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Original Article

Surgical Site Infection Rates in Elective vs Emergency Laparotomy

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Abstract-

Introduction: Surgical site infections (SSIs) remain one of the most common postoperative complications following abdominal surgeries. Laparotomy, particularly when performed under emergency conditions, is associated with increased morbidity due to contamination, delayed presentation, and physiological instability. ***Materials and Methods:*** A prospective comparative observational study was conducted over 18 months in a tertiary care hospital. A total of 200 patients undergoing laparotomy were enrolled and divided into two groups: Elective (n=100) and Emergency (n=100). Demographic variables, operative details, wound classification, and postoperative outcomes were recorded. SSIs were diagnosed based on CDC criteria. Statistical analysis was performed using chi-square test and logistic regression. ***Results***: Overall SSI rate was 18%. Elective group showed 8% SSI rate, whereas Emergency group demonstrated 28% SSI rate ($p < 0.001$). Risk factors significantly associated with SSI included emergency surgery, contaminated wounds, operative duration >2 hours, anemia, diabetes mellitus, and delayed antibiotic administration. ***Conclusion:*** Emergency laparotomy is associated with significantly higher SSI rates compared to elective laparotomy. Optimization of patient factors, strict aseptic technique, timely antibiotics, and perioperative monitoring can reduce infection rates.

Keywords: *Surgical site infection, Laparotomy, Emergency surgery, Elective surgery, Postoperative complications, Abdominal surgery.*

INTRODUCTION

Surgical site infection (SSI) is defined as infection occurring within 30 days after a surgical procedure involving skin, subcutaneous tissue, deep soft tissue, or organ space[1]. SSIs account for nearly 20% of healthcare-associated infections globally and significantly contribute to prolonged hospital stay, increased healthcare costs, and patient morbidity[2]. Despite advancements in antiseptic protocols, antimicrobial prophylaxis, and surgical techniques, SSI remains a persistent challenge in abdominal surgeries[3].

Laparotomy, a surgical incision into the abdominal cavity, is commonly performed for various conditions such as gastrointestinal obstruction, malignancies, perforation peritonitis, trauma, and inflammatory diseases[4]. The risk of SSI in laparotomy is influenced by several factors including wound contamination level, duration of surgery, patient comorbidities, nutritional status, and emergency nature of the procedure[5].

Elective laparotomies are performed under controlled conditions after adequate preoperative optimization of patients. Proper bowel preparation, prophylactic antibiotics, glycemic control, and sterile surgical environments contribute to lower infection rates[6]. In contrast, emergency laparotomies are often conducted in patients with hemodynamic instability, sepsis, bowel perforation, or trauma, where contamination risk is significantly higher[7].

The World Health Organization reports that SSI incidence ranges from 1–10% in developed countries but may reach 30% in low- and middle-income countries[8]. Studies have consistently demonstrated that emergency surgeries carry a 2–4 times higher risk of SSI compared to elective procedures[9]. The presence of fecal contamination, delayed presentation, and inadequate physiological preparation are major contributing factors[10].

Host-related factors such as diabetes mellitus, anemia, obesity, hypoalbuminemia, smoking, and immunosuppression further increase susceptibility to postoperative infections[11]. Additionally, prolonged operative time (>2 hours) and higher American Society of Anesthesiologists (ASA) scores correlate strongly with SSI incidence[12].

Understanding the differential risk between elective and emergency laparotomy is essential for implementing targeted preventive strategies. Enhanced Recovery After Surgery (ERAS) protocols, standardized antibiotic timing, wound protectors, and negative pressure wound therapy have shown promising reductions in SSI rates[13].

Given the burden of SSI and its impact on surgical outcomes, this study aims to compare the incidence and risk factors of SSI in elective versus emergency laparotomy patients in a tertiary care setting.

MATERIALS AND METHODS

Prospective comparative observational study conducted over 18 months in a tertiary care hospital.

Sample Size

200 patients undergoing laparotomy.

- Elective group: 100 patients
- Emergency group: 100 patients

Inclusion Criteria

- Age ≥18 years
- Patients undergoing midline laparotomy
- Both genders
- Informed consent obtained

Exclusion Criteria

- Laparoscopic surgeries
- Re-laparotomy within 30 days
- Patients on immunosuppressive therapy
- HIV-positive patients
- Patients with pre-existing wound infection
- Pediatric patients

Data Collection

- Demographic data: Age, gender, BMI
- Clinical parameters: Comorbidities (DM, HTN), hemoglobin, serum albumin
- Operative variables: Duration of surgery, wound classification (clean, clean-contaminated, contaminated, dirty)
- Antibiotic timing: Within 60 minutes before incision

SSI Diagnosis

Based on CDC criteria:

- Superficial incisional
- Deep incisional
- Organ-space infection

Follow-up: 30 days postoperatively.

Statistical Analysis

- Chi-square test
- Logistic regression
- p-value <0.05 considered significant

Ethical approval obtained from Institutional Ethics Committee.

RESULTS

Table 1: Demographic Profile

Variable	Elective (n=100)	Emergency (n=100)
Mean Age	45.2 ±12	48.6 ±14
Male (%)	58	62
Diabetes (%)	18	26
Anemia (%)	22	40

Emergency patients had higher prevalence of anemia and diabetes.

Table 2: Wound Classification

Classification	Elective	Emergency
Clean	40	5
Clean-contaminated	45	20
Contaminated	10	40
Dirty	5	35

Majority of emergency surgeries were contaminated/dirty wounds.

Table 3: Duration of Surgery

Duration	Elective	Emergency
<2 hours	70	42
>2 hours	30	58

Emergency procedures had significantly longer duration.

Table 4: SSI Incidence

Group	SSI Present	SSI Absent	Rate
Elective	8	92	8%
Emergency	28	72	28%

$p < 0.001$
Emergency laparotomy showed significantly higher SSI rate.

Table 5: Type of SSI

Type	Elective	Emergency
Superficial	6	15
Deep	2	7
Organ-space	0	6

Organ-space infections were more common in emergency cases.

Table 6: Risk Factor Analysis

Risk Factor	Odds Ratio	p-value
Emergency surgery	3.8	<0.001
Contaminated wound	4.2	<0.001
Duration >2h	2.6	0.01
Diabetes	2.1	0.03
Anemia	2.8	0.01

Emergency surgery and contaminated wounds were strongest predictors.

DISCUSSION

The present study demonstrates that SSI rates are significantly higher in emergency laparotomy (28%) compared to elective laparotomy (8%). These findings align with global data reporting SSI rates ranging from 20–35% in emergency abdominal surgeries[14].

The higher incidence in emergency cases is attributable to increased contamination levels, hemodynamic instability, and inadequate preoperative optimization[15]. Contaminated and dirty wounds showed a fourfold increase in infection risk, similar to findings by Smith et al.[16].

Operative duration exceeding two hours was another independent predictor. Prolonged exposure increases bacterial load and tissue trauma[17]. Diabetes mellitus doubled the risk of SSI, consistent with findings from WHO multicenter studies[18]. Organ-space infections were predominantly seen in emergency surgeries, likely due to perforation peritonitis and intra-abdominal sepsis[19]. Early antibiotic administration and improved perioperative glycemic control have shown effectiveness in reducing SSI rates[20].

Enhanced recovery protocols, wound protectors, and negative pressure dressings have demonstrated significant reductions in high-risk abdominal surgeries[21]. Resource-limited settings require implementation of standardized infection prevention bundles[22].

Overall, this study reinforces the need for risk stratification and aggressive preventive measures in emergency laparotomy patients.

CONCLUSION

Emergency laparotomy carries significantly higher risk of surgical site infection compared to elective procedures. Wound contamination, prolonged surgery, anemia, and diabetes are major contributing factors. Implementation of evidence-based preventive strategies and optimization of patient comorbidities are essential to reduce SSI burden.

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