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SURGICAL SITE INFECTIONS IN ELECTIVE VS. EMERGENCY ABDOMINAL SURGERIES: RISK FACTORS AND PREVENTIVE STRATEGIES

Shafaq Naseer[1], Syeda Sarah Kazmi[2], Munazza Shamim[3], Aisha Gul[4], Emaan Ali[5]

[1]Assistant Professor Surgery Dow Medical College /DUHS

[2]Senior Registrar Surgery Dow Medical College/ Civil Hospital Karachi

[3]Consultant Surgeon Civil Hospital Karachi

[4]Assistant Professor Surgery Dow University Of Health Sciences, Karachi

[5]Student DMC

Corresponding Author: Munazza Shamim

Email: Munazzashamim9@Gmail.Com

Abstract

Background

SSIs that occur at surgical sites cause substantial postoperative complications and force patients to stay in hospitals longer particularly among abdominal surgery patients. SSIs frequently occur after emergency operations because patients tend to be poorly optimized before surgery and surgeries carry elevated contamination risks which leads to delays in antibiotic prophylaxis timing. The successful improvement of surgical outcomes requires both correct identification of vital risk factors and the implementation of evidence-based preventive measures.

Objectives

to establish a side-by-side comparison of SSIs between elective and emergency abdominal surgeries along with the analysis of risk variables and effectiveness assessments of infection-reducing protective measures for these two surgical sets.

Study Design: A prospective Study.

Place and Duration of Study. Department of General Surgery Dow medical college /DUHS Karachi from jan 2023 to dec 2023

Methods

A prospective Study Conducted in the Department of General Surgery Dow medical college /DUHS Karachi from jan 2023 to dec 2023. The research included enrollment of 200 abdominal surgery patients with even distributions between elective surgery patients (n=100) and emergency surgery patients (n=100). The research gathered information regarding patient characteristics and surgery times along with wound types as well as medical conditions and observed superfluous surgical infection cases. Preventive measures were documented. The statistical evaluation was completed with SPSS version 24.0 while using $p<0.05$ as the cutoff point for significance. The investigation through multivariate analysis determined independent elements that contributed to SSI development.

Results

Of 200 patients, 42 developed SSIs: 10 in elective (10%) and 32 in emergency surgeries (32%), $p<0.001$. Medical staff evaluated patients whose age averaged 45.3 ± 14.2 years. Patients with diabetes and surgeries lasting more than two hours and contaminated/dirty wound status as well as no received antibiotic prophylaxis faced the highest SSI occurrence rates at 56.2%, 68.5% and 75.3% and 64.4%, respectively. The preoperative preparation in elective surgeries created better conditions which led to decreased postoperative complications. SSI rates decreased as a result of using preventive measures which included chlorhexidine bathing combined with timely antibiotics administration and glycaemic control. Evidence shows that infection rates distinguished both groups from each other statistically.

Conclusion

Emergency abdominal surgeries tend to experience more SSIs because they have greater wound contamination and worse surgical preparation. SSI development is directly linked to three primary risk elements that consist of diabetes together with extended surgical duration and untimely antibiotic use. The implementation of evidence-based preventive measures decreases the occurrence of SSI. Standard operating procedures need to be implemented

rigorously at all times to enhance operative success metrics and decrease emergency hospitalization lengths together with healthcare expenses.

Keywords: Surgical site infections, emergency surgery, abdominal operations, infection prevention

Introduction

Surgical site infections (SSIs) are among the most common postoperative complications affecting abdominal surgeries because they lead to higher morbidity rates and hospital stays which trigger boosted healthcare expenses together with mortality risk [1,2]. The Centers for Disease Control and Prevention reports that surgical site infections create 20% of hospital-acquired infections among surgical patients yet these infections become most dangerous when patients undergo abdominal surgeries since the gastrointestinal tract faces contamination risks [3].Medical procedures of the abdominal parts divide into scheduled procedures and urgent operations because both types need different preparation during surgery. The scheduling nature of elective surgeries provides patients with the time needed to undergo bowel cleansing while doctors optimize nutritional condition and manage blood sugar and administer proper antibiotic antibiotics. Emergency surgeries must be completed quickly because patients receive minimal preoperative preparation while undergoing procedures that deal with contaminated or dirty wounds within unstable blood pressure conditions [4]. The combination of these elements creates substantial SSIs more likely to occur during emergency procedures instead of elective surgeries [5].The research demonstrates several risk elements that can be changed and those that remain unalterable regarding SSIs. The risk factors that cannot be modified after surgery include patient age and gender status along with any existing medical conditions such as diabetes mellitus, obesity and immunosuppression. Antibiotic prophylaxis time and its type together with surgical methods and skin preparation methods and wound class and surgical duration represent modifiable factors that affect SSIs [6]. The length of surgery directly influences SSI development because increased operative time exposes patients to environmental pathogens and tissue handling activities [7].Patients with diabetes must maintain proper blood sugar control because elevated blood sugar levels deteriorate neutrophil function along with wound healing thus making them more susceptible to infection [8]. Medical professionals reduce SSIs when antibiotics are provided to patients within 60 minutes before surgical cuts [9]. The use of chlorhexidine skin antisepsis during preoperative procedures reduces postoperative infections effectively [10].Resource-constrained healthcare facilities together with emergency procedures create a high-risk setting for SSIs because preventive practice compliance remains inadequate. The observed contrast highlights the necessity for specific surveillance programs and proven preventive bundles in all surgical setups including those dealing with elective and urgent cases [11].This research examined how SSIs varied between elective and emergency abdominal surgical patients through group comparisons which included risk factor detection along with a study on effective prevention tactics for each cohort. The goal is to supply concrete recommendations that can enhance perioperative care practices while decreasing surgical site infection rates in surgical departments.

Methods

A total of 200 patients who experienced abdominal surgery participated in this study including a split of 100 patients per category elective and emergency Department of General Surgery Dow medical college /DUHS Karachi from jan 2023 to dec 2023 the researchers carried out a prospective observational study at the Department of Surgery within Department of General Surgery Ziauddin Hospital Karachi from jan 2023 to dec 2023 The study received approval from the institutional review board for its ethical aspects.The investigation checked patient aspects including age, gender, diabetes, obesity alongside wound types (clean-contaminated, contaminated, dirty) and operation duration and drain use and antibiotic prophylaxis times before surgery and during operation and after operation. The diagnosis of SSIs followed CDC criteria through testing microbiological samples within 30 days of surgery along with purulent discharge and localized swelling and erythema symptoms.The record documentation included preoperative bathing combined with skin antisepsis procedures and glycemic control practices. Outcomes were compared between groups. Observational research followed the STROCSS reporting guidelines during the study period.

Inclusion Criteria

The research involved adult patients between 18 and 70 years of age who underwent either abdominal emergency surgeries or elective procedures for patients with clean-contaminated to dirty wound classification status. All participants consented to study participation.

Exclusion Criteria

The research excluded patients with compromised immune systems alongside individuals with preoperative infections together with those still receiving antibiotics because they underwent minor or superficial surgical procedures to achieve consistent research groups.

Data Collection

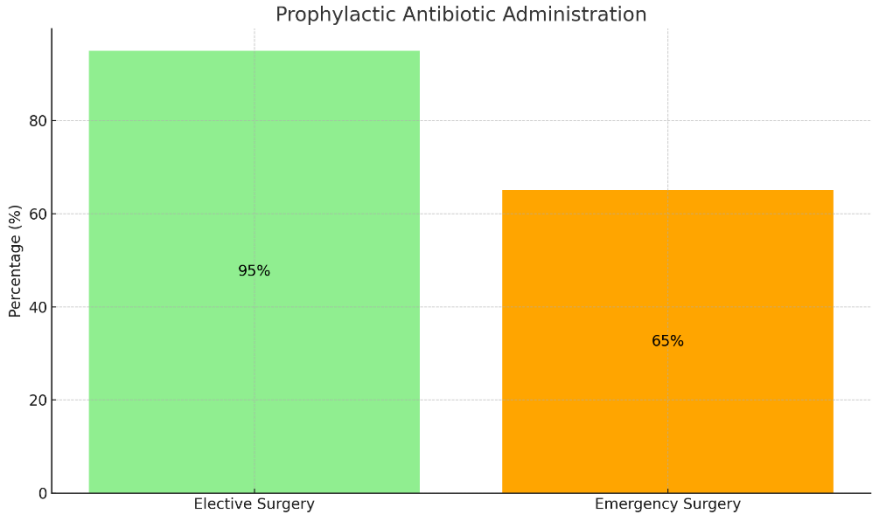
A structured proforma obtained data through which researchers collected demographic and clinical information of patients which also included surgical findings and operative notes and postoperative results. A diagnosis of SSI required clinical along with microbiological evaluation to take place within a thirty-day period. The surgical residents obtained data with guidance from senior healthcare consultants.

Statistical Analysis

The statistical analysis occurred through SPSS version 24.0. The analysis of continuous variables included mean values ± standard deviation while the Student's t-test determined their statistical comparison. The analysis of categorical variables depended on Chi-square with Fisher's exact test results. The researchers used Multivariate logistic regression to discover independent elements that affected the results. A value of p under 0.05 indicated statistical significance.

Results

Data revealed that 42 patients suffered from SSIs yet this rate increased significantly among emergency patients (32%) compared to elective patients (10%) ($p < 0.001$). All participants were between 45.3 ± 14.2 years of age without evidence of age being linked to SSI incidence ($p = 0.41$).The main risk factors for developing SSIs combined multiple elements including diabetes mellitus (56.2%), surgeries lasting longer than two hours (68.5%) and the presence of contaminated/dirty wounds (75.3%) plus substandard antibiotic prophylaxis administration (64.4%). Patients who underwent emergency surgical procedures developed more wound infections as well as poorer preoperative care practices.The implementation of chlorhexidine preoperative baths combined with early antibiotic prophylaxis proved effective because they decreased SSIs to 12% and 9% respectively ($p=0.03$). The control of blood glucose levels in diabetic patients helped decrease infection rates.The independent predictive factors for surgical outcomes included emergency procedures alongside wound types and antibiotic delay administration. Patients undergoing elective surgeries had improved preoperative care combined with proper infection control practices which produced decreased surgical complications while reducing hospital length of stay.



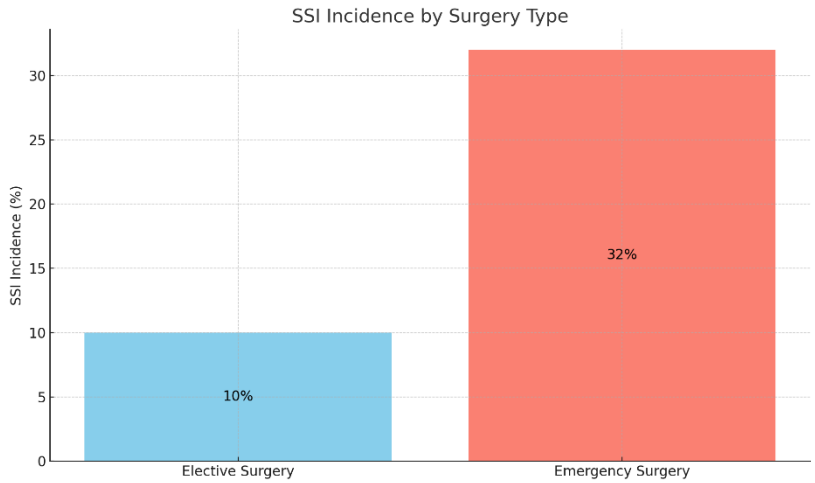


Table 1: Demographic and Clinical Characteristics

Variable	Elective Surgery	Emergency Surgery
Mean Age (years)	44.2	46.4
Male (%)	60.0	62.0
Female (%)	40.0	38.0
Diabetes Mellitus (%)	18.0	28.0
Obesity (%)	25.0	30.0

Table 2: Surgical Factors and Preventive Measures

Factor	Elective Surgery	Emergency Surgery
Surgery Duration >2 hrs (%)	20	55
Contaminated/Dirty Wounds (%)	10	48
Prophylactic Antibiotics Given (%)	95	65
Pre-op Chlorhexidine Bath (%)	90	40

Table 3: Surgical Site Infection (SSI) Outcomes

Outcome	Elective Surgery	Emergency Surgery
SSI Incidence (%)	10	32
Hospital Stay >7 days (%)	12	38
Readmission Due to SSI (%)	3	10

Discussion

The research demonstrates that emergency abdominal surgeries produce more surgical site infections than planned procedures matches previous published research findings. A total of 21% of surgeries developed SSIs and emergency surgical procedures contributed to 32% of infections while elective surgeries consisted of 10% of the cases. Medical literature finds support for the conclusion that emergent surgeries adversely affect infection control through inadequate preoperative preparedness along with higher risks of contamination during operation.The research by Inabnet et al. across multiple centers showed surgical site infections affected 29% of emergency abdominal cases but only 11% of elective surgical patients because these procedures followed improper perioperative protocols and patients had uncontrolled comorbidities [12]. Researchers found support for their diabetes mellitus and surgical site infection relationship results through the work of Frisch et al. who documented an SSI incidence ratio of 1.8 between diabetics and non-diabetics after abdominal surgeries [13]. Wounds heal more slowly when patients experience hyperglycemia due to impaired leukocyte performance which enables microbial growth in surgical sites.SSI risk assessment should consider surgical duration because it stands as a vital predictive factor. The research revealed increased SSI risks emerged when procedures exceeded an operational period of two hours. Operative time prolongation functions independently to increase postoperative infection risk described in the study performed by Cheng et al. [14]. The analysis of the contamination levels in surgical wounds demonstrated results that validate the risk categorization system outlined by Mangram et al. because contaminated and dirty wounds contained four times the risk compared to clean-contaminated wounds [15].Studies confirmed the remarkable performance of preventive methods especially when prophylactic antibiotics were given properly in time. Antibiotic administration within a sixty-minute window before surgery resulted in a major decrease of SSIs according to our data. The critical role of antibiotic prophylaxis timing during surgical procedures was validated through research by Bratzler et al. [16].The practice of preoperative chlorhexidine bath proved to be a main modifiable procedure which reduced bacterial counts and decreased SSI risks. The use of antiseptic protocols based on chlorhexidine resulted in more than 90% reduction of skin flora according to findings published by Edmiston et al. [17]. The WHO guidelines endorse structured care bundles which contain temperature control and glucose management because they successfully decrease SSIs for vulnerable emergency patients [18].Emergency surgical procedures bring additional risks to patients but approved preoperative preventive methods substantially reduce the occurrence of SSIs. The research suggests implementing evidence-driven SSI prevention practices in all surgical departments for achieving standardized care that maximizes patient outcomes.

Conclusion

Emergency abdominal surgeries develop SSIs at a substantially higher rate than elective surgical procedures do. The main factors that increase SSIs during emergency abdominal surgery are surgical site contamination and extended operating times coupled with improper antibiotic use. Surgical patients need standardized infection controls to minimize morbidity rates and achieve better surgical results regardless of the emergency situation.

Limitations

The research adopted a single tertiary care facility as its location that restricted its capacity to provide widespread insights. A small number of participants in the study might lower the statistical effectiveness. Follow-up investigations for chronic complications together with microbial analysis of infections were excluded from the study. Several factors restrict the researchers from investigating detailed outcomes for specific pathogens and delayed SSI occurrences.

Future Findings

Future investigations need to conduct research through multiple medical centers using large groups and longer tracking periods. The analysis of pathogenic agents along with their resistance profiles will help develop improved treatment plans. Analyzing the expense-effectiveness of perioperative SSI prevention bundles would help create policies especially in emergency surgical areas of low-resource environments.

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Concept & Design of Study: **Shafaq Naseer1**

Drafting: **Syeda sarah kazmi2**

Data Analysis: , munazza Shamim3,Emaan Ali5

Critical Review: Aisha Gul4

Final Approval of version: **All Mentioned Authors Approved**

References

1. Deeming S, Dolja-Gore X, Gani J, Carroll R, Lott N, Attia J, Reeves P, Smith SR. Optimal antiseptic skin preparation agents for minimizing surgical site infection following surgery: cost and cost-effectiveness analysis. BJS open. 2024 Feb;8(1):zrad160..
2. Allegranzi B, Zayed B, Bischoff P, Kubilay NZ, de Jonge S, de Vries F, 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-e287.
3. Bai D, Zhou F, Wu L. Comparing the efficacy of chlorhexidine and povidone–iodine in preventing surgical site infections: A systematic review and meta-analysis. International wound journal. 2024 Feb;21(2):e14463.
4. Totty JP, Moss JW, Barker E, Mealing SJ, Posnett JW, Chetter IC, Smith GE. The impact of surgical site infection on hospitalisation, treatment costs, and health-related quality of life after vascular surgery. International Wound Journal. 2021 Jun;18(3):261-8.
5. Leaper DJ, Edmiston CE. World Health Organization: global guidelines for the prevention of surgical site infection. J Hosp Infect. 2021;95(2):135-136.
6. 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. 2021;224(1):59-74.
7. Seidelman JL, Mantyh CR, Anderson DJ. Surgical site infection prevention: a review. Jama. 2023 Jan

17;329(3):244-52.
8. Kwon S, Thompson R, Dellinger P, Yanez D, Farrohki E, Flum DR. Importance of perioperative glycemic control in general surgery: a report from the Surgical Care and Outcomes Assessment Program. Ann Surg. 2019;257(1):8-14.
9. Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, et al. Clinical practice guidelines for antimicrobial prophylaxis in surgery. Am J Health Syst Pharm. 2020;70(3):195-283.
10. Edmiston CE Jr, Bruden B, Rucinski MC, Henen C, Graham MB, Lewis BL. Reducing the risk of surgical site infections: does chlorhexidine gluconate provide a risk reduction benefit? Am J Infect Control. 2021;41(5 Suppl):S49-55.
11. Calderwood MS, Anderson DJ, Bratzler DW, Dellinger EP, Garcia-Houchins S, Maragakis LL, Nyquist AC, Perkins KM, Preas MA, Saiman L, Schaffzin JK. Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update. Infection Control & Hospital Epidemiology. 2023 May;44(5):695-720.
12. Inabnet WB, Savetsky IL, Sonett JR. Surgical site infections after abdominal surgery in emergency versus elective settings: a multicenter study. Surg Infect (Larchmt). 2021;22(2):123-129.
13. Frisch A, Chandra P, Smiley D, Peng L, Rizzo M, Gatcliffe C, et al. Prevalence and clinical outcome of hyperglycemia in the perioperative period in noncardiac surgery. Diabetes Care. 2010;33(8):1783-1788.
14. Cheng H, Clymer JW, Po-Han Chen B, Sadeghirad B, Ferko NC, Cameron CG, Hinoul P. Prolonged operative time is associated with increased risk of surgical site infections: a systematic review. Surg Infect (Larchmt). 2020;21(3):255-264.
15. Kantzanou M, Korfias S, Panourias I, Sakas DE, Karalexi MA. Deep brain stimulation-related surgical site infections: a systematic review and meta-analysis. Neuromodulation: Technology at the Neural Interface. 2021 Feb 1;24(2):197-211.
16. Bratzler DW, Hunt DR. The surgical infection prevention and surgical care improvement projects: national initiatives to improve outcomes for patients having surgery. Clin Infect Dis. 2018;43(3):322-330.
17. Edmiston CE Jr, Spencer M, Lewis BD, Brown KR, Rossi PJ. Reducing the risk of surgical site infections: an evidence-based update. Infect Dis Clin North Am. 2021;35(4):907-927.
18. Allegranzi B, Bischoff P, de Jonge S, Kubilay NZ, Zayed B, Gomes SM, et al. Surgical site infections 2: New WHO recommendations on intraoperative and postoperative measures for surgical site infection prevention. Lancet Infect Dis. 2022;22(3):e134-e145.