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CLINICO-EPIDEMIOLOGICAL STUDY OF WOUND INFECTION: A CASE SERIES TYPE OF DESCRIPTIVE STUDY

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ABSTRACT

Introduction: Healthcare-associated infections remain a critical public health issue, with surgical site infections (SSIs) being among the prevalent nosocomial infections globally. This case series investigates SSI cases to elucidate their clinical and epidemiological profiles, aiming to enhance understanding of their causes and thus improve preventive measures.

Material and Methods: This study encompassed 200 SSI cases treated and operated within the upgraded surgical department of Sawai Man Singh Hospital in Jaipur. The study spanned from January 2023 to August 2023 and included cases of varying age and gender who underwent emergency laparotomies, selected randomly.

Results: Patients averaged 47.4 years, with 91% being females and 9% males. Prominent symptoms included discharge (76 cases), pain and tenderness (66 cases), raised local temperature (46 cases), and suture issues (22 cases). The primary collection type was seropurulent (120 cases), followed by serous, purulent, and fecopurulent collections. E. coli led SSIs at 27% (n=52), Enterobacter at 5% (n=10), Staphylococcus at 2% (n=4), while Klebsiella and Pseudomonas each accounted for 1% (n=2).

Conclusion: SSIs stand as a leading cause of nosocomial infections, pivotal in driving substantial morbidity, mortality, extended hospital stays, and increased treatment costs in surgical patients. However, these impacts can be mitigated through stringent adherence to infection control protocols and prudent antibiotic usage, as per guidelines.

Keywords: Surgical Site Infections (SSI), Laparotomies.

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INTRODUCTION

Surgical Site Infection (SSI) encompasses infections affecting both the surgical wound and body cavities or organs, potentially involving implants or prosthetic devices.[1] Particularly prevalent in low-middle income countries (LMICs), SSI impacts up to a third of surgical patients, constituting a major hospital-acquired infection (HAI) category. While SSI rates are notably lower in high-income countries (HICs), it still ranks as the second most frequent HAI.[2]

The implications of SSIs extend significantly to patients, healthcare facilities, and society at large. They elevate both morbidity and mortality[3], contributing to the societal healthcare burden through increased economic costs and diminished years of health. Moreover, SSIs lead to escalated healthcare expenses and resource utilization. Notably, previous research indicates that SSI-related costs can escalate considerably—potentially doubling, tripling, or even increasing by sixfold when compared to patients unaffected by SSIs.[4-6] These variations in cost impact are contingent on factors such as the surgery type, healthcare environment, and infection type.

While evidence-based guidelines for preventing Surgical Site Infection (SSI) are comprehensive and numerous studies have validated their effectiveness in reducing wound sepsis rates through successful implementation[7-10], the overall scenario reflects significant non-compliance and a lack of initiative among stakeholders to adopt these optimal care practices.

Furthermore, post-operative wound infections or SSIs not only hinder a prompt return to productive work but also extend hospital stays.[7] They can compromise abdominal closure integrity, leading to complications like wound dehiscence and incisional hernias. These outcomes exacerbate patient distress, reduce quality of life, and increase unnecessary suffering.[8,9]

Advancements in infection control encompass better operating room ventilation, sterilization techniques, protective barriers, refined surgical approaches, and access to antimicrobial prophylaxis. Despite these advancements, SSI continues to stand as a significant contributor to morbidity and mortality among hospitalized patients. Hence, to effectively curtail SSI-related morbidity, a systematic yet pragmatic approach is essential. This approach should acknowledge that the risk of SSI is influenced by patient attributes, the nature of the procedure, healthcare personnel, and hospital conditions.

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This case series involving 200 instances of Surgical Site Infection (SSI) was undertaken with the goal of comprehending the clinico-epidemiological characteristics of these cases. The primary aim was to gain a deeper understanding of the causative factors behind SSIs and to enhance preventive strategies.

MATERIAL AND METHODS

This prospective observational study was conducted at the Department of General Surgery, SMS Medical College in Jaipur, Rajasthan, India. The study focused on a cohort of 200 patients who had undergone emergency laparotomies and subsequently developed Surgical Site Infections (SSIs). The research was carried out between January 2023 and August 2023. The study participants were randomly selected regardless of age or gender, and they were chosen from those who had undergone emergency laparotomies.

Patients with any risk factors for wound infection and those who had not provided written informed consent were excluded from the study. Upon admission to the surgical ward, a comprehensive patient history was obtained, followed by a systemic examination. Pre-operative diagnoses were established based on history and pre-operative investigations. All patients diagnosed with peritonitis (both Primary and Secondary) who underwent emergency laparotomies were included in the study. During surgery, meticulous irrigation of the peritoneal cavity and the surgical wound site was performed using normal saline, ensuring proper hemostasis.

Patients who were already receiving intravenous antibiotics based on their primary pathology continued with the same antibiotic regimen. For patients not on antibiotics, broad-spectrum antibiotics were initiated. Adjustments to antibiotic treatment were made according to sensitivity reports and the severity of wound infections when necessary. The amount of discharge from the surgical wound was recorded daily, and drainage tubes were removed once the drainage stopped or the output reached 5ml or less, whichever occurred earlier. Sutures were removed before patients were discharged from the hospital.

Patients were followed up for a period of 30 days postoperatively, either through regular outpatient visits or correspondence. The treatment and management of the patients were overseen by senior consultants and residents under their direct supervision. The procedure was subsequently communicated to other clinical faculty members and residents who assisted in the ongoing treatment and care of these patients.

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Information concerning the phases before, during, and after surgery was methodically collected. This included data from different stages of the surgical procedure. The amassed information was structured into a detailed master chart using Microsoft Excel 2010 spreadsheets. Qualitative data were expressed as percentages and proportions, providing a distinct grasp of comparative incidents. Conversely, quantitative data were showcased using central statistical measures, particularly average values, accompanied by their respective standard deviations. This precise method of arranging and illustrating data supported a thorough examination of the gathered data, assisting in extracting significant observations from the research.

RESULTS

Out of the total 200 cases of surgical site infections (SSIs), a significant portion of them fell within the age range of 35 to 50 years. The youngest individual affected was 26 years old, while the eldest patient was 74 years old. The average age of the patients was determined to be 47.4 years. The majority of the cases consisted of females, accounting for 91%, whereas males constituted a smaller proportion at only 9%. Among the cases, 70% were associated with patients from rural areas, whereas the remaining 30% were linked to individuals from urban settings.

Table 1: Bio-socio-demographic distribution of SSI cases

Parameter		Number	%
Age (in years)	20-30	20	10
	31-40	32	16
	41-50	64	32
	51-60	40	20
	61-70	28	14
	71-80	16	8
Sex	Male	18	9
	Female	182	91
Residence	Rural	140	70
	Urban	60	30

The prevailing indication and manifestation observed was discharge, noted in a total of 76 cases. Subsequently, pain and tenderness were reported in 66 instances, followed by elevated local temperature in 46 cases, and suture-related issues such as tension or cutting through in 22 cases. Furthermore, the most commonly encountered collection type was seropurulent, identified in a majority of 120 cases, followed by serous, purulent, and fecopurulent collections.

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Table 2: Clinical profile of SSI cases

Parameter		Number	%
Sign & Symptom	Discharge	76	38
	Pain and Tenderness	66	33
	Raised local Temperature/ Fever	46	23
	Suture under tension/ Cut through	22	11
Type of Collection	Seropurulent	120	60
	Serous and purulent	36	18
	Fecopurulent	10	5

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Among the total of 200 cases that underwent surgery, the highest proportion, specifically 160 cases (80%), underwent the classical modified radical mastectomy (MRM) procedure. Additionally, 12 cases (6%) involved toilet mastectomies or palliative mastectomies, all of which were conducted due to the presence of fungating masses. A simple mastectomy was performed in 24 cases (14%). Out of the entire cohort of 200 surgical cases, 112 cases (56%) were conducted by surgical oncologists, with the remaining 88 cases (44%) being carried out by general surgeons.

Table 3: Distribution of SSI cases according to type of operation done.

Parameter	Number	%
Simple Mastectomy	28	14
Classical modified radical mastectomy (MRM)	160	80
Toilet mastectomies or palliative mastectomies	12	6

Among the complete set of surgical site infections (SSIs), 27% of cases (n=52) were attributed to E. coli, while Enterobacter was responsible for 5% (n=10), Staphylococcus for 2% (n=4), and both Klebsiella and Pseudomonas individually contributed to 1% of cases each (n=2).

Table 4: Distribution of SSI cases according to etiological agent.

Parameter	Number	%
E. Coli	52	27
Enterobactor	10	5
Staphylococcus	4	2
Kleibsella	2	1
Pseudomonas	2	1

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DISCUSSION

The occurrence of wound infections subsequent to surgical procedures poses a tangible risk inherent to any surgery, imposing a notable burden in terms of patient well-being and mortality. Despite advances in infection control protocols, surgical site infections (SSIs) continue to exert a significant impact, leading to prolonged hospital stays, increased patient morbidity, and even fatalities. It is noteworthy that SSIs hold a mortality rate of 3%, and a substantial 75% of deaths linked to SSIs can be directly attributed to the infections.[11] These infections not only hinder the recovery process and extend hospitalization but also contribute to considerable psychological distress and financial strain on society.

Traditional approaches for managing purulent wound collections typically involve open drainage, followed by a series of dressing changes over several weeks, ultimately leading to secondary intention healing.[12] However, this treatment approach lengthens the time patients spend under medical care for wound management. Wound healing is a complex, interconnected biological process taking place at the molecular level. This healing process is categorized into distinct phases for explanatory purposes: the inflammatory phase, the proliferative phase, and the maturation phase. Throughout these phases, the wound undergoes a continuous remodeling process to regain a state similar to its condition prior to injury. Approximately 70-80% of the wound's initial tensile strength is regained within 3-4 months postoperatively. For this systematic wound healing process to occur effectively, the local environment of the wound must be conducive to healing.

Evidence indicates that if a wound isn't allowed to drain freely, blood, bodily fluids, and necrotic material accumulate within the wound, creating an environment conducive for microbial growth. Surgical wound drainage is recognized as a pivotal factor in facilitating the healing process. Throughout history, this surgical drainage method was accompanied by daily dressings, enabling healing through secondary intention. Consequently, the prevention of surgical site wound infections is considerably more pragmatic than addressing them once they have already taken root.

Among the total of 200 cases of surgical site infections (SSIs), a substantial majority was observed within the age bracket of 35 to 50 years. Notably, the majority of these cases consisted of females, accounting for 91%, while males made up only 9%. The distribution based on background revealed that 70% of cases hailed from rural settings, with the remaining 30% originating from urban environments.

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A study conducted by Farhan et al[13] yielded findings indicating that SSIs were more prevalent in patients aged above 60, constituting 44.44% of cases, whereas patients under the age of 15 exhibited a lower occurrence at 9.09%. This trend suggests that the risk of SSI tends to increase as the patient's age advances. Similarly, a study in Andhra Pradesh, India demonstrated similar outcomes[14], further validating this observation. The rise in age is often linked to a heightened likelihood of chronic conditions and delayed wound healing, potentially accounting for the escalated incidence in older age groups.

Parallel results were reported by Masood A et al[15], who noted a higher infection rate among patients aged 51 to 60 years compared to younger age groups. In contrast, a study conducted by Rajendra et al[16] found that cases of post-operative wound infection were most common following Prostatectomy, followed by Intestinal surgery (42.11%), and Cholecystectomy (33.33%). However, the distribution of cases according to the type of operation did not show significant differences (p>0.05). Conversely, various authors[15] have observed that the proportion of post-operative wound infections varies depending on the type of surgery performed.

Concurrently, this study observed that all cases were operated on in emergency situations, resulting in post-operative wound infections. This finding is corroborated by Rajendra et al[16], who similarly noted that surgeries performed in emergency scenarios led to a significantly higher incidence of post-operative wound infections. This observation gains further support from Michalopoulos A et al[17], whose research indicated that emergency surgical procedures exhibited greater susceptibility to infections (p = 0.08) in comparison to planned procedures.

Regarding the nature of the infections in this study, out of the entire collection of SSIs, E. coli was responsible for 27% of cases (n=52), Enterobacter for 5% (n=10), Staphylococcus for 2% (n=4), and both Klebsiella and Pseudomonas individually caused 1% of cases each (n=2). Similar patterns were noted by Rajendra et al[16], who discovered that the primary causative agent in post-operative infected wounds was Staphylococci (90.48%), followed by Streptococci, E. coli, Klebsella, and Pseudomonas. Masood et al[15] also identified common organisms involved in SSIs, including Staphylococcus aureus, E. coli, Streptococcus pyogenes, and the Pseudomonas group. Additionally, Arora et al[18] reported that Staphylococcus aureus was the most frequently encountered single pathogen linked to postoperative wound infections.

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CONCLUSION

The findings of this study lead to the conclusion that evident signs of inflammation were present in post-operative wound collections. Notably, associated morbidity emerged as a significant risk factor. Moreover, the rates of surgical site infections (SSIs) were notably higher in certain groups, including older patients, those with elective surgical procedures, individuals with obesity, patients undergoing prolonged surgeries, those who had undergone major surgical interventions, patients operated on by TMOs, and those with anemia. These factors can be regarded as potential indicators of heightened risk. Addressing these high-risk groups becomes imperative to mitigate the occurrence of SSIs.

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