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ORIGINAL ARTICLE

A Comparative Study of the Incidence and Severity of Surgical Site Infection Following Emergency and Elective Abdominal Surgeries in a Tertiary Care Hospital

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Abstract

Background: Surgical site infection is a medical condition that develops up to 30 days after the surgery if no implants have been placed, and as long as 12 months if the patient has an implant device. SSIs pose a substantial barrier to healing and resumption of normal activities. SSIs and its side-effects have been noted as one of their primary contributors to the morbidity following surgery. This study will look at the incidence and severity of infections at the surgical site after both emergency and elective abdominal surgery. **Methods:** This is prospective observational research in patients who underwent Surgeries in either elective or emergency settings. Southampton wound assessment scale and the ASEPSIS wound scoring system were used in grouping the patients with SSI followed by each patient's SSI type was further recorded. The study also documented other factors, such as hospital stay and interventions. **Results:** There were one fifty participants in this study. 23 patients experienced SSI (6 elective cases and 17 emergency cases), while 127 people did not. The pathogens most commonly cultured were coagulase negative staphylococcus (CoNS, 8 cases), after which came Escheria coli. (4 cases). **Conclusion:** A higher prevalence of SSI is linked to factors including the patient's advancing age, a dirty wound, prolonged surgery, usage of drains, nutritional deficiency, anemia, and diabetes. The hospital personnel need to be more careful about following aseptic procedures and have more awareness of infection management.

Keywords: Abdomen, Laparotomy, Coagulase negative Staphylococcus aureus, Surgical Site Infections, Incidence

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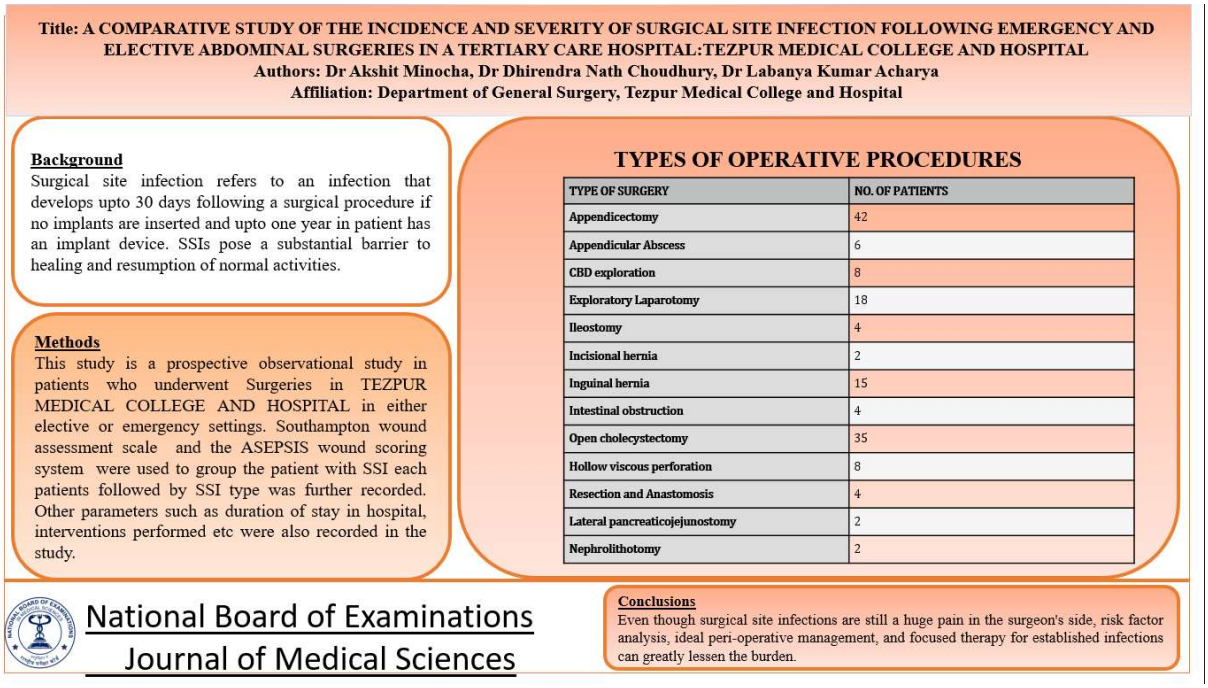
Graphical Abstract



Background

The Centers for Disease Control and Prevention describe surgical site infection as an infection of the wound that arises within a thirty days of the procedure or over a year if a prosthesis is still in place [1]. The infection is thought to have occurred as a result of surgery. SSI are a substantial hindrance to a patient's recovery and return to normalcy. As Osler famously stated, “Typically, patients die from their body's response to infection rather than the infection itself” [2]. Infections were once thought to be a necessary evil, but there has been a gradual but significant paradigm shift in favor of early detection and effective treatment of these infections [3-6].

Methods

This study is a prospective observational research in patients who had Surgery in Tezpur Medical College and Hospital in either elective or emergency settings. Southampton wound assessment scale [7] and the ASEPSIS scoring system [8] were used in grouping the patient with SSI each patient followed by SSI type was further recorded. Other factors, such as length of hospital stay, interventions performed, and so on, were documented in the study.

Inclusion Criteria

Patient with age ≥ twelve years

Patients who agree to engage in the clinical study.

Exclusion Criteria

Patients who have been diagnosed as immune compromised and are being treated with steroids.

Patients under the age of twelve.

Patients with prostheses.

Patients refused to participate in the clinical study.

Data Collection

The presence or absence of surgical site infection was assessed by routine, daily postoperative evaluation of the patient's general condition and a local examination of the patient's laparotomy incision. The

ASEPSIS wound score system was then used to divide patients with SSIs into distinct categories. Seven plus the Southampton Wound Assessment Scale. Each patient's exact SSI type was also documented. Additional parameters such as the length of the patient's hospital stay, their microbiological profile, the interventions they received, and so on were also recorded. Patients with SSIs were evaluated based on the severity of the infection utilizing wound culture and sensitivity, complete blood count, abdominal ultrasonography, and/or computed tomography (CT) abdomen, if needed. There were other tests to assess liver and renal function.

SAMPLE SIZE ESTIMATION

$$N = \frac{((p0q0 + p1q1)(Z\alpha + Z\beta)^2}{(p1 - p0)^2}$$

where,

N = Sample size

Z alpha = Z score of alpha error (i.e 1.96 with an alpha error of 5%)

Z beta= Z score of beta error (i.e. 0.842 with beta error of 20%)

P = prevalence according to study

The overall rate of surgical wound infection was 13.7%, and the infection rate was higher with emergency surgery (29.3%) than with elective surgery, per a retrospective observational study done in the Departments of General Surgery over a 12-month period in a tertiary care center in Tezpur. The sample size after adjusting for changes was 71, comprising 150 patients from Tezpur Medical College and Hospital who were eligible for the study period that was being suggested.

Results

Out of the one fifty participants who signed for the research, the patients' ages ranged from 12 (the lowest age that could be included) to over 80 (mean age of 42.5 and standard deviation of 45.3). Most of the patients clustered in the age range of 21 to 70, with the vast majority falling between 21 and 30 years of age. There were just two patients who were discovered to be older than 80 (Tables 1 to 4).

Table 1. Clinical data of sampled patient

AGE (IN YEARS)	NO. OF PATIENTS
<20	11
21-30	35
31-40	28
41-50	24
51-60	27
61-70	20
71-80	4
>80	2

Table 2. Showing types of operative procedure performed

TYPE OF SURGERY	NO. OF PATIENTS
Appendicectomy	42
Appendicular Abscess	6
CBD exploration	8
Exploratory Laparotomy	18
Ileostomy	4
Incisional hernia	2
Inguinal hernia	15
Intestinal obstruction	4
Open cholecystectomy	35
Hollow viscous perforation	8
Resection and Anastomosis	4
Lateral pancreaticojejunostomy	2
Nephrolithotomy	2

Table 3. 2x2 contingency table

		Surgical site infection		
		Yes	No	Total
Elective surgery	Count	6	69	75
	%within SSI	26%	54%	50%
Emergency surgery	Count	17	58	75
	%within SSI	74%	46%	50%

Analysis of the prevalence of SSIs in planned and emergency procedures. When compared to elective surgery, patients undergoing emergency operations had a higher rate of SSI.

Table 4. Clinical data of organisms growth in elective and emergency procedures

	Organism count	
Organism	Emergency	Elective
Citrobacter	1	0
Coagulase negative staph aureus	6	2
E. coli	3	1
Klebsiella	2	1
MRSA	1	0
Pseudomonas	2	0
Staphylococcus aureus	0	1
Other	2	1

In this study, the use of drains has considerably increased the risk of SSI i.e. 24.2%. More commonly used in contaminated or dirty wounds, as well as in urgent and protracted operations that increase the possibility of the site being infected [9], has also recorded 22.4% cases of drained wounds and 3% of not drained wounds being affected (Figure 1).

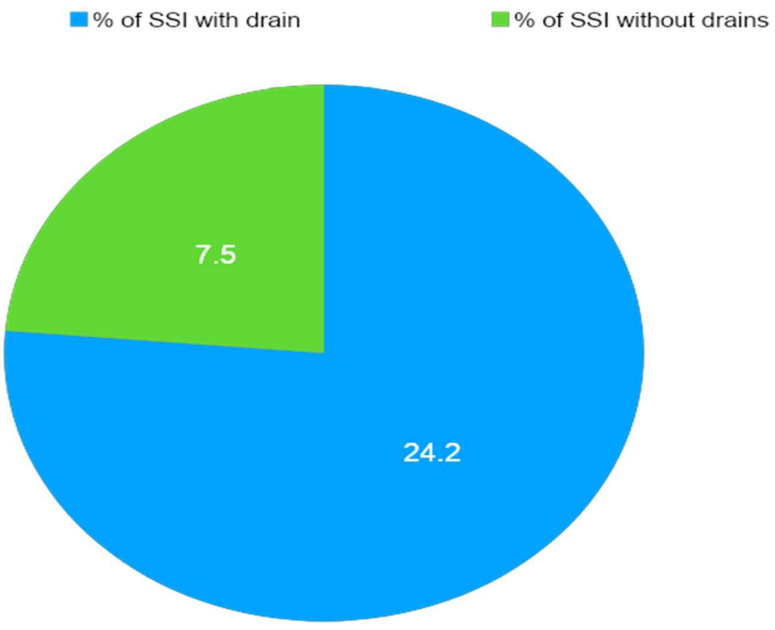


Figure 1. Piechart showing percentage of patient having SSI with or without drain.

The three comorbid conditions under investigation were anemia, hypertension, and diabetes mellitus. The threshold for the anemia in males and females respectively, were 13.5gm% and

12gm% of haemoglobin. 17 (58.6%) of the 29 surgically treated anemic patients developed SSI.

Diabetics and hypertensives, respectively were defined as study participants who were aware of their condition prior to admission and those who received a diagnosis after admission. It was found majority of them have both the condition 18 (75%) patients of 24 diabetics and 16 (72.7%) patients of 22 respectively developed SSI.

Discussion

After surgery wound infection continues to be one of the leading causes of morbidity and among the most prevalent nosocomial infection [10]. SSI rate varies widely both globally and amongst hospitals. Various studies have found SSI rates to range from 2.5% to 41.9% [11-15]. Although high, the current study's incidence of SSI, which is 15.33%, is consistent with previous research.150 patients in all were included and followed up during the course of the trial.

The article has already described the parameters that were taken into account. When taking into account the patients' ages, the vast majority (114 of the total 150 patients) fell into the 20–60 age range, as indicated in Table 1. Numerous studies have shown that age is a separate risk factor. This is most likely clarified by those being treated with concentration in age groups that do not substantially impact their postoperative course, the relative scarcity of patients at the oldest and youngest ages, and potentially because older people have better access to and knowledge of health care. Significant risk factors for SSI included comorbid diseases such anemia, diabetes, and hypertension. In multivariate analysis, diabetes remained a significant predictor. Similar to our study, the National Academy of Science likewise found that patients with diabetes mellitus had a greater rate of infection [16]. The study participants underwent surgical procedures, with an appendectomy being the most frequent surgery. (42 of 150 patients).

This is important since it shows that the results of this study can be applied to a larger group of surgical patients. Table 2 contains a comprehensive list of all the different operations that were carried out. As previously stated, the type of surgery conducted affects the likelihood that SSI will develop; nevertheless, given the small number of cases where SSI did develop and the vast range of procedures carried out, a conclusive association could not be established.

All of the trial participants received preventative antibiotics. Ceftriaxone was the most commonly used antibiotic (42 out of 150), followed by cefuroxime (34 out of 150). This aligns to the hospital's antibiotic regimen. Evidence supporting the use of cephalosporins as a prophylactic precaution. In cases when there is an overwhelming clinical belief that the offending bacterium is present, it is also recommended to switch to other targeted antibiotics. According to subgroup analysis, the majority of patients (8 of 23) who later developed an SSI had ceftriaxone prior to surgery, indicating localized Resistance to antibiotics exists among organisms in the research area.

The most frequently cultured organism in SSIs was CONS (8 out of 23 cases), followed by Escheria coli (4 out of 23 cases). Because of its ubiquity in skin flora, S. aureus is the most often cultured bacterium in SSIs, followed by coagulase-negative staphylococci (CNS) [17,18]. However, This study identified

just two cases of Staphylococcus aureus as indicated in Table 4.

Conclusion

Even while infections at the surgical site remain an important cause of concern for surgeons, risk factor analysis, excellent perioperative care, and focused therapy for existing pathogens can dramatically minimize the burden. Risk elements can be efficiently handled and patients classified by identifying risk variables including the type of procedure done (e.g., emergency vs. planned), existing co-morbidities, the existence or absence of illnesses. This study also looks at the geographic and socioeconomic patterns of SSIs, as well as how the microbial flora involved in SSIs changes, resulting in antibiotic resistance. This enables for adjustments to antimicrobial regimens while emphasizing the importance of improved regional and hospital-based surveillance programs.

Risk factor for prevention and proper therapy for infection that has already taken hold are essential components of the management of SSIs.

Statements and Declarations

Conflicts of interest

The authors declares that they do not have conflict of interest.

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