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Incidence of surgical site infections in clean and clean contaminated surgeries

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***Abstract*---**Background: Health care-associated infections (HAI) continue to be a significant global community health issue and a concern to patient safety despite significant progress in infection control strategies. Among the most often reported illnesses acquired in hospitals are surgical site infections (SSI) (HAI). Methods: This prospective observational study was held in the various Surgical departments of Bakhtawar Amin Trust Teaching Hospital Multan and Fauji foundation hospital Peshawar cantt.April, 2022 to September, 2022. The study comprised a total of 400 individuals who underwent clean and clean contaminated procedures. Data on comorbidities, post-operative stay, kind of surgery, length of operation, use of prosthesis, day of SSI event, demographics, and re-suturing were gathered and evaluated. Pus aspirate/swab from patients suspected of having SSI was sent for culture and sensitivity testing. Results: The study covered 400 clean contaminated and clean surgeries. 5 percent of cases developed SSI. There was a correlation between SSI and age group, gender and also depends on the procedure type as emergency

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or elective. The stay in hospital was prolonged post-operatively (>7 days) in 14 (70%) patients who acquired SSI. 13 (65%) of the patients with SSI had co-morbidities. E. coli was analyzed from 7 SSI cases (35%), Staphylococcus aureus from 3 cases (15%), Coagulase-negative Staphylococcus from 2 case (10%), Enterococcus faecalis from 1 case (5%), Enterobacter cloacae from 2 cases (10%), Klebsiella pneumoniae from 2 cases (10%), and Acinetobacter baumannii was isolated from 3(15%) cases in total. Conclusions: Regularly monitoring of SSI and providing stakeholders with appropriate data is beneficial to lower the rate of SSI. In order to accurately identify cases of SSI after patient discharge, infection control team must accurately identify the SSI cases.

Keywords---Comorbidities, Surgical antibiotic prophylaxis, Surveillance

Introduction

Healthcare associated infections (HAI) pose a serious threat to the community's health. Patient safety continues to face a serious threat even after infection control measures have been taken[1-2]. One of the most typical HAIs is an infection at the surgical site (SSI). Globally, the incidence of SSI varies. SSI is thought to occur in at least 2% of surgeries[3]. Incidence of SSI is higher in low-income countries. The likelihood of acquiring SSI in Pakistan ranges from 4% to 30%. In Pakistan, surveillance information is still insufficient, and HAI prevention is not always given top priority[4-5]. An evidence-based surveillance strategy can stop SSI and its negative impact on patients and the health system. Also, Patient safety will be ensured, and financial burden will be lessened. It will also contribute to raising the standard of medical care. Globally, SSIs are linked to higher morbidity, low quality of life, redo surgeries, rehabilitation and prolonged antibiotic therapy as well as related with unemployment[6-7]. Due to the lengthened hospital stays and elevated risk of readmission, SSIs are linked to a significant financial burden for both the patient and the healthcare system. Infections at the surgical site are those that develop after an invasive surgical procedure[7]. It is described as an infection that develops thirty days after surgery without any prothesis implantation or a year after surgery if patient has prosthesis[8]. These infections may impact organs or body spaces, or they may be superficial or deep incisional infections. SSIs are divided into four categories by the CDC: clean contaminated, clean, dirty and contaminated. Controlling complications post-operatively is crucial to giving patients high-quality treatment[9-10]. The surgical site infections prevalence must be documented. This will help in determining the issue and developing effective control of infection procedures in healthcare system. Understanding the organisms that cause SSI and their pattern of antibiotic susceptibility may help to identify antimicrobial patterns of resistance and can help to determine the SSI pathogenesis[11]. Thus, SSI prevention and infection control techniques that are appropriate for the local environment can be used. Additionally, it will help in the early detection of any outbreaks. This study was held to determine the surgical site infections prevalence and related factors in both clean contaminated and clean surgeries.

Methods

This prospective observational study was held in the various Surgical departments of Bakhtawar Amin Trust Teaching Hospital Multan and Fauji foundation hospital Peshawar cantt.April, 2022 to September, 2022. A universal sample strategy was used for data collection. The institutional ethics committee gave its approval to the project.

Adult patients (age 18) who underwent elective or emergency general surgery, gynecology/obstetric, or orthopedic procedures and were classified as clean OR clean contaminated (according to Centers for Disease Control (CDC) guidelines) patients met the inclusion criteria. Contaminated and dirty procedures were excluded in accordance with CDC recommendations.

The data of daily performed surgeries was taken from the surgical operation theatre. Only clean and clean contaminated procedures were chosen from this list. Demographic information, the surgery type accomplished, whether planned or emergency surgery, the length of the procedure, the length of the preoperative stay, the administration of surgical antibiotic prophylaxis, the length of the postoperative stay and the presence of co-morbid conditions were all collected.

Throughout the patients stay in hospital, the on-duty doctor or nurse observed all of the study participants in the ward for the SSI signs and symptoms on a regular basis. For procedures without implants, post-operative patient monitoring lasted 30 days, while for procedures with implants, it lasted a full year. All surgical OPDs maintained an OPD dressing register. When the patient visited for follow-up and dressing, any signs of SSI were noted. If there is any suspicion of SSI, samples were sent for culture and sensitivity. Standard practices were used in the laboratory to identify the infectious organism. Using SPSS version 22.0, data were entered into an excel sheet and evaluated. Frequencies and percentages have been used to express categorical variables.

Results

The study included total of 400 clean and clean contaminated surgeries. 20 of these patients developed SSI (5%). There were 240 male patients (60%), and 5 of them (2.1%) developed SSI. While 15 (9.4%) of the 160 (40%) female patients diagnosed with SSI. The study's participants' ages vary from 18-70 years old. Of the 20 patients who established SSI, 2 were 21-30 years of age, 4 were between the 31-40 years of age; 3 were 41-50 years of age, 2 patients were between 51-60 years of age and 1 over the age of 60.

Table-I shows the demographic features of the patients

Characteristics		Total number of patients	Total number of cases with SSI	Total number of cases without SSI
		N (%)	**N (%)**	**N (%)**
Gender	Male	240 (60)	5 (2.1)	235 (97.9))

	Female	160 (40)	15 (9.4)	145 (90.6)
Age (in years)	18-20	55 (13.8)	2(2.4)	81 (97.6)
	21-30	105 (26.3)	8 (10)	72 (90)
	31-40	95 (23.4)	4 (6.1)	62 (93.9)
	41-50	30 (7.5)	3 (7.9)	35 (92.1)
	51-60	15 (3.8)	2(4.9)	39 (95.1)
	>60	290 (12.17)	1 (8.3)	11 (91.7)
Operation category	Planned	290 (72.5)	13 (4.4)	277(95.6)
	Emergency	110 (27.5)	7 (6.4)	103 (93.4)

In planned surgery, the SSI incidence was 4.4%, SSI incidence was 6.4% in emergency surgery. When SSI incidence was surveyed by department (Table 2), 11 (55%) cases were recorded after obstetrics and gynecology procedures, 6 (30%) cases were reported after general surgery, and 3 (15%) cases were reported after orthopedic procedures. Surgery duration ranged from 20 minutes to 6.5 hours. 16 (80%) of the SSI patients had procedures lasting more than 60 minutes, compared to 4 (20%) who had <60 minutes.

In 10 (50%) of the patients, SSI diagnosed 6–10 days after surgical procedure, in 5 (25%) of the patients it identified 5–16 days after surgery, in 3 (15%) of the patients it appeared 21–25 days after surgery and in only 2 (10%) of the patients it appeared after 30 days. 3 (15%) of the patients with SSI had prostheses (Table 2).

Table-II shows the analysis of surgical site infections (n=20)

Department		N (%)
	Obstetrics and Gynecology	11(55%)
	General surgery	6(30%)
	Orthopedics	3(15%)
Duration of surgery	≤60 min	4(20%)
	>60 min	16(80%)
Surgical antibiotic prophylaxis Stopped within 24 hrs	Yes	15(75%)
	No	5(25%)
Comorbid conditions	Yes	13(65%)
	No	7(35%)
Prosthesis	Yes	3(15%)
	No	17(85%)
Post-operative stay in days	≤7	6(30%)
	>7	14(70%)
Diagnosis of SSI	After the discharge	5(25%)
	During hospital stay	15(75%)
Resuturing	Yes	1(5%)
	No	19(95%)

One (5%) patients with SSI required re-suturing. SSI was identified in 13 (65%) of the patients when they were admitted to the hospital and in 7 (35%) of the discharged patients. (Table 2). 13 (65%) of the patients with SSI had co-morbidities. Four of the patients had diabetes, one had anemia, one had obesity, and one had hypothyroidism. E. coli was analyzed from 7 SSI cases (35%), Staphylococcus aureus from 3 cases (15%), Coagulase-negative Staphylococcus from 2 case (10%), Enterococcus faecalis from 1 case (5%), Enterobacter cloacae from 2 cases (10%), Klebsiella pneumoniae from 2 cases (10%), and Acinetobacter baumannii was isolated from 3(15%) cases in total. One sample of Klebsiella pneumoniae (50%) and three isolates of E. coli (42.8%) were resistant to carbapenem. The resistance of Acinetobacter to carbapenems was 70%.

Discussion

One of the most important sources of morbidity in individuals who have undergone surgery is post-operative SSI[12]. Due to the prolonged hospital stays of these patients, increased wound and nursing care, further surgical operations and potential hospital readmissions are additional burden on them financially and emotionally[13]. With this context, the current study was designed and carried out to determine the SSI incidence over the course of a year in clean and clean contaminated operations. In Pakistan, the prevalence of SSI varies from 3.1% to 30%. In our analysis, the incidence of SSI was 5% (20/400) in both clean and clean contaminated procedures[14]. Similar research conducted by Madhusudan et al. found that SSI incidence was higher than in our study, at 12% with 2042 surgeries. The frequency of SSI was 3.1% in clean surgeries and 21.10% in clean contaminated surgeries in one study carried out in Mumbai. We had a lower SSI rate than prior trials[15-16]. This could be accomplished through consistent SSI monitoring, thorough analysis of SSI main causes, and strict adherence to infection control procedures. The majority of female patients in our study had SSI because obstetrics and gynecology surgeries had more infections than other types of surgeries. Jain et al. reported a similar preponderance among females[17-18].

Eight (7.3%) of the 108 females who underwent surgery in their research develop SSI. One Indian study conducted by Shetty NH et al in Mysore found that men had significantly higher ratio of SSI[19].

Infection rates peaked (27.20%) in the 21–30-year age range. This age group's dominance can be explained by the fact that lower section caesarian sections have been observed in this age-group and have higher number of SSIs. In the study by Shetty NH et al., participants older than 50 years were found to have a higher proportion (63.15%) of SSI. There were more SSI in older age groups, according to other research as well. Older individuals lowered immune responses and related comorbidities are the reason for this.

20 of the 400 patients developed SSI (5%). There were 240 male patients (60%), and 5 of them (2.1%) developed SSI. While 15 (9.4%) of the 160 (40%) female patients diagnosed with SSI. In planned surgery, the SSI incidence was 4.4%, SSI incidence was 6.4% in emergency surgery. When SSI incidence was surveyed by department, 11 (55%) cases were recorded after obstetrics and gynecology procedures, 6 (30%) cases were reported after general surgery, and 3 (15%) cases were reported after orthopedic procedures. Surgery duration ranged from 20 minutes to 6.5 hours. 16 (80%) of the SSI patients had procedures lasting more

than 60 minutes, compared to 4 (20%) who had <60 minutes. In 10 (50%) of the patients, SSI diagnosed 6–10 days after surgical procedure, in 5 (25%) of the patients it identified 5–16 days after surgery, in 3 (15%) of the patients it appeared 21–25 days after surgery and in only 2 (10%) of the patients it appeared after 30 days. 3 (15%) of the patients with SSI had prostheses[20-21].

One (5%) patients with SSI required re-suturing. SSI was identified in 13 (65%) of the patients when they were admitted to the hospital and in 7 (35%) of the discharged patients. (Table 2). 13 (65%) of the patients with SSI had co-morbidities. Four of the patients had diabetes, one had anemia, one had obesity, and one had hypothyroidism. E. coli was analyzed from 7 SSI cases (35%), Staphylococcus aureus from 3 cases (15%), Coagulase-negative Staphylococcus from 2 case (10%), Enterococcus faecalis from 1 case (5%), Enterobacter cloacae from 2 cases (10%), Klebsiella pneumoniae from 2 cases (10%), and Acinetobacter baumannii was isolated from 3(15%) cases in total[22-23]. According to several studies, patients who experienced SSI after surgery spent longer in the hospital than patients who were not infected. In our study, there was no mortality among individuals who acquired SSI. Staphylococcus aureus and Escherichia coli are the two most prevalent isolates in our investigation[24]. Patel et al. and Misha et al. both reported on similar findings[25].

Conclusion

In our study, a relationship between SSI and the type of surgery, age, and gender was found. The length of the post-operative hospital stays increased as a result of SSI. Regular monitoring of SSI and providing stakeholders with appropriate data is beneficial to lower the rate of SSI. In order to accurately identify cases of SSI after patient discharge, infection control team must accurately identify the SSI cases.

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