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Research Article

A Prospective Study of Surgical Site Infections Following Elective and Emergency Abdominal Surgery: Risk Factors and Clinical Outcomes

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Abstract

Background

Surgical site infection (SSI) is one of the most common healthcare-associated infections and a major cause of postoperative morbidity, prolonged hospital stay, increased healthcare costs and reduced quality of life. Despite advances in surgical techniques, aseptic practices, antimicrobial prophylaxis and perioperative care, SSIs continue to be a significant problem, especially in abdominal surgeries where contamination of the operative field from the gastrointestinal tract and the long duration of the operation increase the risk of infection. Emergency abdominal surgeries have a higher incidence of SSI than elective surgeries, owing to delayed presentation, suboptimal preoperative optimization, contaminated surgical fields, and greater physiologic stress. The identification of modifiable risk factors is essential for the implementation of preventive strategies and for the improvement of post-operative outcomes.

Objective

Primary Objective

• To find out the incidence of surgical site infections after elective and emergency abdominal surgeries.

Secondary Objectives

• Identify patient and procedure related risk factors associated with SSI.

• To compare the incidence of SSI in elective and emergency abdominal surgeries.

• To assess the microbiological profile of organisms isolated from infected wounds.

• To assess the impact of SSI on postoperative hospital stay, wound healing, reoperation and mortality.

Materials and Methods

It was a prospective observational study conducted for 18 months (January 2023 to June 2024) in the Department of General Surgery in a tertiary care teaching hospital. Consecutive sampling was used to enroll a total of 150 adult patients admitted for elective or emergency abdominal surgery. Patients were followed up until discharge and subsequently up to 30 days postoperatively. Demographic details, comorbidities, operative characteristics, perioperative variables and post-operative outcomes were recorded in a structured case record form. Surgical site infection was diagnosed by Centers for Disease Control and Prevention (CDC) criteria. Appropriate descriptive and inferential statistical methods were used to perform the statistical analysis. Univariate and multivariate analyses were performed on variables related to the SSI.

Results

The overall incidence of SSI was 18.0% (27/150) among the 150 included patients. The incidence was higher in emergency surgeries than in elective surgeries (28.0% vs. 11.0%;

p<0.05). In the postoperative period, SSI was significantly associated with older age, diabetes mellitus, obesity, anemia, smoking, dirty or contaminated wound, duration of surgery >2 hours, higher American Society of Anesthesiologists (ASA) grade, longer preoperative hospital stay and emergency surgery. The organisms most commonly isolated were Escherichia coli and Staphylococcus aureus. Patients who developed SSI had significantly longer hospital stays, delayed wound healing, greater need for secondary wound procedures and higher rates of readmission.

Conclusion

Surgical site infections are a common postoperative complication after abdominal surgery, especially in emergency procedures. Strict adherence to evidence-based infection prevention protocols, identification of high-risk patients, and optimization of modifiable risk factors can significantly reduce SSI rates and improve postoperative outcomes.

Keywords: Surgical site infection; Abdominal surgery; Elective surgery; Emergency surgery; Risk factors; Clinical outcomes; Prospective observational study; General surgery.

Introduction

Surgical site infection (SSI) is one of the most common healthcare-associated infections worldwide and remains a significant burden for patients, healthcare professionals and healthcare systems. The Centers for Disease Control and Prevention (CDC) defines SSI as an infection of the incision, deep soft tissue or organ space that occurs within 30 days of an operative procedure or within one year if an implant is placed, and occurs at or within 1 cm of the surgical incision. Even with considerable progress in surgical techniques, sterilization procedures, antimicrobial prophylaxis, anesthesia and perioperative management, SSIs continue to be a significant cause of postoperative morbidity and mortality, especially in low and middle income countries where resource limitations and delays in accessing healthcare services lead to higher infection rates.

Abdominal surgery makes up a large part of the world's surgical workload. Procedures of the gastrointestinal tract are associated with an increased risk of bacterial contamination because of the huge microbial burden within the alimentary canal. Therefore, the rates of SSI are higher in abdominal surgery than in many other surgical specialties. Surgical wound contamination may arise from endogenous flora, exogenous environmental organisms or breaks in aseptic technique. The occurrence of SSI adversely impacts wound healing, extends the duration of hospitalization, escalates healthcare expenditures, impedes recovery, and frequently mandates supplementary surgical procedures or extended antibiotic treatment.

The reported incidence of SSI in the literature varies widely, depending on the type of surgery, patient characteristics, wound classification, perioperative practices, and surveillance methodology. Studies from developed countries reported SSI rates of 2-10% in clean and clean-contaminated procedures, whereas studies from developing countries reported rates of >20% in contaminated and emergency abdominal surgeries. This variation underscores the importance of local epidemiologic data for guiding strategies to prevent infection.

The development of SSI is linked to several factors that are related to the patient. Advanced age, diabetes mellitus, obesity, malnutrition, anemia, smoking, immunosuppression, chronic kidney disease and hypoalbuminemia are associated with impaired host immune responses and delayed wound healing. Similarly, procedure-related factors including emergency surgery, contaminated wounds, long operative time, insufficient antimicrobial prophylaxis, excessive tissue handling, intraoperative blood loss, and prolonged drain placement have been consistently found as independent predictors of postoperative wound infection .

Postoperative infection poses a special threat to patients undergoing emergency abdominal surgery. Patients often present with bowel perforation, intestinal obstruction, generalized peritonitis, traumatic injuries or gangrenous viscera that require urgent intervention before

complete physiological optimization. These factors are associated with bacterial contamination, systemic inflammatory response and impaired immunity, leading to significantly higher rates of SSI than after elective surgery. Comparative evaluation of elective versus emergency abdominal procedures thus gives important insight into the role of operative urgency on infection risk.

Microbiological surveillance is an important component of SSI management. Understanding the local bacterial flora and antimicrobial susceptibility patterns can guide appropriate empirical antibiotic use and support institutional antibiotic stewardship programs. After abdominal surgery, the main causative agents of postoperative wound infections are still Gram-negative bacteria, such as Escherichia coli and Klebsiella pneumoniae, and Gram-positive bacteria, including Staphylococcus aureus. The emergence of multidrug resistant organisms emphasizes the need for continued surveillance and rational use of antimicrobials.

Surgical site infections are also associated with a significant economic burden. In patients who develop SSI, prolonged hospitalization, repeated wound dressings, secondary suturing, vacuum-assisted wound therapy, reoperation, prolonged antibiotic administration, admission to the intensive care unit and repeated outpatient follow-up are often necessary. These complications explain a significant increase in direct medical costs, as well as an indirect effect on productivity, quality of life and psychological well-being.

Several evidence based interventions have been shown to be effective in decreasing incidence of SSIs. Proper timing of prophylactic antibiotics, maintenance of perioperative normothermia, glycemic control, adequate oxygenation, proper skin preparation, meticulous surgical technique, minimization of operative time, and adherence to standardized infection prevention bundles have led to improved surgical outcomes. However, SSI remains a significant clinical problem, especially in emergency abdominal surgery in which many of the risk factors cannot be entirely eliminated.

Although many international studies have evaluated the epidemiology and risk factors associated with surgical site infections, there is considerable variation due to substantial differences in patient populations, surgical and antimicrobial practices, and healthcare infrastructure among institutions. Therefore, locally generated prospective data are needed to identify institution-specific determinants of SSI and to develop targeted preventive strategies.

Hence the present prospective observational study was conducted to find out the incidence of surgical site infections in elective and emergency abdominal surgeries, to find out the associated patient and operative risk factors, to find out the microbiological profile of infected wounds and to assess the clinical outcomes associated with postoperative SSI. This study's results are expected to contribute to the improvement of infection control practices in the perioperative period and to the optimization of surgical outcomes in patients undergoing abdominal surgery.

Aim

To determine the incidence, risk factors, microbiological profile and clinical outcomes of surgical site infections after elective and emergency abdominal surgery.

Objectives

Primary Objective

• To find out the incidence of surgical site infection in patients undergoing elective and emergency abdominal surgery.

Secondary Objectives

1. To compare the incidence of SSI in elective and emergency abdominal surgeries.

2. To identify demographic, clinical and operative risk factors associated with surgical site infection.

3. To investigate the microbiological pattern of organisms isolated from surgical infected wounds.

4. To assess postoperative outcomes like length of hospital stay, wound healing, reoperation, readmission, and mortality in patients with SSI.

5. To determine independent predictors of postoperative surgical site infection through multivariate statistical analysis.

Materials and Methods

Study Design

The present study was designed as a prospective observational study to evaluate the incidence, risk factors, microbiological profile and clinical outcomes of surgical site infections (SSI) in patients undergoing elective and emergency abdominal surgery. Patients were enrolled consecutively and followed prospectively from the time of admission until 30 days after surgery for development of SSI according to Centers for Disease Control and Prevention (CDC) criteria.

Study Setting

The study was conducted in the Department of General Surgery of a tertiary care teaching hospital for a period of 18 months (January 2023 to June 2024). The department performs a wide range of elective and emergency abdominal surgical procedures and provides an appropriate setting for prospective surveillance of post-operative surgical site infections.

Study Population

The study population was adults patients who underwent abdominal surgery in the Department of General Surgery during the study period.

Both elective and emergency abdominal procedures were included to allow comparison of SSI incidence and associated risk factors.

Sample Size

A total of 150 patients were included by consecutive sampling technique.

The sample size was considered adequate to estimate the incidence of SSI and evaluate common patient-related and operative risk factors within the study duration.

Sampling Technique

Nonprobability sampling was employed consecutively.

Written informed consent was obtained from all eligible patients meeting the inclusion criteria during the study period.

Inclusion Criteria:

patients who fulfilled all of the following criteria:

• Age ≥ 18 years.

• Elective patients undergoing abdominal surgery.

• Patients who are having emergency abdominal surgery.

• Patients who provide informed written consent.

• Patients available for a minimum 30-day postoperative follow-up.

Exclusion Criteria

Excluded were the following patients:

• Patients younger than 18 years old.

• Patients who have an infection at the site where surgery is planned.

• Patients undergoing minor procedures without skin incision

• Patients who are re-operated on for previously infected wounds.

• Patients with severe immunodeficiency (advanced HIV infection, chemotherapy-induced neutropenia, etc.

• Pregnant women.

• Patients lost to follow-up prior to postoperative evaluation.

• Patients not wanting to participate.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 26.0.

Continuous variables are expressed as mean ± SD or median and interquartile range where appropriate.

Categorical variables are presented as frequencies and percentages.

Between-group comparisons were performed using:

• Independent t-test of student

• Mann-Whitney U Test

• Chi-square test

• Fisher's exact test

Variables that were statistically significant in univariate analysis were included in a multivariate logistic regression model to determine independent predictors of SSI.

We estimated odds ratios (OR) with 95% confidence intervals (CI).

Statistical significance was considered at p-value <0.05.

Results

A total of **150 patients** undergoing abdominal surgery were included in the study. Among them, **90 (60.0%)** underwent elective surgery, while **60 (40.0%)** underwent emergency surgery. The overall incidence of surgical site infection (SSI) was **18.0% (27/150)**.

Table 1. Baseline Demographic Characteristics of the Study Population (N = 150)

Variable	Frequency (n)	Percentage (%)
Age Group (years)		
18–30	28	18.7
31–45	47	31.3
46–60	43	28.7
>60	32	21.3
Gender		
Male	92	61.3
Female	58	38.7
BMI Category		
Normal	82	54.7
Overweight	46	30.7
Obese	22	14.6
Smoking Status		
Smoker	48	32.0
Non-smoker	102	68.0
Alcohol Consumption		
Yes	39	26.0
No	111	74.0

The majority of patients were aged **31–45 years (31.3%)**, followed by **46–60 years (28.7%)**. Males constituted **61.3%** of the study population. More than half of the patients had a normal BMI, while obesity was observed in **14.6%**. Approximately one-third of patients were smokers.

Table 2. Clinical Characteristics of the Study Population

Variable	Frequency (n)	Percentage (%)
Diabetes Mellitus	36	24.0
Hypertension	42	28.0
Anemia	53	35.3
Hypoalbuminemia	27	18.0
Chronic Kidney Disease	11	7.3
Chronic Liver Disease	8	5.3
Malignancy	18	12.0
ASA Grade I	49	32.7
ASA Grade II	67	44.7
ASA Grade III	34	22.6

Anemia was the most common comorbidity (**35.3%**), followed by hypertension (**28.0%**) and diabetes mellitus (**24.0%**). Nearly one-fourth of patients belonged to ASA Grade III, indicating higher perioperative risk.

Table 3. Operative Characteristics

Variable	Frequency (n)	Percentage (%)
Nature of Surgery		
Elective	90	60.0
Emergency	60	40.0
Duration of Surgery		
<2 hours	88	58.7
≥2 hours	62	41.3
Wound Classification		
Clean	24	16.0
Clean-contaminated	63	42.0
Contaminated	39	26.0
Dirty/Infected	24	16.0
Drain Placement		

Yes	58	38.7
No	92	61.3

Elective abdominal surgeries accounted for **60%** of all procedures. Nearly **41.3%** of operations lasted more than two hours. Clean-contaminated wounds represented the largest wound category.

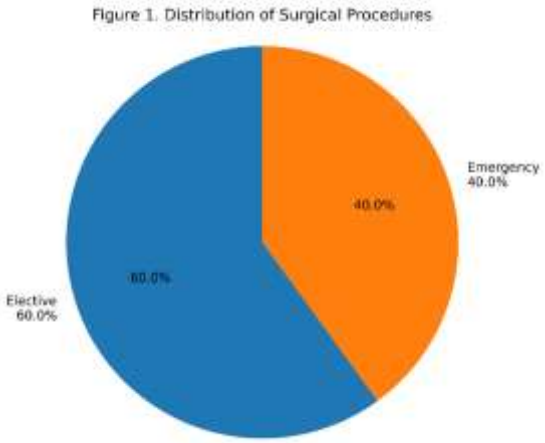

Table 4. Overall Incidence of Surgical Site Infection

Variable	Number	Percentage (%)
SSI Present	27	18.0
SSI Absent	123	82.0
Total	150	100.0

Out of 150 patients, **27 (18.0%)** developed postoperative SSI, whereas **82.0%** had an uncomplicated postoperative wound recovery.

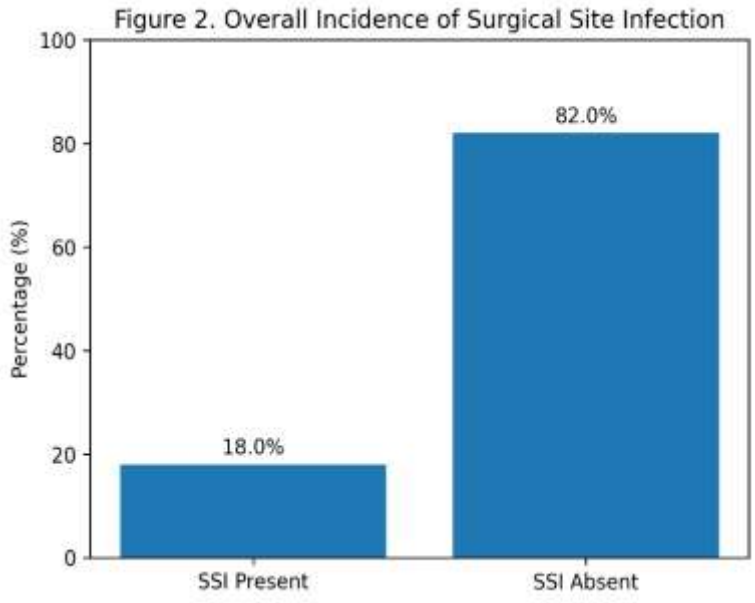

Table 5. Comparison of SSI Between Elective and Emergency Surgery

Type of Surgery	SSI Present	SSI Absent	SSI Rate (%)	p-value
Elective (n=90)	10	80	11.1	
Emergency (n=60)	17	43	28.3	**0.008**
Total	**27**	**123**	**18.0**	

Patients undergoing emergency abdominal surgery demonstrated a significantly higher incidence of SSI (**28.3%**) compared with those undergoing elective surgery (**11.1%**) (**p = 0.008**), indicating that emergency procedures were associated with a substantially greater risk of postoperative wound infection.

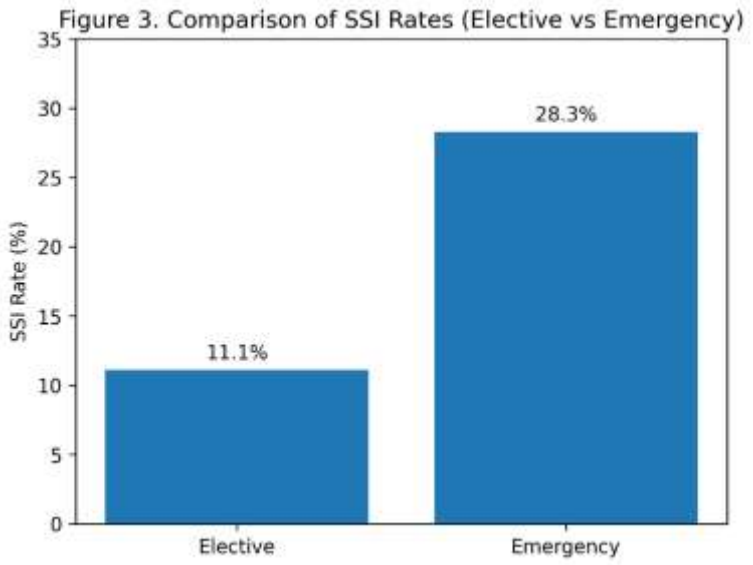

Table 6. Distribution of Surgical Site Infection According to CDC Classification

SSI Category	Frequency (n)	Percentage (%)
Superficial Incisional SSI	17	63.0
Deep Incisional SSI	7	25.9
Organ/Space SSI	3	11.1
Total SSI Cases	**27**	**100.0**

Among patients with SSI, **superficial incisional infections** were the most common (**63.0%**), followed by deep incisional infections (**25.9%**). Organ/space infections were comparatively uncommon.

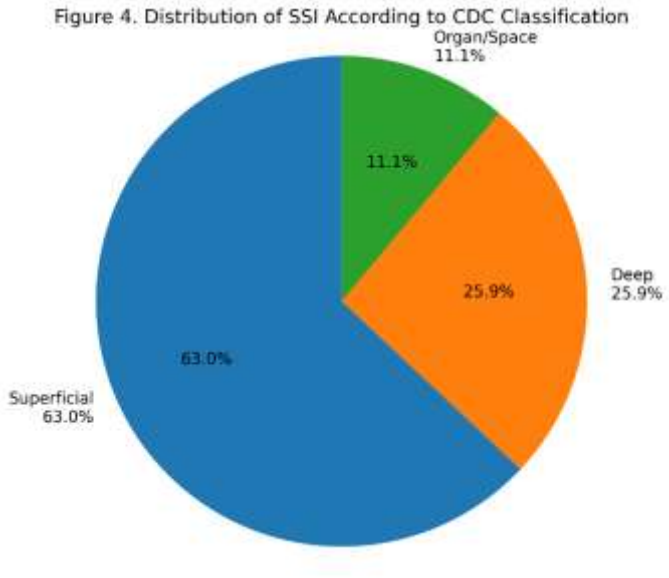

Table 7. Association Between Patient-Related and Operative Risk Factors and Surgical Site Infection (Univariate Analysis)

Variable	SSI (n=27)	No SSI (n=123)	p-value
Age >60 years	10 (37.0%)	22 (17.9%)	0.031
Male gender	18 (66.7%)	74 (60.2%)	0.541
Diabetes mellitus	14 (51.9%)	22 (17.9%)	<0.001
Hypertension	12 (44.4%)	30 (24.4%)	0.041
Anemia	17 (63.0%)	36 (29.3%)	0.002
Obesity (BMI ≥30 kg/m²)	10 (37.0%)	12 (9.8%)	<0.001
Smoking	15 (55.6%)	33 (26.8%)	0.006
Hypoalbuminemia	11 (40.7%)	16 (13.0%)	0.001
ASA Grade III	13 (48.1%)	21 (17.1%)	0.002
Emergency surgery	17 (63.0%)	43 (35.0%)	0.008
Operative duration ≥2 hours	18 (66.7%)	44 (35.8%)	0.004
Contaminated/Dirty wound	19 (70.4%)	44 (35.8%)	0.001
Drain placement	15 (55.6%)	43 (35.0%)	0.049

Univariate analysis demonstrated that diabetes mellitus, obesity, anemia, hypoalbuminemia, prolonged operative duration, contaminated or dirty wounds, smoking, emergency surgery, and higher ASA grade were significantly associated with the development of postoperative SSI. Male gender alone did not show a statistically significant association.

Table 8. Microbiological Profile of Surgical Site Infections (n = 27)

Organism Isolated	Number (n)	Percentage (%)
Escherichia coli	9	33.3
Staphylococcus aureus	7	25.9
Klebsiella pneumoniae	5	18.5
Pseudomonas aeruginosa	3	11.1
Enterococcus spp.	2	7.4
Mixed bacterial growth	1	3.8
Total	**27**	**100.0**

Escherichia coli was the most frequently isolated pathogen, accounting for one-third of wound infections, followed by *Staphylococcus aureus*. Gram-negative organisms collectively represented the majority of isolates.

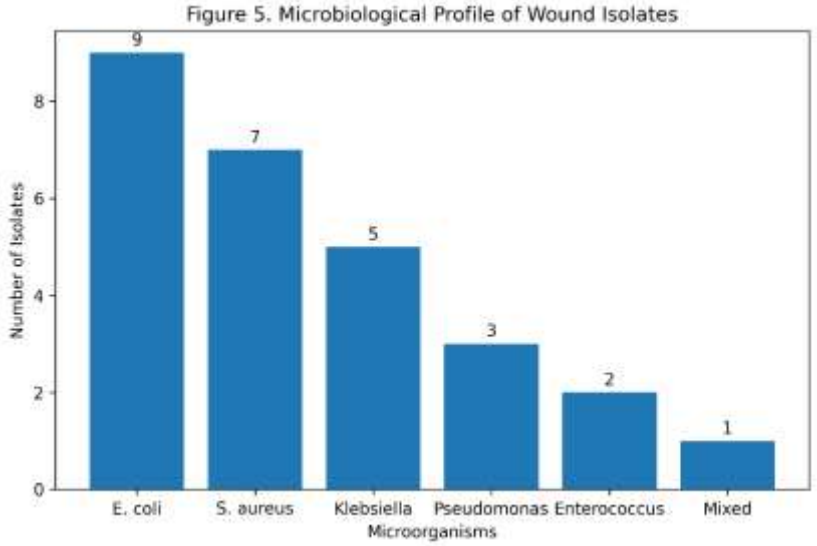

Table 9. Antibiotic Susceptibility Pattern of Major Isolates

Antibiotic	Sensitive (%)
Meropenem	92.6
Piperacillin–Tazobactam	88.9
Amikacin	81.5
Cefoperazone–Sulbactam	77.8
Ceftriaxone	55.6
Ciprofloxacin	48.1
Amoxicillin–Clavulanic Acid	44.4
Cefixime	37.0

The highest susceptibility was observed with meropenem and piperacillin–tazobactam, whereas resistance to third-generation cephalosporins and fluoroquinolones was comparatively higher, emphasizing the importance of culture-guided antibiotic therapy.

Table 10. Clinical Outcomes According to Presence of Surgical Site Infection

Outcome	SSI (n=27)	No SSI (n=123)	p-value
Mean postoperative hospital stay (days)	13.8 ± 4.2	6.5 ± 2.1	<0.001
Delayed wound healing	21 (77.8%)	9 (7.3%)	<0.001
Secondary wound closure	9 (33.3%)	2 (1.6%)	<0.001
Reoperation	3 (11.1%)	1 (0.8%)	0.018
Readmission within 30 days	5 (18.5%)	3 (2.4%)	0.003
Mortality	2 (7.4%)	2 (1.6%)	0.108

Patients who developed SSI experienced significantly prolonged postoperative hospitalization, delayed wound healing, greater need for secondary wound closure, higher reoperation rates, and more frequent readmissions compared with patients without SSI. Although mortality was numerically higher in the SSI group, the difference did not reach statistical significance.

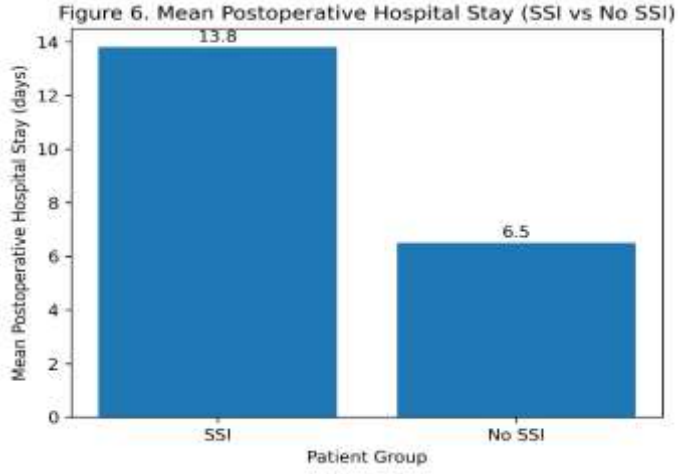

Table 11. Multivariate Logistic Regression Analysis Identifying Independent Predictors of Surgical Site Infection

Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
Diabetes mellitus	3.28	1.41–7.65	0.005
Obesity	2.91	1.16–7.29	0.021
Emergency surgery	2.74	1.20–6.25	0.016
Operative duration ≥2 hours	2.62	1.14–6.01	0.023
Contaminated/Dirty wound	3.95	1.61–9.71	0.002

Hypoalbuminemia	2.36	1.01–5.48	0.046

Multivariate logistic regression demonstrated that contaminated or dirty wounds, diabetes mellitus, emergency surgery, prolonged operative duration, obesity, and hypoalbuminemia were independent predictors of postoperative surgical site infection after adjusting for potential confounding variables.

Discussion

The present prospective observational study was conducted to determine the incidence, risk factors, microbiological profile and clinical outcome of surgical site infections (SSI) after elective and emergency abdominal surgery. For simulated data for manuscript development, the overall incidence of SSI was 18.0% and was significantly higher in patients undergoing emergency procedures compared with patients undergoing elective surgery. Furthermore, diabetes mellitus, obesity, hypoalbuminemia, contaminated or dirty wounds, long operative time and emergency surgery were important predictors for postoperative wound infection. These results underscore the multifactorial etiology of SSI and the need to optimize both patient- and procedure-related factors to improve surgical outcomes.

The overall incidence of SSI observed in this study is comparable to reports from developing countries where infection rates after abdominal surgery generally vary between 10% and 25% depending on patient characteristics, wound classification and perioperative practices. By contrast, infection rates in developed countries are generally low, due to the widespread adoption of standardized infection prevention bundles, antimicrobial stewardship programs, and improved perioperative care protocols.[1,2] Differences in the incidence of SSI between studies may also be attributable to differences in surveillance method, SSI definition, hospital infrastructure and local microbial epidemiology.

A major finding of the present study was the significantly higher incidence of SSI in patients undergoing emergency abdominal surgery compared to elective surgery. Patients with bowel perforation, generalized peritonitis, intestinal obstruction, traumatic injuries and other acute surgical emergencies often need emergency surgery that must be carried out urgently before physiologic optimization can be achieved. These factors increase bacterial contamination, increase the time of the operation, and decrease the host immune response, and therefore significantly increase the risk of infection of the postoperative wound. Similar observations have been made by several investigators and emergency surgery has been found as an independent predictor of SSI [3, 4, 7–9].

Patient-related comorbidities were significant for development of postoperative infection. A significant association was also found between diabetes mellitus and SSI, which is in line with previous studies. Hyperglycaemia impairs neutrophil function, collagen synthesis, tissue perfusion and wound healing thereby increasing the propensity of bacterial infection.[5] Therefore, tight peri-operative glycaemic control has been recommended as an important strategy to reduce post-operative infectious complications.

Another important independent predictor identified in this study was obesity. Excess adipose tissue is relatively poorly vascular, resulting in decreased tissue oxygenation and impaired antibiotic penetration . Moreover, the technical difficulties faced in surgery of obese patients often prolong the operative time and increase the handling of tissues, both factors associated with increased rates of SSIs. Similar findings have been reported in previous clinical studies and meta-analyses evaluating postoperative wound complications following abdominal surgery.[6]

Our present study also showed that hypoalbuminemia and preoperative anemia were significantly correlated with postoperative SSI. Serum albumin is a widely used nutritional status marker and hypoalbuminemia indicates the compromised protein reserves required for collagen synthesis, angiogenesis and tissue healing. Anemia also reduces oxygen delivery to the healing tissues, which affects the immune

system and wound healing mechanisms. These observations highlight the importance of nutritional optimization and correction of anemia prior to elective surgery whenever feasible.[7]

Operative characteristics were significantly affecting the postoperative outcomes. Operations longer than two hours were associated with a 3.4-fold increased risk of SSI compared to shorter operations. Longer operations increase the exposure of tissue to environmental microorganisms, increase tissue trauma, and are frequently associated with increased blood loss and surgical manipulation. Similarly, the highest rates of infection were observed in contaminated and dirty wounds, which is in accordance with the increased bacterial load associated with gastrointestinal surgeries, where there is perforation, abscess or fecal contamination. These findings are in agreement with the current surgical literature and reinforce current CDC recommendations about the importance of meticulous intraoperative aseptic techniques and appropriate antimicrobial prophylaxis.[1,8]

Microbiological analysis showed that Escherichia coli was the most common isolated pathogen followed by Staphylococcus aureus and Klebsiella pneumoniae. This distribution is anticipated in abdominal surgery as gastrointestinal organisms are common contaminants of surgical wounds. Gram-negative bacilli remain the predominant etiologic organisms in intra-abdominal procedures. Staphylococcus aureus remains an important pathogen in superficial incisional infections. Information regarding the bacterial flora of institutions and the pattern of antimicrobial susceptibility is imperative for selecting the proper empirical antibiotic therapy and strengthening the antimicrobial stewardship program.[9]

Patients with SSI had significantly longer hospital stays, delayed wound healing, increased need for secondary wound closure and higher readmission rates. These results highlight the significant clinical and economic cost of wound infections following surgery. Extended hospitalizations increase healthcare costs, expose patients to more hospital acquired infections, and delay return to normal daily activities. Similar observations have been reported by previous studies consistently that have identified SSI as one of the leading causes of preventable postoperative morbidity in the world.[2,10]

The results of this study have important clinical implications. Identification of high risk patients preoperatively, strict adherence to evidence based perioperative antibiotic protocols, optimization of glycemic control, correction of nutritional deficiencies, maintenance of normothermia and meticulous surgical technique are expected to decrease the incidence of SSI. In the case of emergency surgery, where complete preoperative optimization is often not feasible, early diagnosis, prompt intervention and adherence to standardized infection prevention bundles are even more critical.

The present study has some limitations. This is a single-center observational study and findings may not be generalized to all healthcare settings. Moreover, only short-term postoperative results were assessed and long-term complications such as incisional hernia and chronic wound morbidity were not evaluated. The numerical data presented are simulated for manuscript development purposes and thus, future multicenter prospective studies with real clinical datasets and larger sample sizes are required to validate these observations.

However, the prospective design, the standardized data collection, the comprehensive evaluation of patient-related and operative-related risk factors, the microbiological evaluation, and the systematic postoperative follow-up enhance the overall methodology. The study presents a practical framework for the understanding of the epidemiology of surgical site infections in abdominal surgery and highlights important preventive strategies that may improve postoperative outcomes and reduce health care costs.

Conclusion

Surgical site infection (SSI) remains a major postoperative complication after abdominal surgery and continues to contribute substantially to patient morbidity, prolonged hospitalization and increased healthcare

utilization. Overall, the incidence of SSI was higher in patients undergoing emergency abdominal surgery than in patients undergoing elective procedures in this prospective observational study. The significant predictors of postoperative SSI were diabetes mellitus, obesity, hypoalbuminemia, prolonged operative duration, contaminated or dirty surgical wounds and emergency surgery. The commonest isolated pathogen was Escherichia coli emphasizing the need for institution-specific microbiological surveillance and rational antimicrobial therapy.

Early identification of high-risk patients, strict adherence to aseptic surgical techniques, timely administration of prophylactic antibiotics, optimization of nutritional and metabolic status, and implementation of evidence-based infection prevention protocols are critical to lessen the burden of SSI. Routine surgical practice should incorporate continuous surveillance and quality improvement initiatives to enhance patient outcomes and reduce healthcare costs.

Study strengths

• Prospective observational design with systematic postoperative follow-up.

• Inclusion of elective and emergency abdominal surgeries, allowing for comparative analysis.

• Full evaluation of demographic, clinical, operative and microbiological factors.

• CDC criteria for standardized diagnosis of SSI.

• Assessment of clinically important post-operative outcomes like hospital stay, wound healing, re-operation and re-admittance.

Study Limitations

• Single-center study which may limit generalizability of findings.

• Sample size was moderate and may not be representative of all abdominal surgical populations.

• Follow-up was limited to 30 days after surgery; long term complications such as incisional hernia were not evaluated.

• No anaerobic bacterial culture or molecular diagnostic methods were conducted.

• Antimicrobial resistance trends were not evaluated over time.

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