Original Article

Common Organisms Causing Surgical Site Infections (SSI) in Post-Operative Patients in a Tertiary Care Hospital

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[1,2]Conception of study
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[2,4,5]Critical Review
[3,6] Facilitation and Material analysis

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Article Processing
Received: 29/06/2022
Accepted: 05/09/2022

Cite this Article: *Fatima Mustafa, Mumtaz Ahmed Khan, Abdullah Mustafa, Arifa Manzoor, Safia Safa, Samiullah Khogyani. Common Organisms causing surgical site infection (SSI) in Postoperative patients in a tertiary care Hospital. https://www.journalrmc.com/index.php/JRMC/article/view/1982 DOI: https://doi.org/10.37939/jrmc.v26i4.1982*

Conflict of Interest: *Nil*
Funding Source: *Nil*

Abstract

Objective: To investigate the common types of organisms causing surgical site infections in postoperative patients and their association with other factors.

Study Design: Cross-sectional

Duration and Place of Study: Surgical Unit-II of Pakistan Institute of Medical Sciences (PIMS) Islamabad and from 1st March 2021 – 31st July 2021.

Materials and Methods: There were 391 surgeries in this study, but only 27 patients met the inclusion criteria. A diagnosis of SSI was based on specific parameters, including the detection of two or three cardinal signs of inflammation and the surgeon's confirmation of the diagnosis. This data was analyzed using IBM SPSS 23.

Results: Among 391 patients, 242 had elective surgeries (male:female, 1.6:1), and 149 had emergency surgeries (male:female, 1:3.4). The mean length of stay for elective surgeries was 2.19 ± 1.8 days and 4.2 ± 3.7 days for emergency procedures.

There were 98 abdominal procedures (65.77%) performed in emergency settings. Only 9 (3.71 %) elective procedures and 18 (12.08 %) emergency procedures reported surgical site infections. Escherichia coli was the most commonly isolated organism from SSI during the study. The rate of SSI in postoperative patients was 6.9%.

There was a statistically significant association between SSI and type of surgery (p=0.002). The mean length of stay (LOS) was longer for patients with SSI (mean=12.5, p=.000). Emergency cases had a longer LOS compared with elective cases (mean= 4.21 days vs 2.19 days, p=.000).

Conclusion: According to our study, our unit's SSI were comparable to other developing countries. SSI are more frequent in emergency cases, men, and diabetics, and are the primary cause of longer hospital stays.

Keywords: Surgical Site Infection; E.Coli; Length of stay.

Introduction

Surgical Site Infections (SSI) are the soft tissue, deep tissue, or organ infections that occur within 30 days of surgery or within the one-year post-surgery if any external implantation is done[1]. SSI are accounted as one of the most critical causes for postoperative complications[2]. SSI are 3rd most prevalent nosocomial infection, accounting for 10-40% of all nosocomial infections[3,4]. SSI rates have been reported from 2.5%-41.9% globally[3]. The prevalence of SSI in Ethiopia ranges from 10.9 to 75%5. In Pakistan, SSI were recorded in 4.6% to 17.5%[6-8].

There are four classes of wounds (clean, clean-contaminated, contaminated and dirty wounds)[9]. Aseptic surgical methods and appropriate wound toileting can prevent bacterial invasion into the wound. The etiologic agent must be identified before antibiotics can be prescribed to prevent antimicrobial resistance[10]. Staphylococcus aureus is the most common cause of SSI in community hospitals, accounting for up to 37% of cases, with methicillin-resistant S. aureus (MRSA) being of special concern[11].

Patient-related factors include advanced age, obesity, gender, medical history (e.g., diabetes), smoking, length of preoperative hospital stay, and any concurrent infections. The time it takes to scrub for surgery, and the time it takes to do the procedure, antiseptic skin medicine, and paring and preparing before the treatment is all examples of techniques[8]. Antibiotics are prescribed before surgery as a precautionary measure to avoid SSI. According to some recent studies, adopting minimally invasive methods can reduce the risk of SSI by shortening the procedure period[10].

The study aimed to determine the type and frequency of organisms causing SSI in postoperative patients in a tertiary care hospital.

Materials and Methods

This study was performed in accordance with the Declaration of Helsinki. This human study was approved by Shaheed Zulfiqar Ali Bhutto Medical University - approval: F.1-1/2015/ERB/SZAMU/582. All adult participants provided written informed consent to participate in this study.

- **Inclusion Criteria:** All post-operative adults patients (Above 18 years) developing SSI within 30 days after operation in the Department of Surgery, PIMS.
- **Exclusion Criteria:** Patients having a)Stitch abcess b)Episiotomy c)Burn wound infections.

The recruitment of participants began in March, and the study lasted around 5 months, from March to July, 2021. All cases received in the surgical team 2 had undergone surgery (major or minor).

Using WHO sample size calculator sample size was calculated with 7.6 %[8] expected prevalence, 99 % confidence level, margin of error 3.5% in an expected population size of 380. Patients included through non-probability sampling technique.

Total 410 surgeries took place, but only 391 patients were included in this study. Surgical wounds were examined by the consultant surgeons. Surgical Sites were assessed, and the wounds were considered infected based on a) Pus/discharge from the wound b) Cardinal signs of inflammation.

Data was analyzed in SPSS 23. We analyzed the mean and standard deviation of quantitative variables like age and period of hospital stay. Frequency and percentage were calculated by qualitative data like type of surgery, department and type of microorganism. Chi-square test was used to determine association between qualitative variable while Independent T test, T test and One-way Anova were used to determine association between length of hospital stay and other factors.

Results

Total 410 surgeries were performed during the study, and 391 patients were included and 19 patients missing their follow up record. All the baseline demographic characteristics of the study participants were recorded and analysed, as shown in Table 1. Elective Surgery was performed in 242 patients and 149 had surgery in emergency. The mean age of the participants was 35.14 ± 8.5 years in elective surgeries and 35.36 ±7.6 years in emergency surgeries.

Out of 242 patients who had elective surgeries, 150 (61.9 %) patients were male, and 92 (38.01 %) patients were female. Of 149 patients, patients who had emergency surgeries, 34 (22.8 %) patients were male, and 115 (77.1 %) patients were female. Mean hospital stay for elective surgeries was 2.19 ± 1.8 days and 4.2 ± 3.7 days for emergency procedures.

Out of 242 elective Surgeries performed laparoscopic procedures 80 (33.05 %) and abdominal surgeries

51(21.07 %) were the most common ones. On the other hand in emergency procedures abdominal procedures 98 (65.77 %) were the most commonly performed surgeries as shown in Table 1.

Table 1: Baseline demographic characters of study participants

Variables	*Elective Surgery (n=242)*	*Emergency Surgery (n = 149)*
Mean Age	35.14 ± 8.5	35.36 ±7.6
Gender:		
Male	150 (61.9%)	34 (22.8%)
Female	92 (38.01%)	115 (77.1%)
Mean Hospital Stay	2.19 ± 1.8	4.2 ± 3.7
Area of Surgery:		
Abdominal Surgery	51(21.07%)	98 (65.77%)
Mastectomy	41 (16.94%)	-
Thyroidectomy	8 (3.3%)	-
Hernioplasty	25 (10.33%)	-
Laparoscopic Procedures	80 (33.05%)	-
Open Cholecystectomy	13 (5.37%)	-
Perineal Surgery	16 (6.61%)	-
Miscellaneous	8 (3.3%)	51 (34.22%)

Surgical site infections were recorded in only 9 (3.71%) elective procedures and 18 (12.08%) emergency procedures. During the study it was noted that Escherichia Coli was the most commonly isolated organism from SSI in both types of procedures and rest of all organisms along with classes of wound are listed in Table 2.

It was seen that majority of the patients had Class II wounds in both the groups.

Table 2: Microorganisms causing SSI

	Elective Surgery (n=242)	*Emergency Surgery (n = 149)*
SSI Detected	9 (3.71%)	18 (12.08%)
Microorganisms causing SSI:		
E- Colli	6 (1.6%)	5 (3.3%)
Pseudomonas	-	3 (2.01%)
Klebsiella Pneumonia	2 (0.8%)	4 (2.68%)
Acinetobacter	-	2 (1.3%)
MRSA	-	1 (0.67%)
Staph Aureus	3 (0.8%)	2 (1.3%)
Others	1 (0.4%)	
Class of Wound:		
Class I	74 (30.9%)	-
Class II	139 (57.4%)	57 (38.2%)
Class III	21 (8.6%)	39 (26.1%)
Class IV	8 (3.3%)	53 (35.5%)
Organisms isolated from the cultures	Single Organism 12 (44.4%)	Multiple Organisms 15 (55.5%)

Out of 391 surgeries performed we have found SSI in 27 patients, so 6.9% in post-operative patients.

SSI showed statistically significant association with type of surgery (p=0.002) and no association with area of surgery, class of wound and gender respectively (p=0.88, 0.84, 0.359) using chi-square test. Similarly SSI showed statistically significant association with length of stay and comorbids (p=0.000) and no association with age of patients (p=0.362).

Length Of Stay (LOS) was more in patients with SSI (mean=12.5 days) vs patients without SSI (mean=2.25 days) and showed significant association(p=.000), on independent T-test. LOS was dependent with age of patients (p=.000) on paired-T test. LOS was more in emergency cases than elective cases on independent T-test (mean=4.21 days vs 2.19 days, p=.000). LOS showed significant association with class of wounds (more in class III and I, p=.000) on post-hoc analysis.

Discussion

Despite practicing a rigorous antiseptic regime during surgery, postoperative SSI remains a leading problem globally. In this study, 27 patients out of 391 surgeries performed were found with SSI with a rate of 6.9% because of the inclusion of all classes of wound and emergency cases. Still, the results are comparable with data from developing countries[12].

We have found in our study that SSI is more common in emergency surgeries as compared to elective surgeries. Similarly SSI showed statistically significant association with length of stay (p=0.000) and association with age of patients (p=0.000).

Several interesting factors play an important place in the threat of surgical site infection circumstance, including way of living, comorbidities, medicines, and duration of stay at hospital[13]. We also found that Class of Surgical wound is also an important predictor of surgical site infection and comparable with findings of Mioton et al i.e. more in class IV wounds[14]. Results of our study were in harmony with the guidelines of CDC recommending that there was a higher risk of SSI in emergency cases. Escherichia Coli (40.7 %) was the

most commonly isolated organism from SSI and similar with the study performed by Alkaaki et al[15]. Resistance towards antibiotics leads to noticeable increase in rate of morbidity and mortality, which is a major apprehension worldwide. Regrettably the number of organisms added to the recovered cases through surgical ward and intensive care units is also a leading distress to treating physician. Suspected risk factors must be identified and steps must be taken to reduce SSI in the high risk groups. We recommended that patient and the family members should be informed and guided regarding post-operative wound care of wound after discharge.

Conclusion

We conclude that SSI in our unit was comparable to other developing countries. Escherichia Coli is most common organism in SSI. It was noted that frequency of SSI was higher in emergency cases, males and amongst diabetic patients and are the main cause for longer duration of hospital stay.

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