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Original Research Article

Surgical site infections in emergency vs elective surgery: a cross-sectional comparison

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ABSTRACT

Background: Surgical site infections (SSI) are among the most common postoperative complications, leading to increased morbidity, prolonged hospitalization, and higher healthcare costs. Emergency surgical procedures are particularly associated with higher infection rates because of limited preoperative preparation and a greater likelihood of contaminated wounds. This study compared the incidence of SSI between emergency and elective surgeries and evaluated associated risk factors and postoperative outcomes.

Methods: This cross-sectional comparative study was conducted in the Department of Surgery, Sir Salimullah Medical College & Mitford Hospital, Dhaka, Bangladesh, from January 2025 to December 2025. A total of 104 patients were enrolled using purposive sampling, including 52 undergoing emergency surgery and 52 undergoing elective surgery. Data were analyzed using SPSS version 26.0.

Results: The overall SSI rate was 19.2%. SSI occurred significantly more often in emergency surgeries (28.8%) than in elective surgeries (9.6%). Emergency procedures were more frequently associated with prolonged operative duration and contaminated or dirty wounds. Significant risk factors for SSI included diabetes mellitus, smoking, prolonged surgery (>2 hours), and wound contamination. Patients who developed SSI experienced significantly longer hospital stays, higher reoperation rates, and increased 30-day readmission rates compared with those without infection.

Conclusion: Surgical site infections are significantly more common following emergency surgery than elective procedures. The higher SSI rate in emergency operations is largely attributable to greater wound contamination, longer operative times, and limited opportunities for preoperative patient optimisation.

Keywords: Surgical Site Infections, Emergency Surgery, Elective Surgery

INTRODUCTION

Surgical site infection (SSI) remains one of the most common and significant healthcare-associated infections worldwide, contributing substantially to postoperative morbidity, prolonged hospital stays, increased healthcare expenditure, and mortality. According to the Centres for Disease Control and Prevention (CDC), SSI is defined as an infection occurring at or near the surgical incision within 30 days after an operation, or within one year if an implant is placed and the infection is related to the procedure.[1] Despite advances in surgical techniques, sterilisation methods, and antibiotic prophylaxis, SSIs continue to pose a major challenge, particularly in developing countries where healthcare resources may be limited.[2] Globally, SSIs account for approximately 20% of all healthcare-associated infections and represent a significant burden on patients and healthcare systems.[3] The incidence of SSI varies considerably depending on patient characteristics, type of surgery, wound classification, duration of operation, and adherence to infection prevention protocols.[4] Several studies have demonstrated that the risk of SSI is substantially higher in emergency surgical procedures compared to elective surgeries due to inadequate preoperative preparation, greater wound contamination, and the urgent nature of intervention.[5,6]

Emergency surgeries are often performed under suboptimal conditions, leaving limited time for comprehensive patient assessment, correction of comorbidities, bowel preparation when indicated, and administration of appropriately timed prophylactic antibiotics. Furthermore, patients requiring emergency operations frequently present with contaminated or dirty wounds, perforated viscera, trauma, or ongoing infections, all of which increase the likelihood of postoperative wound infection.[7] In contrast, elective surgeries allow sufficient time for patient optimisation, control of existing medical conditions, nutritional improvement, and meticulous preoperative planning, resulting in comparatively lower SSI rates.[8] Numerous patient-related and procedure-related factors have been associated with the development of SSI. Patient-related factors include advanced age, diabetes mellitus, obesity, malnutrition, smoking, immunosuppression, and prolonged preoperative hospitalisation.[2,9]

Procedure-related factors include wound classification, duration of surgery, surgical technique, perioperative blood loss, use of drains, and adherence to aseptic practices.[4] Studies have shown that contaminated and dirty surgical wounds carry significantly greater infection risks than clean wounds, emphasising the importance of perioperative infection control measures.[6] The consequences of SSI extend beyond clinical complications. Patients with SSI often experience delayed wound healing, increased pain, prolonged antibiotic use, repeated surgical interventions, and longer hospital stays.

These complications lead to substantial economic burdens for both healthcare institutions and patients, especially in low- and middle-income countries where healthcare resources are already constrained.[3,5] Additionally, SSIs contribute to the growing problem of antimicrobial resistance through increased antibiotic consumption.[8] Therefore, the present study aims to compare the occurrence of surgical site infections between emergency and elective surgeries and to evaluate the associated risk factors contributing to postoperative wound infections.

METHODS

This cross-sectional comparative study was conducted in the Department of Surgery in Sir Salimullah Medical College & Mitford Hospital, Dhaka, Bangladesh, from January 2025 to December 2025. A total of 104 patients who underwent surgical procedures were enrolled using purposive sampling, comprising 52 patients undergoing emergency surgery and 52 patients undergoing elective surgery. Adult patients aged 18 years and above who consented to participate were included, while patients with pre-existing surgical wound infections, immunodeficiency disorders, or incomplete clinical records were excluded. Data were collected using a structured questionnaire and review of hospital records, including demographic characteristics, comorbidities, smoking history, type of surgery, wound classification, duration of operation, drain usage, and postoperative outcomes.

Patients were followed for 30 days after surgery to identify the occurrence of surgical site infection (SSI), which was defined according to the Centres for Disease Control and Prevention (CDC) criteria. SSIs were categorised as superficial incisional, deep incisional, or organ/space infections. Data were analysed using the Statistical Package for the Social Sciences (SPSS) version 26.0. Continuous variables were expressed as mean±standard deviation (SD), while categorical variables were presented as frequency and percentage. Comparisons between emergency and elective surgery groups were performed using the independent-samples t-test for continuous variables and the Chi-square test. A p value of <0.05 was considered statistically significant. Ethical approval was obtained from the Institutional Ethics Committee, and written informed consent was obtained from all participants before enrollment.

RESULTS

The mean age of patients undergoing emergency surgery was 45.8±14.2 years compared to 43.6±13.5 years in the elective surgery group (p=0.418). Males constituted 59.6% of emergency cases and 55.8% of elective cases. Diabetes mellitus was present in 23.1% and 19.2% of patients in the emergency and elective groups, respectively. No statistically significant differences in baseline demographic characteristics were observed between the groups (Table 1).

Operations lasting more than two hours were significantly more frequent in the emergency surgery group (53.8%) than in the elective surgery group (34.6%) (p=0.048). Contaminated or dirty wounds were observed in 40.4% of emergency surgeries compared with only 11.5% of elective surgeries (p<0.001) (Table 2).

The overall incidence of surgical site infection was 19.2% (20/104). SSI developed in 28.8% of patients undergoing emergency surgery compared to 9.6% of those undergoing elective surgery. The difference was statistically significant (p=0.013) (Table 3).

Table 1: Distribution of patients according to demographic characteristics (n=104).

Variables	Emergency surgery (n=52)	Elective surgery (n=52)	P value
Age (years), mean±SD	45.8±14.2	43.6±13.5	0.418
Male, N (%)	31 (59.6)	29 (55.8)	
Female, N (%)	21 (40.4)	23 (44.2)	
BMI (kg/m²), mean±SD	24.8±3.7	24.1±3.4	0.312
Diabetes mellitus, N (%)	12 (23.1)	10 (19.2)	0.628
Smoking history, N (%)	16 (30.8)	11 (21.2)	0.264

Table 2: Distribution of surgical characteristics among the study population (n=104).

Variables	Emergency surgery (n=52)	Elective surgery (n=52)	P value
Duration of surgery >2 hours, N (%)	28 (53.8)	18 (34.6)	0.048*
Drain used, n (%)	24 (46.2)	17 (32.7)	0.160
Contaminated/ Dirty wound, N (%)	21 (40.4)	6 (11.5)	<0.001*
Clean/Clean-contaminated wound, N (%)	31 (59.6)	46 (88.5)	

*Statistically significant.

Table 3: Comparison of surgical site infection rates between emergency and elective surgeries (n=104).

Surgical site infection	Emergency surgery (n=52)	Elective surgery (n=52)	Total (n=104)	P value
Present	15 (28.8)	5 (9.6)	20 (19.2)	0.013 *
Absent	37 (71.2)	47 (90.4)	84 (80.8)	

*Statistically significant.

Among the 20 patients who developed SSI, superficial incisional infection was the most common type, accounting for 65.0% of cases. Deep incisional SSI constituted 25.0% of infections, while organ/space SSI accounted for 10.0%. Organ/space infections were observed only among emergency surgery patients (Table 4).

Significant associations were observed between SSI and diabetes mellitus (45.0% vs. 15.5%, p=0.004), smoking history (50.0% vs. 20.2%, p=0.006), operative duration exceeding two hours (70.0% vs. 38.1%, p=0.010), and contaminated/dirty wounds (60.0% vs. 17.9%, p<0.001) (Table 5).

Table 4: Types of surgical site infection among infected patients (n=20).

Type of SSI	Emergency (n=15)	Elective (n=5)	Total (n=20)
Superficial incisional SSI	9 (60.0)	4 (80.0)	13 (65.0)
Deep incisional SSI	4 (26.7)	1 (20.0)	5 (25.0)
Organ/space SSI	2 (13.3)	0 (0.0)	2 (10.0)

Table 5: Association of selected risk factors with surgical site infection (n=104).

Risk Factors	SSI present (n=20)	SSI absent (n=84)	P value
Diabetes mellitus, N (%)	9 (45.0)	13 (15.5)	0.004*
Smoking history, N (%)	10 (50.0)	17 (20.2)	0.006*
Duration of surgery >2 hours, N (%)	14 (70.0)	32 (38.1)	0.010*
Contaminated/Dirty wound, N (%)	12 (60.0)	15 (17.9)	<0.001*

*Statistically significant.

Patients who developed SSI experienced significantly longer hospital stays (12.6±3.9 days versus 6.8±2.4 days, p<0.001). Reoperation was required in 15.0% of SSI cases compared with 1.2% of non-SSI cases (p=0.008). Similarly, 30-day readmission rates were significantly higher among patients with SSI (20.0% vs. 3.6%, p=0.015) (Table 6).

Table 6: Postoperative outcomes according to SSI status (n=104).

Outcome	SSI present (n=20)	SSI absent (n=84)	P value
Hospital stays (days), mean±SD	12.6±3.9	6.8±2.4	<0.001*
Reoperation required, N (%)	3 (15.0)	1 (1.2)	0.008*
Readmission within 30 days, N (%)	4 (20.0)	3 (3.6)	0.015*

*Statistically significant.

DISCUSSION

Regarding demographic characteristics, the mean age was 45.8±14.2 years in the emergency surgery group and 43.6±13.5 years in the elective surgery group, while males constituted 59.6% and 55.8% of the groups, respectively. Diabetes mellitus was present in 23.1% of emergency cases and 19.2% of elective cases. Sun et al. reported a mean age of approximately 57 years among emergency colorectal surgery patients and 59 years among elective surgery patients, with males accounting for 56% and 54% of the respective groups.[5] Similarly, Megahed et al found diabetes in 26.8% of emergency surgery patients and 21.4% of elective surgery patients.[6] Analysis of surgical characteristics showed that procedures lasting more than two hours were significantly more common in emergency surgeries (53.8%) than in elective surgeries (34.6%). In addition, contaminated or dirty wounds were present in 40.4% of emergency cases compared with only 11.5% of elective cases. Megahed et al reported prolonged operative duration in 58.3% of emergency procedures compared with 36.2% of elective procedures and found contaminated wounds in 43.7% and 14.1% of cases, respectively.[6] Likewise, Attah et al documented contaminated wounds in 46.5% of emergency surgeries and identified wound contamination as a major contributor to postoperative infection.[10] The most important finding of this study was the significantly higher SSI rate in emergency surgeries (28.8%) compared with elective surgeries (9.6%), with an overall SSI incidence of 19.2%. Sun et al reported SSI rates of 24.8% among emergency colorectal procedures and 11.2% among elective procedures.[5] Similarly, Kakati observed postoperative wound infection rates of 26.0% in emergency surgeries and 8.0% in elective surgeries.8 Ahmed et al also found SSI rates of 30.1% and 10.7% among emergency and elective surgeries, respectively.6 About the type of SSI, superficial incisional infection accounted for 65.0% of all infections, followed by deep incisional SSI (25.0%) and organ/space SSI (10.0%). Berríos-Torres et al reported that approximately 60-80% of SSIs are superficial incisional infections, while deep and organ/space infections collectively account for 20-40% of cases.[4] De Lissovoy et al similarly found that superficial SSI represented approximately 68% of all postoperative infections, deep SSI 22%, and organ/space SSI 10%.[9] Several significant risk factors for SSI were identified in the present study. Diabetes mellitus was observed in 45.0% of patients who developed SSI compared with 15.5% among non-infected patients. Smoking was present in 50.0% of infected patients versus 20.2% of non-infected patients. Furthermore, prolonged surgery (>2 hours) occurred in 70.0% of infected patients compared with 38.1% of non-infected patients, while contaminated or dirty wounds were found in 60.0% and 17.9%, respectively. Korol et al reported that diabetes, smoking, prolonged operative duration, and wound contamination were among the most important predictors of SSI development.[11] Similarly, Ban et al identified contaminated wounds and longer operative duration as major independent risk factors for postoperative infection.[12] Regarding postoperative outcomes, patients with SSI experienced significantly longer hospital stays (12.6±3.9 days) compared with those without SSI (6.8±2.4 days). Reoperation was required in 15.0% of infected patients versus 1.2% of non-infected patients, while readmission occurred in 20.0% and 3.6%, respectively. Badia et al reported that SSI increased hospital stays by approximately 7-11 days and significantly increased healthcare costs.[3]

Limitations of the study

This study was conducted at a single tertiary care hospital, which may limit the generalizability of the findings to other healthcare settings. The relatively small sample size (n=104) may have reduced the ability to detect weaker associations between risk factors and surgical site infection. The cross-sectional design did not allow assessment of causal relationships between identified risk factors and SSI.

CONCLUSION

This study demonstrates that surgical site infections are significantly more common in emergency surgeries compared to elective procedures. The higher SSI rate in emergency cases is strongly associated with contaminated wounds, prolonged operative duration, and limited preoperative optimisation. Diabetes mellitus and smoking were also identified as important patient-related risk factors, while SSI itself was associated with increased hospital stay, higher reoperation rates, and greater readmission.

Recommendations

Based on the study findings, strict adherence to standard surgical asepsis and infection prevention protocols should be reinforced, particularly in emergency surgical settings where the risk of surgical site infection is higher. Early identification and optimisation of modifiable risk factors such as diabetes mellitus and smoking should be prioritised before surgery whenever feasible.

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REFERENCES

1. O'Leary EN, Neuhauser MM, McLees A, Paek M, Tappe J, Srinivasan A. An update from the National Healthcare Safety Network on hospital antibiotic stewardship programs in the United States, 2014-2021. Open Forum Infect Dis. 2024;11(2):ofad684.
2. Allegranzi B, Bischoff P, De Jonge S, Kubilay NZ, Zayed B, Gomes SM, et al. New WHO

recommendations on preoperative measures for surgical site infection prevention: an evidence-based global perspective. Lancet Infect Dis. 2016;16(12):e276-87.
3. Badia JM, Casey AL, Petrosillo N, Hudson PM, Mitchell SA, Crosby CJ. Impact of surgical site infection on healthcare costs and patient outcomes: a systematic review in six European countries. J Hosp Infect. 2017;96(1):1-15.
4. Berríos-Torres SI, Umscheid CA, Bratzler DW, Leas B, Stone EC, Kelz RR, et al. Centers for Disease Control and Prevention guideline for the prevention of surgical site infection, 2017. JAMA Surg. 2017;152(8):784-91.
5. Sun K, Wang CC, Geiger TM, Smith MC, Lee H, Younan SA, Khan A. Increasing differences in surgical site infections after emergency and elective colorectal surgery. J Surg Res. 2025;314:261-72.
6. Megahed HA, Taki-Eldin A, Abdel-monem AM, Ibrahim MK, Aziz AA, Farg MZ, et al. Risk factors for surgical site infections in elective and emergency surgeries: a prospective cohort study. Med J Islam Repub Iran. 2025;39:55.
7. Ikegwuonu OE, Okeke CC, Zubair A, Okereke PU, Igboanugo SA, Oladeji EO, Ebiekuraju OE. A systematic review of the incidence and pattern of surgical site infection in orthopedic surgery in Africa. Cureus. 2024;16(10):e71084.
8. Kakati B, Kumar A, Gupta P, Sachan PK, Thakuria B. Surgical site abdominal wound infections: experience at a north Indian tertiary care hospital. J Indian Acad Clin Med. 2013;14(1):13-9.
9. De Lissovoy G, Fraeman K, Hutchins V, Murphy D, Song D, Vaughn BB. Surgical site infection: incidence and impact on hospital utilization and treatment costs. Am J Infect Control. 2009;37(5):387-97.
10. Attah O, Ako A, Akinyoola A, Idowu C, Oyinloye O. Risk factors associated with post-operative infections among orthopaedic patients with clean wounds in OAUTHC, Ile Ife, Nigeria. IOSR J Dent Med Sci. 2019;18(2):16-24.
11. Korol E, Johnston K, Waser N, Sifakis F, Jafri HS, Lo M, et al. A systematic review of risk factors associated with surgical site infections among surgical patients. PLoS One. 2013;8(12).
12. Ban KA, Minei JP, Laronga C, Harbrecht BG, Jensen EH, Fry DE, et al. American College of Surgeons and Surgical Infection Society: surgical site infection guidelines, 2016 update. J Am Coll Surg. 2017;224(1):59-74.

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