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Original Research Paper

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PROSPECTIVE STUDY OF SURGICAL SITE INFECTIONS (SSIs) AMONG OPERATED CASES IN GENERAL SURGERY DEPARTMENT OF A TERTIARY CARE HOSPITAL

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ABSTRACT **Background:** Surgical site infections (SSIs) are hospital-acquired infections occurring within 30 days post-surgery, or up to one year in case of implants. SSIs represent a significant proportion of nosocomial infections, with an incidence that varies based on the type of surgery and patient conditions. This study explores the risk factors, types, and preventive measures related to SSIs at a tertiary care hospital. **Objectives:** To evaluate the incidence of SSIs, identify the predominant microorganisms involved, and examine the association between various risk factors and SSI development. **Methodology:** A prospective observational study was conducted on 800 patients over 24 months, with microbiological evaluations, demographic analysis, and surgical factors being studied. Statistical analysis included Z-tests to determine the significance of risk factors. **Results:** The overall incidence of SSIs was 15%. Escherichia coli was the most common microorganism isolated. Deep SSIs were the most frequent type observed. Significant associations were found between age, comorbidities, emergency surgeries, and SSI occurrence. **Conclusions:** This study underscores the need for enhanced infection control practices, especially in high-risk groups and during emergency surgeries. Preventive strategies, including the administration of appropriate antibiotics and careful surgical techniques, are crucial for reducing SSIrates.

KEYWORDS : Surgical site infection, nosocomial infection, risk factors, microbiology, infection prevention.

INTRODUCTION

Surgical Site Infections (SSIs) are hospital-acquired infections that occur after surgery, typically within 30 days or up to one year if an implant is involved.[1] SSIs account for a significant proportion of all hospital-acquired infections, ranging from 10% to 30%.[2]

Surgical Site Infections (SSI) is the commonest nosocomial infections and is responsible for the morbidity, mortality and significantly prolongs the duration of hospitalization, thus adding the economic burden. Based on NNIS (National Nosocomial Infections Surveillance) system reports, Surgical Site Infections (SSIs) are the third most frequently reported nosocomial infection, accounting for 14 to 16 percent of all nosocomial infections among hospitalized patients. Among surgical patients, surgical site infections were the most common nosocomial infection, accounting for 38 percent of all such infections. Of these surgical site infections 2/3rd was confined to the incision, and one third involved organs or spaces accessed during surgery. [3]

Surgical site infections are frequent and the incidence varies from 0.5 to 15% depending on the type of operation and underlying patient status. [4]

The infection is usually acquired during the operation itself; either exogenously (e.g. from the air, medical equipment, surgeons and other staff), endogenously from the flora on the skin or in the operative site or, rarely, from blood used in surgery. The infecting microorganisms are variable, depending on the type and location of surgery, and antimicrobials received by the patient. The most 5 commonly isolated organisms are Staphylococcus aureus, coagulase negative Staphylococci, Enterococcus spp and E. coli. The main risk factor is the extent of contamination during the procedure (clean, clean contaminated, contaminated, dirty), which is to a large part dependent on the length of the operation, and the patient's general condition. [5]

Patients with known nasal carriage of S. aureus should receive intranasal applications of mupirocin 2% ointment with or without a combination of chlorhexadine gluconate body wash. Mechanical bowel preparation alone (without the administration of oral antibiotics) should NOT be used in adult patients undergoing elective colorectal surgery. In patients undergoing any surgical procedure, hair should either NOT be removed or, if absolutely necessary, should only be removed with a clipper. Shaving is strongly discouraged at all times, whether preoperatively or in the operating room. Surgical antibiotic prophylaxis (SAP) should be administered before surgical incision, when indicated. WHO global guidelines for the prevention of surgical site infection when indicated SAP should be administered within 12withingbefore incision, while considering the half-life of the antibiotic.

Surgical hand preparation should be performed either by scrubbing within a suitable antimicrobial soap and water or using a suitable alcohol-based hand rub before donning sterile gloves. Alcohol-based antiseptic solutions based on CHG for surgical site skin preparation should be used in patients undergoing surgical procedures.

Adult patients undergoing general anesthesia with endotracheal intubation for surgical procedures should receive 80% fraction of inspired oxygen intra operatively and, if feasible, in the immediate postoperative period for 2–6 h. surgical antibiotic prophylaxis administration should not be prolonged after completion of the operation. [6]

Methods And Patients

A prospective observational study was carried out on 800 patients who underwent surgery in a single tertiary care centre. The study was conducted over a period of 24 months between July 2022 and July 2024. Collected data from patients undergoing both elective and emergency indications during the study time who are willing for the study. Informed consent from all subjects taken and data collected according to pre designed case report form.

Sample Collection And Processing Of Specimens

After taking informed consent from subjects willing to participate in study, data collected in pretested predesigned case record form. Data collected about socio demographic factors like age and sex, history of other comorbid conditions, physical examination findings and clinical signs, investigations. Data regarding demographic details, type of surgery performed, whether emergency or planned surgery, the duration of surgery, surgical antibiotic prophylaxis given, duration of preoperative stay, presence of co morbid conditions and the duration of post op stay are collected.

All the patients included in the study will be monitored in the ward for the development of signs and symptoms of SSI. Post-operative monitoring of patient was done for 30 days for surgeries without implant and for 1 year for surgeries with implant. Regular follow up of patients are taken. Samples from patients developed SSI collected and sent for microbiological investigations.

Statistical Analysis

In this study demographic variable such as age, sexes were summarized using means for continuous variables. To know the significant difference between risk factor and presence or absence of SSI, analyses were done using the Z-test. A p value of <0.05 was considered statistically significant.

RESULTS

In this study, most participants fall within the age range of 51-60 years, majority were male (55%) and 520 participants do not have any co-morbidities, constituting 65% of the total. In this study 480 individuals or 60% of the sample, have a BMI exceeding 25.0. The majority of participants, comprising 490 individuals or 61.25% of the sample, underwent Open Surgery. In contrast, 310 participants, representing 38.75% of the total, underwent Laparoscopic Surgery.

Table – 1 Relationships Between Parameters For The Study Participants

PARAMETERS		NON-SSI	SSI
TYPE OF OPERATION	EMERGENCY CASES	440	72
	ELECTIVE CASES	360	48
INCISION TYPE	CLEAN	150	10
	CLEAN-	200	32
	CONTAMINATED	280	68
	DIRTY	50	10
TYPE OF SURGERY	OPEN SURGERY	490	80
	LAPAROSCOPIC	310	40
DURATION OF SURGERY	< 2HRS	480	22
	>2HRS	320	102
GENDER	MALE	440	55
	FEMALE	360	45
COMORBIDITIES	PRESENT	280	72
	ABSENT	520	48
SMOKING STATUS	PRESENT	204	72
	ABSENT	476	48
WBS COUNT	NORMAL	648	12
	INCRESED	32	102

Among 800 study participants, 120 subjects developed surgical site infection out of which the majority falls under Grade II SSI according to Southampton grading with 80 individuals, constituting 66.67% of the sample. Following Grade II, Grade III has 15 participants, representing 12.51% of the total. Grade I and Grade V have the least representation, with 10 participants (8.33%) and 8 participants (6.66%) respectively. Grade IV falls between these extremes with 7 participants, accounting for 5.83% of the sample. Microbiological evaluation of samples of SSI Escherichia coli emerges as the most prevalent, with 62 participants affected, constituting 52% of the sample. Staphylococcus aureus follows isolated from 23 participants, representing 20% of the total. Enterococcus and Streptococcus epidermidis are also identified, with 18 (15%) and 7 (5%) participants affected respectively. Pseudomonas and other microorganisms each account for 4% of the sample. Also meropenem and tazobactem are most common antibiotics sensitive to patients with surgical site infection.

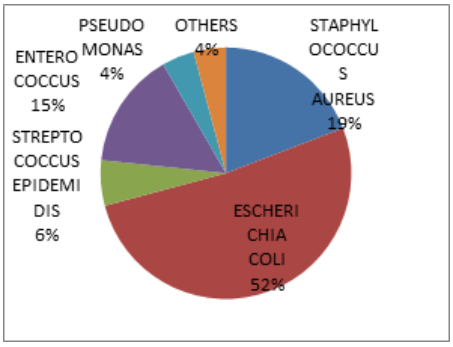

Figure 1: Distribution of the study participants according to the microorganism isolated

The most prevalent type of SSI is Deep SSI, observed in 48 participants, representing 40% of the sample. Following closely, Superficial SSI is documented in 42 participants, constituting 35% of the total. Organ Space SSI exhibits the least frequency, with 30 participants affected, accounting for 25% of the sample.

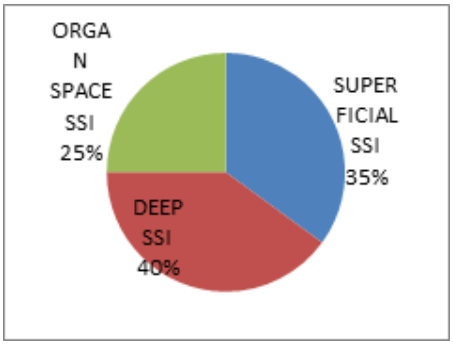

Figure 2: Distribution of the study participants according to the type of SSIs

Among the total of 120 participants, four types of wound classifications were identified: Clean, Clean-Contaminated, Contaminated, and Dry. The majority of participants, comprising 68 individuals or 56.67% of the sample, had contaminated wounds, reflecting a higher risk of infection due to contamination during surgery. Clean- Contaminated wounds were observed in 32 participants, representing 26.77% of the total, indicating a moderate risk of infection as these wounds involve entry into the respiratory, gastrointestinal, or genitourinary tracts under controlled conditions. Clean and Dirty wounds each accounted for 10 participants, constituting 8.33% of the sample, with clean wounds representing the lowest risk of infection due to minimal exposure to microbes.

Associations between various parameters for the study participants, there is strong association between age and SSI occurrence. The mean age of participants with SSI (62.5 ± 15.75 years) is significantly higher than those without SSI (54.5 ± 18.50 years), with a p-value of <0.001. Presence of comorbidities, smoking status, WBC count, length of incision, surgical duration, and blood loss exhibit significant associations with SSI, as indicated by p-values below the threshold of 0.05. type of operation urgency exhibits a significant association with SSI occurrence (p-value = 0.003), with a higher proportion of SSI cases observed in emergency surgeries compared to elective cases. Secondly, incision type also shows a significant association with SSI (p- value = 0.004), indicating a higher risk of SSI development in contaminated and clean- contaminated incisions compared to clean and dry incisions. Thirdly, the type of surgery demonstrates a significant association with SSI occurrence

(p-value = 0.045), with a higher proportion of SSI cases observed in open surgeries compared to laparoscopic surgeries. Lastly, the duration of surgery exhibits a significant association with SSI (p-value = 0.049), with a higher proportion of SSI cases observed in surgeries lasting more than 2 hours compared to those lasting less than 2 hours. These findings emphasize the importance of operative factors in influencing the risk of SSI development and underscore the need for meticulous surgical techniques and infection control measures to minimize postoperative complications effectively.

DISCUSSION

The present study provides a more detailed distribution across age, gender, and BMI categories, offering a nuanced view of the sample population. In contrast, the Dr. Firas Manuel Naamo et al study offers more focused data on older age groups, specific comorbidities, and a narrower BMI range, revealing a high concentration of obesity-related cases. These differences reflect the varying methodologies and focus areas of the two studies, influencing the interpretation and application of their findings.

The present study had a higher proportion of moderate infections (Grade II), while the Pradeep Ghimire et al Study showed a higher prevalence of severe infections (Grade III). Differences may be due to sample size, clinical practices, and infection control measures. Both studies showed high sensitivity to Meropenem and Tazobactam. However, the previous study included additional antibiotics and reported higher sensitivity for Gentamycin and Tigecycline. Differences in resistance patterns and bacterial strains could explain variations.

The present study had a more balanced distribution, with Deep SSI being the most common. The study by Abdu Al-Hajri et al. reported a predominance of Superficial SSIs. Variations may arise from differences in surgical procedures, patient populations, or infection prevention strategies. These different categorizations reflect varied research foci and healthcare setting. The findings underscore the importance of comprehensive patient management and risk factor identification in preventing SSIs.

CONCLUSIONS

This study investigated the incidence, severity, and risk factors associated with surgical site infections (SSIs) in a cohort of 800 patients. The results demonstrate a significant SSI incidence rate of 15% (120/800), with Grade II infections being the most prevalent. Escherichia coli emerged as the dominant pathogen, underscoring the need for targeted antimicrobial therapy and enhanced infection control measures. Notably, deep SSIs were the most common type, often associated with emergency open surgeries, highlighting the critical nature of these interventions. Multivariate analysis revealed significant associations between SSI and several parameters, including age, comorbidities, surgical factors, and anesthesia type.

REFERENCES:

[1] Utsumi M, Shimizu J, Miyamoto A, et al. (2010), "Age as an independent risk factor for surgical site infections in a large gastrointestinal surgery cohort in Japan". J. Hosp. Infect; 75(3): 183–187.

[2] Seidelman JL, Mantyh CR, Anderson DJ (2023): "Surgical Site Infection Prevention: A Review". JAMA; 329(3): 244–252.

[3] R. Saravanakumar b, B. M. Pabitha Devi (2019), "Surgical site infection in a tertiary care centre-an overview - A cross sectional study". IJS;12-16 https://doi.org/10.1016/j.ijso.2019.09.008

[4] Cruse PJE, Ford R (1980). "The epidemiology of wound infection. A 10 year prospective study of 62,939 wounds. Surg Clin North Am, , 60:27 40.

[5] Nosocomial infections rates for interhospital comparison: limitations and possible solutions — A report from NNIS System.(1991), Infect Control Hosp Epidemiol,, 12:609–621.) .

[6] World Health Organization (WHO) publication, Preoperative period - surgical site infection prevention recommendations

[7] Pradeep Ghimire et al (2022) "Postoperative Surgical Site Infections in the Department of General Surgery of a Tertiary Care Centre: A Descriptive Cross-sectional Study". JNMA J Nepal Med Assoc. 5;60(249):439-443.doi: 10.31729/jnma.7316.

[8] Abdu Al-hajri et al. (2024)," Identification of predictive factors for surgical site infections in gastrointestinal surgeries: A retrospective cross-sectional study in a resource-limited setting". F1000Research,DOI:10.12688/ f1000 research.135681.3

[9] Naamo, D. F. M et al. (2024). "Analyzing the Risk Factors and Prevention Strategies for Surgical Site Infections". EJMMP, 4(1), https://inovatus.es/ index.php/ejmmp/article/view/2373