71 (1.12, 29.17)	0.036
	150000-450000	507 (84.2%)	8 (1.3%)	1	1	
	>450000/L	53 (8.8%)	1 (0.2%)	1.19 (0.14, 9.74)	0.93 (0.07, 12.14)	0.956
Amount of Blood loss	≤500 ml	558 (92.7%)	12 (2.0%)	1	1	
	>500 ml	30 (5.0%)	2 (0.3%)	3.10 (0.66, 14.48)	1.68 (0.14, 19.65)	0.679
Previous surgery	No	458 (76.1%)	3 (0.5%)	1	1	
	Yes	130 (21.6%)	11 (1.8%)	12.91 (3.55, 46.99)	4.48 (0.87, 22.96)	0.072
Admission to ICU	No	552 (91.7%)	5 (0.8%)	1	1	
	Yes	36 (6.0%)	9 (1.5%)	27.60 (8.79, 86.64)	14.45 (3.22, 64.70)	0

Note: HGB – Hemoglobin, ICU – Intensive Care Unit, WBC – White Blood Cells,

4. Discussion

The prevalence of post-operative mortality in this study was 2.3% (95% CI: 1.10, 3.50), indicating a significant concern for patient safety and surgical outcomes. While many patients undergo surgery successfully, these finding highlights that a notable minority face serious complications that can lead to death. The confidence interval emphasizes the variability in outcomes and underscores the need for enhanced surgical protocols and improved perioperative care.

Compared to a study conducted in Poland, where the overall post-operative mortality rate was 0.8% [24], the rate observed in HFCSH was notably higher. Similarly, the mortality rate was higher than that reported in Japan, a developed country with a rate of 1.0% [25]. In contrast, the rate found in this study was lower than that reported in several studies conducted in African countries. For instance, a study from Nigeria reported a mortality rate of 8.6% [15], while a study in Kenya involving patients undergoing major abdominal surgery showed a rate of 9.1% [26]. These differences may be attributed to variations in healthcare infrastructure, surgical techniques, patient population, and availability of perioperative care.

Within Ethiopia, a retrospective review from St. Paul's Hospital Millennium Medical College reported a post-operative mortality rate of 3.41% [27], while another study in Addis Ababa reported a rate of 5% [28]. Additionally, studies conducted at Wolayita Sodo (5.7%) [29], Jimma (4.8%) [30], and West Oromia (7.42%) [31] all reported higher mortality rates compared to the 2.3% observed in the current study.

The present study also found that ICU admission and low platelet count were significantly associated with increased odds of post-operative mortality. This aligns with a study conducted in the USA, which demonstrated that postoperative ICU admission was associated with a 2–3 times higher risk of mortality within 48 hours and 30 days post-surgery (AOR = 2.42; 95% CI: 1.32, 4.43; $p < 0.01$) [32].

Similarly, a study from West Oromia found that patients admitted to the ICU were 4.75 times more likely to die post-operatively than those not admitted (AOR = 4.75; 95% CI: 1.50, 14.96) [31]. These findings are consistent with the current study, which showed that patients admitted to the ICU had 14.45 times higher odds (AOR = 14.45; 95% CI: 3.22, 64.70), and those with low platelet counts had 5.7 times higher odds of mortality (AOR = 5.71; 95% CI: 1.12, 29.17).

5. Strength and Limitation of the Study

One of the strengths of this study was the inclusion of a large sample size, addressing the second objective effectively. Another strength was the comprehensive data collection, which encompassed socio-demographic, clinical, laboratory, and surgery-related factors. Despite its strengths, this study has some limitations. Due to its retrospective design, it was difficult to assess certain variables such as marital status, income, and educational level. Additionally, patients' prognosis after hospital discharge was not tracked, so post-operative mortality occurring within 30 days after discharge is unknown, which may have affected the accuracy of the reported mortality magnitude.

6. Conclusion

According to this study, the postoperative mortality rate was higher than the global average. However, when compared to rates reported in other developing countries and various regions within Ethiopia, the prevalence was relatively lower. This variation may be attributed to a range of local and systemic factors. A notably high prevalence of comorbidities was observed among surgical patients, with anemia being the most common. This is a concerning issue, as nearly all surgical procedures are associated with some degree of blood loss. The study identified two key factors significantly associated with postoperative mortality: low platelet count and admission to the intensive care unit (ICU). These findings underscore the importance of thorough preoperative assessment and optimized perioperative care to improve surgical outcomes.

Abbreviations

ASAPS: American Society of Anesthesiology Physiological Status, DM: Diabetes Miletus, HFCSH: Hiwot Fana Comprehensive Specialized Hospital, HIV: Human Immunodeficiency Virus, HTN: Hypertension, ICU: Intensive Care Unit, LMICS: Low- and Middle-Income Countries, SSI: Surgical Site Infection, WHO: World Health Organization

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Authors Contribution

All authors contributed equally to the conceptualization and design of the study. They were involved in the methodology development, data analysis, investigation, and interpretation of the findings. All authors participated in writing, reviewing, and editing the manuscript, and approved the final version for submission.

Ethics Approval

Ethical approval was obtained from the Institutional Review Board (IRB) of Dire Dawa University. An official letter was then submitted to Hiwot Fana Comprehensive Specialized Hospital (HFCSH) to request permission to conduct the research. All relevant offices, department heads, physicians, nurses, and medical record keepers were informed about the purpose, timing, and duration of the data collection and kindly asked for their cooperation. As the study was retrospective and did not involve direct interaction with patients, there was no direct risk to the study subjects. Confidentiality was strictly maintained by ensuring that no patient names or healthcare provider identities were disclosed in relation to the findings. Written consent for the study was obtained from the appropriate office at HFCSH.

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Conflict of Interests

The author(s) declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

Availability of Data and Materials

All data supporting the study is available with the reasonable request.

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