



# Factors Associated with Early Postoperative Complications in Gastrointestinal Surgeries

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## ABSTRACT

Gastrointestinal surgeries' postoperative complications are significant contributors to patient morbidity and healthcare economic burden. The outcomes could be influenced by some of the factors, such as the patient's demographic characteristics, surgical elements, and perioperative management. Early problems, which usually appear 30 days after surgery, can have a detrimental effect on patient outcomes, lengthen hospital stays, escalate medical expenses, and, in serious cases, cause death. This study aims to identify factors associated with early postoperative complications in gastrointestinal surgeries within the Iraqi population. This is a cross-sectional study that took place in hospitals of the Wasit province during the period from August to the end of December 2024. Two hundred patients of each group who had undergone GI surgeries participated. The questionnaire was pretested before it was sent for data collection. Included the patient's demographics, surgery details, and postoperative outcomes. The data were recorded by direct patient interviews. Statistical analysis was performed using SPSS to identify associations between risk factors and complications. Half of the total (100/200) patients were aged between 30 and 50 years old. More than half of those were males (65%) and nonsmokers (60%). The most frequently performed surgeries were cholecystectomy (30%), bowel resection (25%), and appendectomy (20%). Most of these surgeries (70%) were elective and (55%) by laparoscopy. Around a third (30%) of samples reported early postoperative complications; surgical site infection was the most frequent (33.3%). Half (50%) of patients who had complications were aged more than 50 years old with a significant association ( $P < 0.001$ ). High body mass index (above 30), emergency surgeries, open surgeries, and no prophylactic antibiotics were also associated with early postoperative complications.

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## INTRODUCTION

Postoperative complications following gastrointestinal (GI) surgeries are significant contributors to patient morbidity and healthcare costs [1]. GI surgeries include a wide range of procedures, from minimally invasive laparoscopic interventions to extensive open resections for malignancies [2]. Despite advances in surgical techniques, perioperative management, and critical care, the incidence of complications such as infections, anastomotic leaks, and thromboembolic events remains substantial, with rates ranging from 10% to over 35% depending on the procedure and population studied [3,4]. Complications are frequently graded using systems like the Clavien-Dindo classification, which stratifies them based on severity and required interventions. Notably, complications graded II or higher, such as those requiring pharmacological treatment, surgical intervention, or intensive care, are considered clinically significant [5]. Early complications, typically occurring within 30 days post-surgery, can negatively impact patient outcomes, prolong hospital stays, increase healthcare costs, and, in severe cases, result in mortality [6]. Among the most common complications in GI surgeries are surgical site infections (SSIs), Anastomotic leakage, ileus, hemorrhage,

and thromboembolic events, each of which poses unique challenges in the postoperative period [7].

Identifying factors associated with these complications like patient-related, surgical, anesthetic, and systemic aspects is critical for optimizing patient outcomes and minimizing healthcare burdens [7,8]. Several studies have highlighted risk factors for early postoperative complications in GI surgeries. Patient-related factors, including age, sex, body weight, and comorbidities, play pivotal roles. For instance, elderly patients and those with comorbid conditions such as diabetes, cardiovascular disease (especially Atrial fibrillation and Heart failure), or malnutrition have higher complication rates, especially those that are not controlled properly [9-11]. Preoperative nutritional status is linked to impaired wound healing and increased susceptibility to infections [12,13]. Surgical factors such as operative duration, type of surgery (open versus laparoscopic), and blood loss significantly influence outcomes. Longer surgeries and open procedures tend to be associated with higher complication rates due to increased tissue trauma and potential for infection [14].

Understanding the factors associated with early

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complications facilitates targeted interventions. Preoperative optimization strategies, including nutritional supplementation, frailty assessment, and tailored anesthetic approaches, can mitigate risks. Enhanced recovery after surgery (ERAS) protocols, which emphasize multimodal analgesia, early mobilization, and careful fluid management, have shown promise in reducing complication rates and improving recovery [15]. Although extensive literature exists on postoperative outcomes, regional and institutional variations in healthcare delivery, patient demographics, and resource availability necessitate context-specific studies.

So, this study was conducted to assess the factors related to early postop complications among a sample of the Iraqi population. The findings will provide insights into modifiable risks and inform the development of strategies to improve surgical outcomes.

## METHODS

### Study Design and Setting

This is an analytic cross-sectional study. The study took place in Wasit Province hospitals and involved patients who underwent gastrointestinal surgeries. Data collection was starting from 1<sup>st</sup> August till the end of December 2024.

### Study Population and Sampling

The study population comprised patients who underwent gastrointestinal surgeries during the last year. Participants were recruited using a convenience sampling method. Inclusion criteria were patients above 18 years old, who consented to participate and underwent gastrointestinal surgeries. Exclusion criteria included patients who are unable to provide enough medical history, have difficulty recalling exact details, and those unable to provide informed consent.

### Data Collection Tool

Data were collected using a structured questionnaire adapted from a previously published study [7]. The questionnaire consisted of four sections:

1. Demographic Information: This section collected data on age, gender, body mass index (BMI), and smoking status.

2. Medical History: Questions included the presence of comorbidities such as hypertension, diabetes, cardiovascular or respiratory diseases, liver or renal disease, and prior surgical history or immunosuppressive drug use.

3. Surgical Details: Information about the type of gastrointestinal surgery (e.g., appendectomy, cholecystectomy), surgical approach (open or laparoscopic), and duration of surgery was captured. Additional variables included preoperative fasting duration and the use of prophylactic antibiotics.

4. Postoperative Outcomes: Postoperative pain level, time to ambulation, presence and type of complications, length of hospital stays, need for reoperation, and discharge status were recorded.

The questionnaire was validated for content and clarity by a panel of healthcare professionals. It was available in both paper and electronic formats to ensure accessibility.

### Data Collection Procedure

The questionnaire was administered through structured interviews conducted by trained research assistants. Data were collected retrospectively from patients by direct interview (during clinic visits).

### Ethical Considerations

Ethical approval was obtained from the College of Medicine/ Wasit University. Participation was voluntary, and all data were anonymized to protect patient confidentiality. Informed consent was taken from all participants before answering the questionnaire.

### Data Analysis

Collected data were entered into SPSS software program version 26 for analysis. Descriptive statistics, such as means and standard deviations for continuous variables and frequencies for categorical variables, were used to summarize the data. Associations between independent variables (e.g., demographics, medical history, surgical details) and the presence of postoperative complications were analyzed using the Chi-Square test. A p-value of <0.05 was considered statistically significant.

## RESULTS

### Demographics and Clinical Characteristics

A total of 200 patients undergoing gastrointestinal surgeries participated in the study. Their demographic and clinical characteristics are summarized in Table 1. Half of the participants (50%) were aged between 30 to 50 years old. The majority (65%) of the patients were males and 60% were non-smokers.

**Table 1. Demographic and Clinical Characteristics**

Characteristic	Frequency (%)
<b>Age (years)</b>	
< 30	50 (25.0)
30–50	100 (50.0)
> 50	50 (25.0)
<b>Gender</b>	
Male	130 (65.0)
Female	70 (35.0)
<b>Body Mass Index (BMI)</b>	
< 25 kg/m <sup>2</sup>	60 (30.0)
25–30 kg/m <sup>2</sup>	100 (50.0)
> 30 kg/m <sup>2</sup>	40 (20.0)
<b>Smoking Status</b>	
Non-smoker	120 (60.0)
Former smoker	30 (15.0)
Current smoker	50 (25.0)

### Surgical and Postoperative Outcomes

The surgical details and postoperative outcomes are presented in Table 2. Cholecystectomy had the highest percentage of cases (30%) among the study sample. Followed by 25% with bowel resection. Most of the operations (70%) were elective and 55% of them were done by laparoscopy.

**Table 2. Surgical and Postoperative Outcomes**

Characteristic	Frequency (%)
<b>Type of Surgery</b>	
Appendectomy	40 (20.0)
Cholecystectomy	60 (30.0)
Bowel resection	50 (25.0)
Gastrectomy	30 (15.0)
Others	20 (10.0)
<b>Surgery type</b>	
Elective	140 (70.0)
Emergency	60 (30.0)
<b>Surgical approach</b>	
Open surgery	90 (45.0)
Laparoscopic surgery	110 (55.0)
<b>Prophylactic antibiotics use</b>	
Yes	180 (90%)
No	20(10%)

### Early Postoperative Complications

Early postoperative complications were reported in 60 patients (30%). The distribution of complications is shown in Table 3. Surgical Site Infection (SSI) was mentioned in

33.3% of the total cases with complications. 10 out of 60 (16.7%) were presented with respiratory complications. The same number (10/60) complained of paralytic ileus.

**Table 3. Distribution of Early Postoperative Complications**

Complication	Frequency (%)
Surgical Site Infection (SSI)	20 (33.3)
Respiratory complications	10 (16.7)
Cardiovascular complications	5 (8.3)
Bleeding	8 (13.3)
Paralytic ileus	10 (16.7)
Deep Vein Thrombosis (DVT)	7 (11.7)

**Association Between Factors and Early Postoperative Complications**

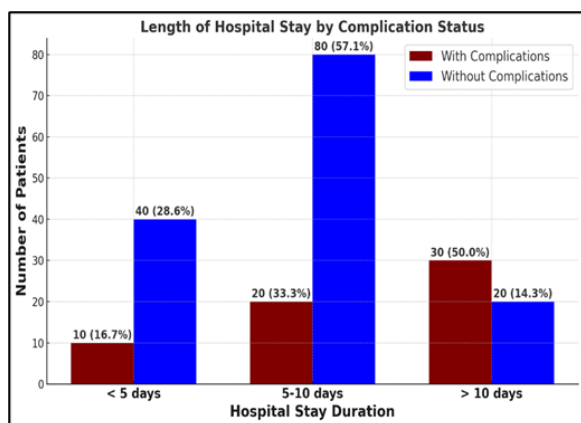
The presence of significant associations between demographic and surgical factors with early postoperative complications is summarized in Table 4. A significant association was noticed between the patients who had complications and those without complications. Half (50%) of the patients who had complications were aged more than 50 years old while 14.3% were only in those without complications (P-value <0.001). Those with higher BMI were found to have more complications than other groups (P-value=0.004). Emergency and open surgeries were related to more complications (P-value <0.001 and 0.001) respectively.

**Table 4. Assessment of Factors Associated with Early Postoperative Complications**

Factor	With Complications n(%)	Without Complications n(%)	p-value
Age > 50 years	30 (50.0)	20 (14.3)	< 0.001
BMI > 30 kg/m <sup>2</sup>	20 (33.3)	20 (14.3)	0.004
Emergency surgery	30 (50.0)	30 (21.4)	< 0.001
Open surgery	40 (66.7)	50 (35.7)	0.001
No prophylactic antibiotics	15 (25.0)	5 (3.6)	< 0.001

**Length of Hospital Stay and Reoperation**

The mean hospital stay was 8 ± 3 days. Patients with complications had a significantly longer stay (10 ± 3 days) compared to those without complications (6 ± 2 days, p < 0.001). Reoperation was required in 15 patients (7.5%), primarily due to anastomosis leaks and wound dehiscence. Figure 1 shows the distribution of hospital stays across patient groups (<5 days, 5–10 days, >10 days), categorized by whether they experienced complications.



**Figure 1. Length of Hospital Stay**

**DISCUSSION**

A total of 200 patients were analyzed, with 30% experiencing early postoperative complications, which is consistent with existing literature that reports complication rates ranging from 10% to over 35% depending on various factors such as the type of surgery and patient demographics [16–18]. The most common complications observed included surgical site infections (SSIs), anastomotic leaks, and thromboembolic events. These findings are consistent with existing literature that identifies SSIs and anastomotic leaks as prevalent issues in GI surgeries [4,7].

The findings of this study on early postoperative complications following gastrointestinal (GI) surgeries in an Iraqi population reveal significant associations between various risk factors and the occurrence of these complications. Notably, factors such as age, body mass index (BMI), and whether the surgery was performed in an emergency setting were identified as critical predictors of complications. These results align with previous literature that emphasizes the importance of patient-related characteristics in determining surgical outcomes. The current study findings regarding high BMI or obesity association with higher rates of post-operative complications run in parallel to retrospective analysis of collected patient data from the ACS-NSQIP database from 2012 to 2018 by Helen J. and her team to a s from [19], which indicated that older patients and those with higher BMI experience higher rates of postoperative complications. Similarly, a Turkish retrospective review of medical records from January 2017 to December 2020 of those who underwent appendectomy, highlighted those elderly patients undergoing appendectomies faced increased complication risks, reinforcing the notion that age is a significant determinant in surgical recovery. So, they need careful preoperative evaluation in these populations [12].

The study's results regarding the type of surgical approach and the influence of postoperative outcomes findings align with Llerena J. et al, Ecuador team, which compared laparoscopic and open surgeries for colorectal cancer treatment. Their review suggested that laparoscopic procedures generally yield lower complication rates due to reduced tissue trauma. While open procedures are associated with higher complication rates due to increased tissue trauma and infection risk a finding that aligns with the current observation that surgical method impacts outcomes [14]. The association between emergency surgeries and higher complication rates found in this study is consistent with Dan Andras and his team, meta-analysis study of 135 peer-reviewed publications from 2000-2023 regarding postoperative complications in colorectal cancer surgery, which noted that urgent procedures often lead to poorer outcomes due to factors such as inadequate preoperative optimization and increased physiological stress on patients [3].

The recommendation for prophylactic antibiotic use to mitigate infection risk aligns with Herra Javed et al.'s narrative review study, which discussed challenges in managing postoperative complications and emphasized preventive strategies as essential for improving surgical outcomes [8].

Patients who experienced complications had a significantly longer mean hospital stay (10 days) compared to those without complications (6 days). This finding is critical as it underscores the broader implications of complications on healthcare resources and patient recovery times, echoing conclusions from Max Bell et. Sweden Cohort study regarding the economic burden of postoperative complications [6]. The need for

reoperation in 7.5% of patients primarily due to anastomotic leaks highlights the severity of certain complications and their potential to necessitate further surgical intervention. This is a well-documented concern in GI surgery literature, reinforcing the importance of identifying at-risk patients preoperatively [20,21]. While this study provides valuable insights, it is essential to acknowledge its limitations, including the reliance on a convenience sampling method and potential biases in self-reported data during patient interviews. Furthermore, regional variations in healthcare practices may limit the generalizability of these findings to broader populations.

## CONCLUSION

The study identified significant associations between specific risk factors (e.g., age, BMI, emergency surgery) and early postoperative complications. Surgical site infections, respiratory complications, and paralytic ileus are commonly encountered complications. Strategies to address these factors, including the use of prophylactic antibiotics, may reduce complication rates. The insights gained from this study suggest several actionable strategies for reducing early postoperative complications: Implementing comprehensive assessments focusing on age, comorbidities, and nutritional status could help identify at-risk patients before surgery. Emphasizing minimally invasive techniques where appropriate may reduce complication rates associated with traditional open surgeries. Establishing standardized protocols for the use of prophylactic antibiotics and nutritional interventions could enhance recovery outcomes across diverse patient populations. Future research should continue to explore these associations across diverse populations to develop more effective strategies for managing postoperative care.

**Conflict of interest.** Nil

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