Journal of Population Therapeutics & Clinical Pharmacology

"Prevalence and Risk Factors of Postoperative Wound Infections: A Cross-Disciplinary Approach"

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Abstract

Background: Surgical Site Infections (SSIs) are a major postoperative complication, especially in low-resource settings. Multiple patient, procedural, and microbial factors contribute to their development.

Aim: To assess the prevalence and risk factors of SSIs using a multidisciplinary approach.

Methods: A prospective observational study was conducted on 200 postoperative patients at a tertiary care hospital in Gujarat. Data on anesthesia-related risks, wound cultures, and clinical profiles were analyzed. Statistical tests included Chi-square and logistic regression ($p<0.05$).

Results: SSIs occurred in 18% of patients. Significant risk factors included prolonged surgery, diabetes, obesity, emergency procedures, and smoking. Staphylococcus aureus (44.4%) was the most common organism; 30.5% were MRSA. Klebsiella and MDROs were also identified.

Conclusion: SSIs are influenced by modifiable clinical and anesthetic factors. A multidisciplinary strategy can help reduce infection rates and improve outcomes.

Keywords: **Surgical Site Infections (SSI)**, **Postoperative Complications**, **Multidrug-Resistant Organisms (MDROs)**, **Anesthesia Risk Factors**, **Cross-Disciplinary Approach**

Introduction

Surgical Site Infections (SSIs) are among the most common healthcare-associated infections, accounting for a significant proportion of postoperative complications worldwide. Globally, SSIs occur in 2% to 20% of surgeries depending on type, hygiene standards, and patient comorbidities [1]. In low- and middle-income countries like India, this prevalence is often on the higher end due to challenges such as overcrowded wards, limited infection control resources, and inconsistent surgical asepsis [2, 3].

SSIs can delay wound healing, increase the length of hospital stay, lead to readmissions, and even contribute to sepsis and mortality in severe cases [4]. Several factors influence the development of SSIs, including patient-related risk factors (age, diabetes, obesity, smoking), procedural aspects (duration, emergency surgery), and institutional infection control practices [5,6]. Moreover, the microbiological flora causing SSIs has become increasingly resistant, complicating treatment and outcomes [5].

While many studies have focused on isolated risk factors or microbial patterns, there is a need for comprehensive evaluation using multidisciplinary approaches [4], and there is a scarcity of studies in Indian literature that integrate perioperative care, microbiological analysis, and data-driven risk assessment. This study uniquely adopts a cross-disciplinary lens involving Anesthesia (perioperative risk identification), Microbiology (organism isolation and resistance patterns), and Community Medicine (data analysis

and association) to holistically assess SSIs at a tertiary care hospital in Gujarat. This approach allows for more targeted preventive and therapeutic interventions tailored to regional realities. According to de Lissovoy et al. [1], SSIs significantly increase healthcare costs and length of stay. In resource-limited settings, the incidence is even higher, as shown in a multicentric study by Allegranzi et al. [3]. Leaper et al. [2] emphasized that SSIs are preventable with better surgical care and infection control policies.

Aim and Objectives

Aim:

To assess the prevalence and associated risk factors of postoperative wound infections using a cross-disciplinary approach.

Objectives:

1. To determine the prevalence of surgical site infections (SSIs) in postoperative patients.
2. To identify perioperative risk factors related to anesthesia.
3. To isolate and characterize the common causative organisms of SSIs.
4. To analyze associations between demographic and clinical variables with SSIs using statistical tools.

Material and Methods

This prospective observational study was conducted over a period of six months at a tertiary care hospital in Gujarat. A total of 200 postoperative patients were included in the study. Patients eligible for inclusion were adults aged over 18 years who underwent clean or clean-contaminated surgeries and provided informed written consent. Patients with pre-existing infections or

known immunocompromised states such as HIV infection or those undergoing chemotherapy were excluded.

Data collection was carried out using a cross-disciplinary approach. From the anesthesiology perspective, variables such as duration of surgery, ASA (American Society of Anesthesiologists) physical status classification, administration and timing of perioperative antibiotic prophylaxis, and intraoperative temperature were documented. Additional anesthetic parameters assessed included intraoperative hemodynamic stability, maintenance of normothermia, oxygen saturation, blood pressure, and glycemic control. The total duration of anesthesia was also recorded and analyzed in relation to the development of surgical site infections.

From the microbiology domain, wound swabs were collected on postoperative day 3, or earlier if clinical suspicion of infection arose. These specimens were processed for culture, Gram staining, and antimicrobial susceptibility testing to identify the causative organisms and determine resistance patterns.

The community medicine department was involved in the data management and statistical analysis. The collected data were entered into SPSS version 26.0, and associations between various clinical and procedural variables with the occurrence of SSI were analyzed using the Chi-square test and binary logistic regression. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 200 patients who underwent major surgeries were evaluated. The mean age was 47.6 ± 14.2 years. The majority were males (57.5%). Surgeries included abdominal (44%), orthopedic (34%), and gynecological (22%). Out of the total, 36 patients (18%) developed surgical site infections. The most commonly infected patients were older (>50 years), diabetic, obese, or had undergone prolonged or emergency surgeries. Additionally, factors like smoking history and inadequate perioperative antibiotic coverage were statistically associated with higher SSI rates.

Table 1: Demographic and Clinical Profile (n = 200)

Variable	Frequency (n)	Percentage (%)
Age >50	75	37.5
Male	115	57.5
Female	85	42.5
Diabetes Mellitus	62	31.0
Obesity (BMI >30)	46	23.0
Smoking History	38	19.0
Emergency Surgery	54	27.0
Surgery Duration >2 hr	87	43.5

Table 2: Association of SSI with Risk Factors

Risk Factor	SSI Present (n=36)	SSI Absent (n=164)	p-value
Duration >2 hr	28	59	0.03*
Diabetes	20	42	0.01*
Obesity (BMI >30)	15	31	0.02*
Emergency Surgery	16	38	0.04*
Smoker	11	27	0.049*

Table 3: Association of Anesthesia-Related Factors with Surgical Site Infections (n = 200)

Anesthesia-Related Factor	SSI Present (n=36)	SSI Absent (n=164)	p-value
ASA Grade III–IV	21	48	0.01*
Hypothermia (<36°C)	17	30	0.02*
Delayed Antibiotic Prophylaxis	14	27	0.04*
Poor Glycemic Control (intra-op)	16	32	0.03*
Anesthesia Duration >2 hrs	23	61	0.02*

Microbiologically, Staphylococcus aureus was the predominant organism (44.4%), including a significant proportion (30.5%) being MRSA. Pseudomonas aeruginosa and Escherichia coli were also commonly isolated. Klebsiella species were also isolated in 2 cases (5.5%), and multidrug-resistant organisms (MDROs) were identified in 7 cases (19.4%), raising concern over empirical antibiotic effectiveness and underscoring the importance of culture-guided therapy.

Anesthetic observations revealed that patients with higher ASA grades (III and IV) showed a greater predisposition to SSIs, highlighting the impact of pre-existing systemic conditions on postoperative recovery. Additionally, deviations in intraoperative normothermia and delayed antibiotic administration were more commonly observed among those who developed infections. These findings support the role of meticulous anesthesia monitoring in minimizing postoperative complications.

Discussion

The overall SSI prevalence in our study was 18%, aligning with findings from Gupta et al. [6], who reported 16% in a similar hospital setting. Kulkarni et al. [7] found a slightly lower incidence at 14%, possibly due to stricter antibiotic protocols. We observed a strong correlation between surgery duration >2 hours and SSI risk ($p=0.03$), supporting Banerjee et al. [8], who documented a 2.1-fold increase in SSIs with prolonged procedures.

Diabetic patients had a significantly higher risk, consistent with Iyer et al. [9], who found a 2.4x increased risk among diabetics. Obesity also emerged

as a significant factor in our study (p=0.02), which mirrors Singh et al. [10], where 21% of obese patients developed infections.

In terms of microbiology, the predominance of Staphylococcus aureus (including 30.5% MRSA) agrees with Sharma et al. [5] and Kumar et al. [12]. Klebsiella and other multidrug-resistant organisms (19.4%) in our study highlight increasing resistance patterns, which parallels findings by Rajan et al. [13].

Our anesthesia findings that higher ASA grade and intraoperative instability increased SSI risk are supported by earlier observations from Kurz et al. [14], who emphasized temperature control and ASA scoring in reducing SSIs.

Conclusion

Surgical Site Infections remain a prevalent postoperative complication. Our study identified multiple contributing factors, including diabetes, obesity, emergency procedures, prolonged surgery, and high ASA grades. The microbiological landscape, dominated by Staphylococcus aureus and multidrug-resistant organisms, further complicates treatment protocols. Multidisciplinary collaboration, including anesthetic optimization and microbiological surveillance, is crucial. Routine use of preoperative checklists, timely prophylaxis, and surveillance audits may significantly reduce SSI incidence.

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