

## COMPARISON OF SURGICAL SITE INFECTION IN ELECTIVE VERSUS EMERGENCY ABDOMINAL SURGERIES IN TERTIARY CARE HOSPITAL, LAHORE

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### ABSTRACT

**Objective:** To compare the frequency, risk factors, and types of surgical site infections (SSIs) between elective and emergency surgeries.

**Study Design:** Retrospective comparative cross-sectional.

**Place and Duration of Study:** Surgical wards of Services Hospital, Lahore, from July 2024 to December 2024.

**Methodology:** Simple random sampling was employed to select participants based on eligibility during the study period. A total of 216 patients were included in the study, with 108 patients in the elective surgery group and 108 patients in the emergency surgery group. The sample size was determined using the formula:  $n = Z^2 \times P(1-P) / E^2$ ; Where ZZ represents the Z value, PP is the estimated prevalence, and EE is the desired precision.

**Results:** The results indicated a significantly higher incidence of SSIs in emergency surgeries (36.8%) compared to elective surgeries (21.2%) ( $p = 0.014$ ). Factors such as age ( $p = 0.001$ ), urban residency ( $p = 0.001$ ), and longer hospital stays ( $p = 0.001$ ) were significantly associated with higher SSI rates in emergency surgeries. Superficial SSIs were more common, though not significantly different between the groups. Laparotomies and appendectomies in the emergency group demonstrated significantly higher SSI rates compared to the elective group ( $p < 0.05$ ). Proper instrument sterilization was consistent across both groups.

**Conclusion:** Emergency abdominal surgeries have a higher risk of SSIs compared to elective procedures due to inherent patient and procedural complexities. These findings underscore the importance of targeted interventions, including optimized preoperative preparation and stringent infection control measures, to minimize SSIs in emergency settings.

### INTRODUCTION

Surgical Site Infections (SSIs) rank among the most common nosocomial infections, greatly impacting postoperative morbidity and mortality rates[1]. Surgical site infections (SSIs) manifest in between 2% to

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20% of hospitalized patients receiving surgical interventions, with prevalence differing based on the surgical type, patient characteristics, and institutional protocols[2]. Abdominal surgeries, whether elective or emergency, are particularly susceptible to SSIs due to the high microbial load and the intricacy of these procedures[3]. Worldwide, surgical site infections (SSIs) are linked to prolonged hospitalizations, elevated healthcare expenses, and patient distress, rendering their prevention an essential component of surgical care[4][1].

Studies demonstrate that emergency abdominal operations present an elevated risk of surgical site infections (SSIs) relative to elective surgeries, attributed to inadequate preoperative preparation, increased patient acuity, and procedural complexities[5]. A study by Jadoon et al. (2023) indicated that the rates of surgical site infections (SSI) were 36% in emergency abdominal surgeries compared to 18% in elective procedures[6]. Similarly, additional studies have highlighted risk factors such as prolonged hospital stays, comorbidities, poor antibiotic prophylaxis, and improper sterilization methods as contributors to increased SSI incidence[7]. However, despite substantial research, many studies have been restricted by small sample numbers, lack of local data, and poor stratification of SSI forms and risk variables[8].

This study examines the incidence, risk factors, and kinds of surgical site infections (SSIs) in elective versus emergency abdominal surgeries at a tertiary care hospital in Lahore. This research concentrates on a local community, yielding contextually pertinent data to inform infection control measures and enhance surgical results. Moreover, comprehending the distinctions between elective and emergency operations would facilitate the formulation of focused strategies to mitigate SSI rates and related problems. This research aims to ascertain and compare the incidence of SSIs in elective and emergency abdominal surgeries, assess the related risk factors, and offer evidence-based suggestions to improve infection control efforts in local healthcare environments.

## Methodology

The study utilized a retrospective comparative cross-sectional design to evaluate and compare the frequency and risk factors of surgical site infections (SSIs) in elective and emergency abdominal surgeries. Conducted at Services Hospital, Lahore, a tertiary care teaching institution, the research benefitted from a diverse and representative patient population. The sample included 216 patients, divided equally between the elective and emergency surgery groups. The sample size was calculated using a statistical formula based on prevalence and margin of error, and participants were selected using simple random sampling to ensure unbiased representation. The study spanned six months, encompassing phases of data collection, analysis, and interpretation. Patients aged 15–60 years undergoing abdominal surgeries with clean or clean-contaminated surgical wounds were eligible for inclusion. However, patients with pre-existing skin infections, diagnosed with HIV, Hepatitis B or C, or those undergoing laparoscopic surgeries were excluded. Ethical guidelines set by the institutional review board were strictly followed, with written informed consent obtained from all participants. Patient confidentiality was maintained, and participants retained the right to withdraw from the study at any stage without repercussions.

Data were collected using structured questionnaires and medical records, capturing patient demographics, type of surgery, comorbidities, surgical wound classification, and postoperative outcomes. The elective group included 108 patients, as did the emergency group, and follow-ups were conducted for up to 30 days post-surgery to monitor SSI occurrences. The statistical analysis was performed using SPSS version 26.0. Descriptive statistics summarized patient characteristics and outcomes, while statistical tests such as independent sample t-tests, Mann-Whitney U tests, chi-square tests, and Fisher's exact tests assessed differences between the groups. The significance level for all comparisons was set at ( $p < 0.05$ ). This methodology was designed to ensure a robust and ethical evaluation of SSIs in elective versus emergency surgeries, providing insights into risk factors and procedural outcomes in a tertiary care setting. The findings are expected to guide targeted interventions to reduce SSIs and improve surgical outcomes.

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## Results:

The study analyzed data from 216 patients, divided equally into two groups: elective surgeries (n=108) and emergency surgeries (n=108). A higher proportion of male patients was observed in both groups, with 56.6% in the elective group and 57.5% in the emergency group, showing no statistically significant difference ( $p = 0.887$ ). Age distribution differed significantly between the groups. In the elective group, the majority of patients were aged 31–45 years (69.7%), followed by 25.3% in the 15–30 years range and 5.1% in the 46–60 years range. In contrast, the emergency group had a higher proportion of younger patients aged 15–30 years (38.7%) and older patients aged 46–60 years (26.4%), with only 34% falling in the 31–45 years range ( $p < 0.001$ ). Residency was another significant variable; 70.7% of elective patients resided in urban areas compared to 89.6% of emergency patients ( $p = 0.001$ ). These demographic findings indicate that emergency surgeries were more likely to involve younger and urban residents, potentially reflecting socioeconomic and health-seeking behavior patterns.

**Table 1:** Demographic Data of Study Participants

Variable	Elective (n=108)	Emergency (n=108)	p-Value
Gender (Male)	56 (56.6%)	61 (57.5%)	0.887
Age (15–30 years)	25 (25.3%)	41 (38.7%)	0.049
Age (31–45 years)	69 (69.7%)	36 (34%)	0.001
Age (46–60 years)	5 (5.1%)	28 (26.4%)	0.001
Residency (Urban)	70 (70.7%)	95 (89.6%)	0.001

*Significant differences in age distribution and residency were observed between elective and emergency surgery groups.*

In the elective group, the overall incidence of SSIs was 21.2%. Superficial SSIs were the most prevalent, occurring in 17.2% of cases. Deep SSIs were less frequent (5.1%), while organ/space infections were rare (1%). Proper instrument sterilization was maintained in 99% of cases. Most elective surgeries were completed within 1–3 hours (54.5%), while the remaining 45.5% lasted 3–5 hours. Hospital stays were relatively short, with 30.3% of patients discharged within 48 hours. Clean surgical wounds were documented in 18.2% of patients, and clean-contaminated wounds in the remainder. The emergency group showed a higher SSI incidence at 36.8%. Superficial SSIs were observed in 23.6% of cases, deep SSIs in 11.3%, and organ/space infections in 3.8%. Proper instrument sterilization was maintained in 100% of cases, consistent with the elective group. In terms of surgery duration, most emergency procedures lasted 1–3 hours (65.1%), while 38.7% extended to 3–5 hours. Notably, 87.7% of patients were discharged within 48 hours, reflecting the urgency and shorter postoperative monitoring typical in emergency cases.

**Table 2:** Surgical Site Infections by Type

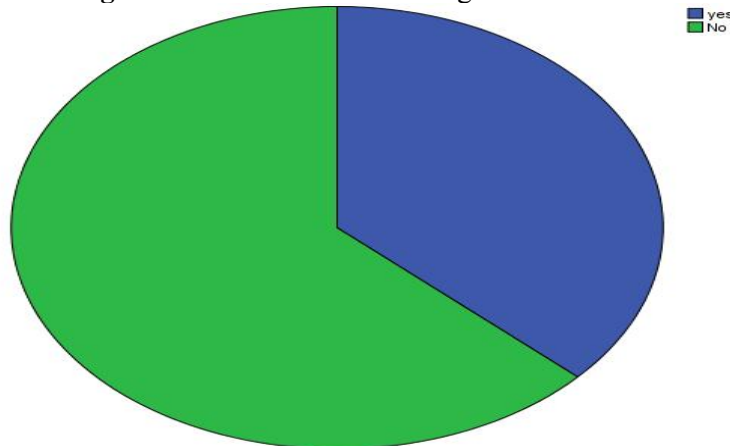
SSI Type	Elective (n=108)	Emergency (n=108)	p-Value
Superficial	17 (17.2%)	25 (23.6%)	0.217
Deep	5 (5.1%)	12 (11.3%)	0.09
Organ/Space	1 (1%)	4 (3.8%)	0.358

*Emergency surgeries showed higher rates of all SSI types, though differences in deep and organ/space infections were not statistically significant.*

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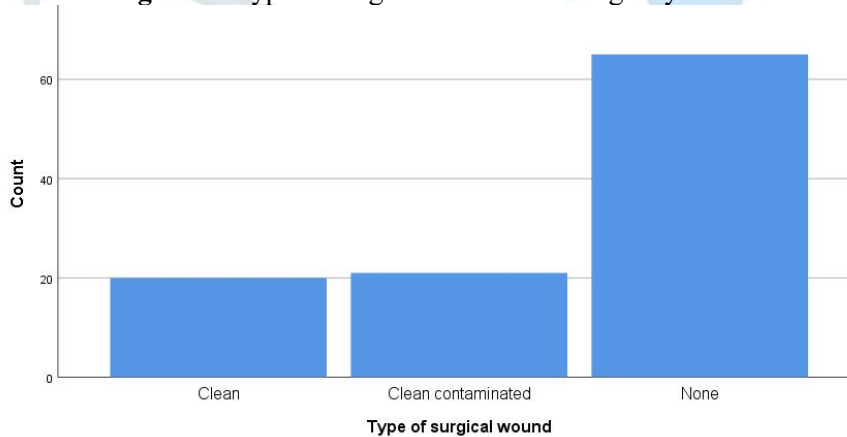
The incidence of SSIs was significantly higher in the emergency group (36.8%) compared to the elective group (21.2%) ( $p = 0.014$ ). Although superficial SSIs were the most common in both groups, the emergency group had higher rates of deep and organ/space infections, though these differences were not statistically significant ( $p = 0.09$  and  $p = 0.358$ , respectively).

**Figure 1:** Occurrence rate of surgical site infection



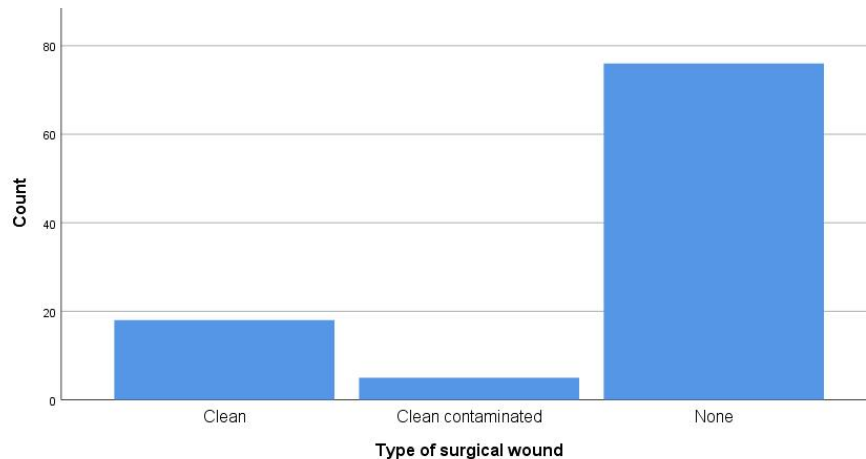
Surgical wound types also showed a significant difference, with clean wounds observed in 18.2% of elective surgeries compared to 18.9% in emergency surgeries ( $p = 0.005$ ). Hospital stays were significantly longer in the emergency group, with 87.7% of patients staying less than 48 hours compared to only 30.3% in the elective group ( $p = 0.001$ ). The frequency of SSIs varied by surgical specialty.

**Figure 2:** Type of surgical wound in emergency cases



**Figure 3:** Type of surgical wound in elective cases

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In the emergency group, appendectomies (39.6%) and laparotomies (36.8%) were the most commonly performed surgeries, with significantly higher SSI rates compared to their elective counterparts ( $p < 0.05$ ). Conversely, hernioplasties and cholecystectomies were more prevalent in the elective group, with significantly lower SSI rates ( $p = 0.002$  and  $p = 0.001$ , respectively). These findings emphasize the procedural and situational risks associated with emergency surgeries.

## Discussion

Surgical Site Infections (SSIs) remain a serious concern in healthcare, particularly in abdominal procedures, where they contribute to prolonged hospital stays, increased healthcare expenses, and raised patient morbidity and death[20]. This study aims to examine the frequency, risk factors, and kinds of SSIs between elective and emergency abdominal surgeries. The findings provide useful insights into the dynamics of SSIs and its consequences for surgical techniques, particularly in a tertiary care context. The results of this study accord with prior research demonstrating a higher prevalence of SSIs in emergency surgery compared to elective procedures. The SSI rate of 36.8% in emergency procedures and 21.2% in elective surgeries is similar with the findings of Jadoon et al. (2023), who reported rates of 36% and 18%, respectively. The large disparity underlines the obstacles associated with emergency procedures, including limited prior preparation, higher patient acuity, and procedural complexity.

Moreover, the study corroborates past findings about the distribution of SSI types. Superficial SSIs were the most prevalent, followed by deep and organ/space infections. These results are analogous to research conducted by Ghous et al. (2018) and Saad et al. (2024), which showed similar tendencies. However, whereas the proportions of deep and organ/space infections were greater in emergency procedures, these differences were not statistically significant in this study, warranting further examination with a larger sample size. Interestingly, the emergency group exhibited a higher number of younger patients (15–30 years) and urban inhabitants compared to the elective group. This conclusion was somewhat unexpected, given older people are often considered at increased risk for surgical complications, particularly SSIs. This gap could be related to the demographic profile of patients seeking emergency care in the study's site, which may differ from global trends.

Another unexpected result was the high probability of discharge within 48 hours for emergency surgery patients (87.7%). This could represent budget constraints or institutional initiatives aimed at limiting hospital stays. However, such approaches may inadvertently impair postoperative monitoring and early detection of SSIs, thus altering the reported rates. The outcomes of this study emphasize the crucial need for focused treatments to minimize SSI incidence in emergency procedures. Enhanced preoperative screening, optimized antibiotic prophylaxis, and stronger infection control methods are necessary to manage the greater risks associated with emergency treatments[21]. Additionally, understanding modifiable risk factors, such as surgical wound classification and duration of operation, might inform targeted interventions to minimize SSIs[22].

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Although the variations in deep and organ/space infections between elective and emergency procedures were not statistically significant, these data highlight critical trends. The greater likelihood of serious infections in emergency procedures agrees with prior data and underscores the need for heightened vigilance in managing these cases. Future studies with greater sample sizes and longitudinal approaches could provide more definitive insights. Future study should focus on long-term outcomes of SSIs, including recurrence rates and patient quality of life, to provide a more thorough knowledge of their impact. Conducting randomized controlled trials to test the effectiveness of focused therapies, such as upgraded preoperative practices and tailored antibiotic regimens, would give practical answers to minimize SSI risks. Additional research are needed to study the effect of demographic characteristics, such as age and residency, in influencing SSI rates, particularly in developing nations.

While the study gives significant information, certain limitations must be addressed. Very short follow-up period would have omitted late-onset SSIs, thereby underestimating their true incidence. Despite these limitations, the study gives a robust comparison of SSIs in elective and emergency procedures and shows crucial areas for improvement in surgical care practices. The findings of this study underline the importance of the issues mentioned in the introduction. Emergency procedures inherently carry higher risks of complications, and this study underscores the necessity for context-specific therapies to address these problems. By concentrating on a tertiary care hospital in Lahore, the research addresses a significant vacuum in the local literature and gives actionable insights for improving surgical outcomes.

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