

Postoperative Mortality in Digestive Surgery in a Low-Resource Setting: A Five-Year Multicentre Study from Cameroon

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Abstract

Background: Postoperative mortality after digestive surgery remains disproportionately high in low-resource settings, particularly in sub-Saharan Africa. Evidence from Cameroon remains limited despite a substantial burden of digestive surgical disease. **Objective:** To determine the prevalence, characteristics, causes, and predictors of postoperative mortality after digestive surgery in two tertiary hospitals in Cameroon. **Methods:** A retrospective multicentre observational study was conducted at Yaoundé Central Hospital and Yaoundé Emergency Centre between January 2020 and December 2024. All adult patients undergoing digestive surgery were included. Postoperative mortality was defined as death within 30 days after surgery. Digestive surgical procedures were categorized according to the underlying pathology and type of operation in order to better describe the case-mix of the study population. Complications were defined as any adverse clinical event occurring within 30 postoperative days or during the index hospital admission. Multivariate logistic regression was used to identify independent predictors of mortality. **Results:** Among 505 digestive surgical procedures, 96 postoperative deaths occurred, corresponding to a mortality rate of 19.0%. Mortality was 17.0% after elective surgery and 20.0% after emergency procedures. The surgical case-mix was dominated by emergency abdominal conditions including generalized peritonitis due to gastrointestinal perforation, intestinal obstruction, complicated appendicitis, traumatic abdominal injuries, and digestive malignancies. Early deaths (<48 h) accounted for 38.5% of cases. Septic shock was the leading

cause of death (30.2%). Independent predictors of mortality included age ≥ 60 years (OR 1.62, 95% CI 1.00–2.60), ASA ≥ 3 (OR 3.35, 95% CI 2.11 - 5.30), delayed surgery > 24 h (OR 2.88, 95% CI 1.70 - 4.90), and postoperative complications (OR 5.40, 95% CI 2.80 - 10.40). **Conclusion:** Postoperative mortality after digestive surgery is markedly high in this low-resource setting and is primarily driven by delayed care, advanced disease severity, and septic complications. Strengthening perioperative and emergency surgical systems is essential to reduce digestive surgical mortality in sub-Saharan Africa.

Keywords

Postoperative Mortality, Digestive Surgery, Sepsis, Septic Shock, Emergency Surgery, Low-Resource Setting, Cameroon

1. Introduction

Postoperative mortality is a major global indicator of surgical quality and health-system performance. More than 4.2 million deaths occur within 30 days after surgery worldwide each year, with the majority occurring in low- and middle-income countries (LMICs) [1].

In sub-Saharan Africa, postoperative mortality rates are substantially higher than in high-income countries due to delayed access to care, limited infrastructure, and restricted perioperative capacity [2]. The African Surgical Outcomes Study demonstrated that postoperative mortality in Africa is strongly associated with disease severity at admission and limited critical-care resources [3].

Digestive surgery carries a particularly high risk of mortality because of peritoneal contamination, delayed diagnosis, and the predominance of emergency indications [4]. Severe intra-abdominal infections and postoperative sepsis are major causes of death after digestive surgery in resource-limited settings [5]. In many low-resource environments, digestive surgical case-mix is dominated by sepsis-related abdominal emergencies rather than elective oncologic or hepatobiliary procedures, which significantly influences postoperative mortality patterns.

In Cameroon, data on digestive postoperative mortality remain scarce despite a high burden of acute abdominal disease. Understanding the magnitude and determinants of postoperative mortality is essential to guide surgical system strengthening strategies.

This study aimed to determine the prevalence, characteristics, causes, and predictors of postoperative mortality after digestive surgery in two tertiary hospitals in Cameroon.

2. Methodes

2.1. Study Design and Setting

This retrospective multicentre observational study was conducted in two tertiary referral hospitals in Yaoundé, Cameroon: Yaoundé Central Hospital and Yaoundé

Emergency Centre. These institutions provide specialised digestive surgical care, including both elective and emergency procedures, for the capital city and surrounding regions. The study period extended from January 1, 2020 to December 31, 2024.

2.2. Study Population

All consecutive adult patients (≥ 18 years) who underwent digestive surgery during the study period were eligible for inclusion. Digestive surgery was defined as any operative procedure involving the gastrointestinal tract, hepatobiliary system, or peritoneal cavity. Procedures were grouped into two main surgical categories:

- 1) Bowel surgery (intestinal resection, appendectomy, obstruction surgery, stoma formation);
- 2) Hepatobiliary surgery (cholecystectomy, biliary surgery, liver procedures).

Patients were followed for 30 days postoperatively to assess mortality. Patients were excluded if they underwent non-digestive surgery or if essential outcome data were missing from medical records.

2.3. Data Collection

Data were collected retrospectively from operative registers and patient medical records using a standardised data extraction form. Variables recorded included demographic characteristics (age and sex), operative context (elective or emergency surgery; traumatic or non-traumatic indication), preoperative clinical status assessed by the American Society of Anesthesiologists (ASA) classification, delay from hospital admission to surgery, occurrence of postoperative complications, timing of death, and cause of death.

Candidate predictors of mortality included age, ASA classification, surgical urgency, delay to surgery, and postoperative complications. Variables with $p < 0.20$ in bivariate analysis were included in the multivariable logistic regression model. Collinearity between predictors was assessed using variance inflation factors. The hospital site was included as a fixed effect in the model to account for clustering.

2.4. Definitions

Postoperative mortality was defined as death occurring within 30 days after surgery, irrespective of hospital discharge status.

Postoperative complications were defined as any adverse clinical event occurring during the postoperative hospital stay or within 30 days after surgery. Complications included: surgical site infection, intra-abdominal sepsis, anastomotic leak, postoperative hemorrhage, respiratory complications, renal failure, and thromboembolic events.

Delayed surgical management (>24 hours) was defined as the time interval between hospital admission and surgical intervention. This delay may reflect multiple system-level factors including diagnostic delay, financial barriers to surgery, operating-room availability, or referral delays.

Clinical documentation including progress notes, laboratory results, imaging

findings and operative reports were used. The cause of death was determined after review of clinical records. When multiple causes were present, the dominant clinical syndrome leading to death was assigned as the primary cause. Septic shock was considered the cause of death when death occurred in the context of severe infection associated with circulatory failure and organ dysfunction documented in clinical records.

2.5. Outcomes

The primary outcome was postoperative mortality after digestive surgery. Secondary outcomes included timing of death and distribution of causes of death.

2.6. Statistical Analysis

Data were analysed descriptively. Categorical variables were summarised as frequencies and percentages. Postoperative mortality was calculated as the proportion of deaths among all digestive surgical procedures performed during the study period. Results were presented overall and stratified according to surgical context (elective versus emergency) and clinical characteristics.

2.7. Ethical Considerations

The study protocol was approved by the institutional ethics committee of the Faculty of Medicine and Biomedical Sciences, University of Yaoundé I. Given the retrospective nature of the study and the use of anonymised data, the requirement for individual informed consent was waived.

3. Results

3.1. Case-Mix of Digestive Surgery

Among the 505 procedures analyzed, the majority were emergency abdominal surgeries. The most frequent indications were: generalized peritonitis due to gastrointestinal perforation, intestinal obstruction, complicated appendicitis, traumatic abdominal injuries, and digestive malignancies. Emergency septic abdominal conditions represented a large proportion of operations.

3.2. Overall Postoperative Mortality

During the five-year study period, 505 digestive surgical procedures were performed in the two participating tertiary hospitals. Ninety-six postoperative deaths occurred, yielding an overall 30-day mortality rate of 19.0%.

Mortality varied according to the surgical context. It was 17.0% following elective procedures (30/175) and 20.0% after emergency surgery (66/330). The highest mortality was observed in emergency traumatic digestive surgery (22.7%), compared with emergency non-traumatic surgery (19.2%) (**Table 1**).

3.3. Timing of Postoperative Death

Among the 96 deceased patients, death occurred early in a substantial proportion

of cases. Thirty-seven patients (38.5%) died within the first 48 hours after surgery, 29 (30.2%) between postoperative days 3 - 7, and 30 (31.3%) after the first postoperative week (**Table 2**). This distribution indicates a predominance of early postoperative mortality in this cohort.

3.4. Causes of Postoperative Mortality

Septic shock was the leading cause of death, accounting for 29 deaths (30.2%), followed by hypovolemic shock (22.9%). Other causes collectively accounted for 46.9% of deaths (**Table 2**). Infection-related complications accounted for the majority of deaths

3.5. Factors Associated with Postoperative Mortality

Multivariate logistic regression identified four independent predictors of postoperative mortality after digestive surgery (**Table 3**). Advanced age (≥ 60 years) was associated with increased mortality (OR 1.62, 95% CI 1.00 - 2.60; $p = 0.047$).

Preoperative physiological status showed a stronger effect, with ASA score ≥ 3 independently predicting death (OR 3.35, 95% CI 2.11 - 5.30; $p < 0.001$).

Delayed surgical management beyond 24 hours from admission was also associated with higher mortality (OR 2.88, 95% CI 1.70 - 4.90; $p < 0.001$).

The strongest predictor of mortality was the occurrence of postoperative complications (OR 5.40, 95% CI 2.80 - 10.40; $p < 0.001$).

Overall, postoperative mortality in this cohort resulted from the interaction between patient vulnerability (age and ASA), health-system delay (late surgery), and postoperative morbidity.

Table 1. Postoperative mortality according to surgical context (n = 505).

Surgical category	Total procedures	Deaths	Mortality (%)
All digestive surgery	505	96	19.0
Elective surgery	175	30	17.0
Emergency surgery	330	66	20.0
Emergency traumatic	75	17	22.7
Emergency non-traumatic	255	49	19.2

Table 2. Timing of death and associated clinical factors among deceased patients (n = 96).

Variable	≤ 48 h	3 - 7 days	> 7 days
Deaths (n)	37	29	30
Septic shock (%)	High	Moderate	Lower
Hypovolemic shock (%)	Moderate	Moderate	Low
ASA ≥ 3 (%)	Very high	High	Moderate
Delayed surgery > 24 h (%)	High	Moderate	Moderate
Postoperative complications (%)	Present in majority	Present	Present

Table 3. Independent predictors of postoperative mortality (multivariate analysis, n = 505).

Predictor	Adjusted OR	95% CI	p-value
Age ≥ 60 years	1.62	1.00 - 2.60	0.047
ASA ≥ 3	3.35	2.11 - 5.30	<0.001
Delayed surgery > 24 h	2.88	1.70 - 4.90	<0.001
Postoperative complications	5.40	2.80 - 10.40	<0.001

4. Discussion

This study demonstrates a markedly high postoperative mortality rate (19%) after digestive surgery in a low-resource setting, substantially exceeding rates reported in high-income countries and lying at the upper range of African surgical series. Global analyses have shown that more than four million deaths occur within 30 days after surgery worldwide each year, with the majority occurring in low- and middle-income countries where access to safe surgical care remains limited [1] [6]. Similar disparities between African and high-income surgical outcomes have been documented in the African Surgical Outcomes Study, which highlighted significantly higher perioperative mortality in African hospitals despite a lower surgical risk profile compared with high-income countries [3] [7].

A key finding of this study is the predominance of early postoperative death, with nearly 40% of deaths occurring within the first 48 hours. Early postoperative mortality following digestive surgery often reflects severe physiological derangement at presentation combined with limited perioperative stabilisation capacity. In sub-Saharan Africa, delayed access to care and late presentation with advanced abdominal sepsis remain common because of barriers to healthcare access, financial constraints, and delays in referral systems [2] [8]. These factors contribute to a higher proportion of critically ill patients undergoing emergency surgery compared with high-income settings.

The surgical case-mix of this cohort was largely dominated by emergency abdominal sepsis, including perforation peritonitis and intestinal obstruction, which partly explains the high mortality rate observed. Previous studies of emergency abdominal surgery in sub-Saharan Africa have similarly reported that intra-abdominal infections and septic complications represent the most frequent indications for surgery and are associated with the highest mortality rates [4] [8]. The predominance of septic abdominal emergencies in low-resource settings contrasts with the surgical case-mix observed in high-income countries, where elective oncologic and hepatobiliary procedures represent a larger proportion of digestive surgery [1].

Septic shock emerged as the leading cause of death in this study, accounting for nearly one-third of postoperative mortality. This finding confirms the central role of infection-related complications in digestive surgical mortality in resource-limited environments. Previous investigations of emergency abdominal surgery in Africa have also identified intra-abdominal sepsis as the dominant cause of post-

operative death [4]. Once septic shock develops, mortality remains extremely high in environments with limited access to intensive care, advanced hemodynamic monitoring, and broad-spectrum antimicrobial therapy [5] [9].

The multivariate analysis provides important insight into the mechanisms underlying postoperative mortality. Advanced age and ASA ≥ 3 were independently associated with death, reflecting reduced physiological reserve and severe systemic disease. The association between ASA classification and postoperative mortality has been consistently demonstrated in global surgical outcome studies, including the African Surgical Outcomes Study and other large multicentre analyses [1] [3] [7]. These findings confirm that preoperative physiological status remains a major determinant of surgical outcomes across diverse healthcare settings.

Delayed surgical intervention was another independent predictor of mortality, increasing the risk of death nearly threefold. Timely surgical source control is essential in the management of intra-abdominal infections and sepsis. Delays in surgery allow ongoing contamination, worsening systemic inflammatory response, and progression toward septic shock. In low- and middle-income countries, surgical delays often result from a combination of diagnostic limitations, financial barriers to treatment, operating-room availability, and delayed referral from peripheral facilities [2] [8] [10]. Addressing these system-level barriers is therefore a critical component of strategies aimed at reducing surgical mortality.

Postoperative complications showed the strongest association with mortality in this study (OR 5.40), indicating that postoperative morbidity represents the final pathway through which patient vulnerability and system delays translate into death. In this context, complications are predominantly septic and occur in physiologically compromised patients, explaining their major impact on survival. Similar patterns have been reported in global surgical outcome studies, where postoperative complications strongly predict mortality in emergency abdominal surgery [3] [6].

Taken together, these findings define a characteristic mortality profile in digestive surgery within low-resource environments: an older patient with high anesthetic risk, delayed access to surgical care, and subsequent postoperative septic complications. This profile differs fundamentally from that observed in high-income countries, where postoperative mortality is more strongly influenced by chronic comorbidities and advanced oncologic disease rather than delayed access to surgical care or severe intra-abdominal sepsis [1] [6].

These results have important implications for surgical system strengthening in sub-Saharan Africa. Reducing digestive surgical mortality requires coordinated improvements across the perioperative pathway, including earlier patient presentation, faster diagnostic evaluation, timely operative intervention, improved resuscitation capacity, and strengthened postoperative monitoring. Evidence from global surgery initiatives suggests that improving emergency surgical pathways and perioperative systems can significantly reduce preventable surgical deaths in low-resource settings [2] [10]. Strategies targeting early recognition of intra-abdominal sepsis and rapid surgical source control are therefore likely to have the greatest im-

pact on reducing digestive surgical mortality in similar environments [5] [9].

5. Conclusion

Postoperative mortality after digestive surgery is markedly high in this low-resource setting and is primarily driven by delayed care, advanced disease severity, and septic complications. Strengthening emergency surgical pathways, perioperative care, and sepsis management is essential to reduce digestive surgical mortality in sub-Saharan Africa.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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