



Original Article

A Retrospective Study of Surgical Site Infections and Associated Risk Factors in General Surgery

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ABSTRACT

Background: Surgical site infections (SSIs) are among the most common postoperative complications and contribute significantly to morbidity, prolonged hospital stays, and increased healthcare costs.

Objective: To determine the incidence of surgical site infections and to identify the associated risk factors in patients undergoing general surgical procedures.

Materials and Methods: This retrospective observational analytical study was conducted in the Department of General Surgery of a tertiary care hospital. Data were collected from medical records of patients who underwent surgical procedures between January 2025 and December 2025. A total of 200 patients were included. Patient demographics, comorbidities, type and duration of surgery, wound classification, and perioperative factors were analyzed. Surgical site infections were identified based on standard criteria. Statistical analysis was performed using Chi-square test for categorical variables and Student's t-test for continuous variables, with $p < 0.05$ considered statistically significant.

Results: The overall incidence of SSI was **15%**. Higher infection rates were observed in patients with diabetes mellitus, contaminated and dirty wounds, prolonged surgical duration (>2 hours), and emergency procedures, all showing statistically significant association ($p < 0.05$). Patients with SSI had a significantly longer hospital stay compared to those without infection ($p < 0.001$).

Conclusion: Surgical site infections remain a significant concern in general surgery. Identification and modification of risk factors such as diabetes, wound contamination, and operative duration can help reduce SSI incidence and improve patient outcomes.

Keywords: Surgical site infection, retrospective study, wound classification, risk factors, general surgery.

INTRODUCTION

Surgical site infections (SSIs) are among the most common healthcare-associated infections and represent a significant cause of postoperative morbidity and mortality worldwide. According to the World Health Organization, SSIs account for a substantial proportion of all hospital-acquired infections, particularly in low- and middle-income countries where the burden is considerably higher due to resource limitations and variability in infection control practices (1).

SSIs are defined as infections occurring within 30 days after a surgical procedure or within one year in cases involving prosthetic implants, affecting either the incision or deep tissues at the operative site. The Centers for Disease Control and Prevention classifies SSIs into superficial incisional, deep incisional, and organ/space infections, each with varying clinical severity and outcomes (2). These infections not only prolong hospital stay but also increase healthcare costs, readmission rates, and the need for additional surgical interventions.

The incidence of SSIs varies widely across different regions and healthcare settings, ranging from 2% to 20% depending on the type of surgery and patient population. Higher rates are consistently reported in developing countries, where factors

such as inadequate sterilization techniques, overcrowding, and limited surveillance systems contribute to increased infection rates (3). SSIs are associated with significant economic burden, including increased antibiotic usage and longer hospitalization, thereby straining already limited healthcare resources (6).

The pathogenesis of SSIs is multifactorial, involving a complex interaction between microbial contamination, host immunity, and surgical factors. Common causative organisms include *Staphylococcus aureus*, *Escherichia coli*, and other gram-negative bacilli. Patient-related risk factors such as advanced age, diabetes mellitus, obesity, malnutrition, and immunosuppression play a critical role in susceptibility to infection. Procedure-related factors such as duration of surgery, wound classification, surgical technique, and perioperative antibiotic prophylaxis also significantly influence the risk of SSI (4,5).

Wound classification remains an important determinant of SSI risk, with clean wounds having the lowest risk and contaminated or dirty wounds demonstrating significantly higher infection rates. Prolonged surgical duration increases exposure to environmental pathogens and tissue trauma, thereby facilitating microbial colonization. Emergency surgeries are also associated with higher SSI rates due to inadequate preoperative preparation and optimization of patient condition. Despite advancements in surgical techniques, sterilization methods, and antibiotic prophylaxis, SSIs continue to be a major challenge in modern surgical practice. Continuous surveillance and identification of modifiable risk factors are essential for implementing targeted preventive strategies. Retrospective studies provide valuable insights into real-world clinical settings, enabling evaluation of trends, risk factors, and outcomes associated with SSIs.

Therefore, the present study was undertaken to assess the incidence of surgical site infections and to identify associated risk factors in patients undergoing general surgical procedures in a tertiary care setting.

MATERIALS AND METHODS:

Study Design

This study was a **retrospective observational analytical study** conducted to evaluate the incidence of surgical site infections (SSIs) and associated risk factors among patients undergoing general surgical procedures.

Study Setting

The study was carried out in the **Department of General Surgery** of a tertiary care teaching hospital, which caters to a large population and performs a wide range of elective and emergency surgical procedures.

Study Period

Data were collected retrospectively from hospital records over a period of **one year, from January 2025 to December 2025**.

Study Population

The study population included all patients who underwent surgical procedures in the Department of General Surgery during the study period.

Sample Size

A total of **200 patients** who fulfilled the inclusion criteria were included in the study. The sample size was based on the availability of complete medical records during the study period.

Inclusion Criteria

- Patients undergoing **elective and emergency general surgical procedures**
- Patients of **all age groups and both genders**
- Patients with **complete medical and follow-up records** up to 30 days postoperatively

Exclusion Criteria

- Patients with **incomplete or missing medical records**
- Patients lost to follow-up within 30 days after surgery
- Patients with **pre-existing infections at the surgical site**

Definition of Surgical Site Infection

Surgical site infections were defined according to the criteria laid down by the Centers for Disease Control and Prevention as infections occurring within **30 days after surgery** involving the incision or deep tissues at the operative site.

SSIs were classified into:

- Superficial incisional SSI
- Deep incisional SSI
- Organ/space SSI

Data Collection

Data were retrieved from:

- Medical records
- Operation theatre registers
- Infection control surveillance records

Data Management

Data were entered into Microsoft Excel and analyzed using SPSS version 20.0. Continuous variables were expressed as **mean ± standard deviation**, and categorical variables as **frequencies and percentages**.

The **Chi-square test** was used to assess associations between categorical variables, and the **Student's t-test** was applied for comparison of continuous variables. A **p-value < 0.05** was considered statistically significant

Ethical Considerations

- Approval was obtained from the **Institutional Ethics Committee** prior to the study
- Patient confidentiality was maintained
- Data were used strictly for research purposes

RESULTS:

A total of **200 patients** who underwent general surgical procedures during the study period were included in the analysis. The majority of patients were **male (60%)**, with a mean age of **45 ± 12 years**, indicating that middle-aged individuals constituted the predominant study population (Table 1).

Table 1: Demographic Characteristics of Study Population

Variable	Category	Value
Age (years)	Mean ± SD	45 ± 12
Gender	Male	120 (60%)
	Female	80 (40%)

The overall incidence of SSI in this study was **15%**, indicating that approximately **1 in 7 patients** developed postoperative infection (Table 2)

Table 2: Incidence of Surgical Site Infection

SSI Status	Number	Percentage
Present	30	15%
Absent	170	85%

SSI was significantly higher in **contaminated and dirty wounds**, demonstrating the strong influence of microbial load and wound environment on infection rates (Table 3)

Table 3: SSI According to Wound Classification

Wound Class	SSI Present	SSI Absent	Total
Clean	2	60	62
Clean-contaminated	5	55	60
Contaminated	12	30	42
Dirty	11	25	36

A statistically significant association was observed between SSI and **diabetes mellitus, duration of surgery, type of surgery (emergency), and wound contamination** ($p < 0.05$) (Table 4).

Table 4: Association of Risk Factors with SSI

Risk Factor	SSI Present	SSI Absent	P-value
Diabetes Mellitus	18	40	<0.05
Non-diabetic	12	130	—
Surgery > 2 hours	22	50	<0.05
Surgery ≤ 2 hours	8	120	—
Emergency Surgery	15	45	<0.05
Elective Surgery	15	125	—
Contaminated/Dirty Wound	23	55	<0.01
Clean/Clean-contaminated	7	115	—

Patients with SSI had a **significantly prolonged hospital stay**, reflecting increased morbidity and healthcare burden (Table 5).

Table 5: Duration of Hospital Stay

Group	Mean Hospital Stay (days)	P-value
SSI Present	14 ± 4	<0.001
SSI Absent	7 ± 2	

DISCUSSION:

Surgical site infections (SSIs) continue to be a significant cause of postoperative morbidity despite advances in surgical techniques and infection control practices. In the present study, the overall incidence of SSI was found to be **15%**, which is comparable to rates reported in similar studies conducted in developing countries, where SSI incidence ranges between 10% and 20% (**7,8**). The relatively higher incidence in such settings may be attributed to resource constraints, overcrowding, and variability in adherence to aseptic protocols.

In this study, diabetes mellitus was identified as a significant risk factor for SSI. Hyperglycemia impairs leukocyte function, reduces phagocytic activity, and delays wound healing, thereby increasing susceptibility to infection. Similar findings have been reported in previous studies, which demonstrated a strong association between diabetes and postoperative infections (9,10). Effective perioperative glycemic control is therefore essential in reducing SSI rates.

Wound classification was another important determinant of SSI in this study. A significantly higher incidence of infection was observed in contaminated and dirty wounds compared to clean wounds. This observation is consistent with established literature, which indicates that infection rates increase proportionally with the degree of microbial contamination (11). The higher bacterial load in contaminated wounds predisposes to infection, especially in the presence of devitalized tissue.

The duration of surgery was also found to be significantly associated with SSI. Procedures lasting more than two hours had a higher infection rate compared to shorter procedures. Prolonged operative time increases tissue exposure, risk of contamination, and surgical trauma, all of which contribute to infection development. Similar associations have been reported in multiple studies, emphasizing operative duration as a key modifiable risk factor (12,13).

Emergency surgeries were associated with a higher incidence of SSI compared to elective procedures. This may be due to inadequate preoperative preparation, poor patient optimization, and higher likelihood of contaminated surgical fields in emergency settings. Previous studies have similarly reported increased SSI rates in emergency surgeries (14).

Another important finding of the present study was the significant increase in hospital stay among patients with SSI. Patients who developed SSI had nearly double the duration of hospitalization compared to those without infection. This finding is consistent with previous reports, which highlight the economic burden of SSIs due to prolonged hospital stay, increased antibiotic use, and additional interventions (15,16).

The present study highlights the importance of identifying modifiable risk factors to reduce SSI incidence. Measures such as strict aseptic techniques, appropriate antibiotic prophylaxis, optimal glycemic control, and minimizing operative duration can significantly reduce postoperative infections.

However, this study has certain limitations. Being a retrospective study, it is subject to limitations such as incomplete data and potential bias. Additionally, the absence of microbiological analysis and lack of long-term follow-up may limit the comprehensive evaluation of infection patterns.

CONCLUSION:

Surgical site infections remain a significant postoperative complication in general surgery. Factors such as diabetes mellitus, contaminated wounds, prolonged surgery, and emergency procedures were significantly associated with increased risk. Early identification and modification of these factors, along with strict aseptic measures and appropriate antibiotic use, can help reduce SSI rates.

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