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Frequency And Risk Factors For Developing Surgical Site Infection In Abbasi Shaheed Hospital

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Abstract*:* **Introduction**: Surgical site infections are the most common nosocomial infections worldwide and are also the common problem in developing countries. The impact of its prevalence contributes to morbidity and mortality and therefore the need to determine its prevalence is necessary. Finding out the prevalence of surgical site infections and the frequency of risk variables for surgical site infections in patients undergoing abdominal surgeries at Abbasi Shaheed Hospital in Karachi is the aim of this study. **Methodology***:* This descriptive study was carried out from February 22, 2022- August 22, 2022 at the Abbasi Shaheed Hospital in Karachi with a sample size of 157 subjects with abdominal surgery fulfilling the inclusion criteria. **Results**: In our study, the mean age, length of operation and BMI were 49.87±8.74 years, 2.14±1.87 hours, 29.72±3 respectively with 61.1% of female and 38.9% male subjects. Out of 157 patients, 22 (14%) and 135 (86%) had and did not have surgical site infection. **Conclusion**: Patients and the healthcare systems are both heavily impacted by the effects of SSIs. A comprehensive strategy addressing pre-, intra-, and postoperative variables is necessary for the prevention of SSI. In order to lower SSI, hospital infection control procedures should be developed in conjunction with the establishment of an ongoing, long-term surveillance system to detect risk factors.

Keywords: Surgical site infection, elective, emergency and abdominal surgery

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Introduction

Infections at the surgical site (SSIs) are the most frequent type of nosocomial (NI) as well as the most frequent complication after surgery procedures. Around 38% of NIs occur in surgical patients while 20% of all infections are related to healthcare [1]. SSIs are linked to a range of unfavorable outcomes which vary with different types of surgery e.g. delayed wound healing, increased hospital stay, increased risk of ICU admission, escalation of treatment expenses, and increasing mortality of patients [2, 3].

Many other factors also influence frequency of infection like age, duration of the operation, wound drainage, length of stay in the hospital before surgery, skin preparation, surgeon skills and techniques and wound contamination respectively [4]. Studies have shown that numerous gram-positive and gram-negative organisms with different antibiotic sensitivity affect outcomes [5]. Patients who undergo invasive operations are at a higher risk of contracting these diseases. Nosocomial pathogens can enter the body's interior environment through gaps in both the skin's intact tissue and the mucosal lining following procedures [6]. The grave repercussions that SSI patients face underscore the necessity of developing preventative measures. Risk factor identification thus is essential in controlling and in implementing postoperative complication [7, 8]. Not only does prevention but also strict vigilance is also essential for authorities to take drastic action to reduce the spread [9]. In developing countries like Pakistan, exact proportion of nosocomial infections are not yet known. [10] Malik et al found the surgical site infection to be 8.6%.[10] and also found its relation with anemia (38%), smoker (16%), obesity (5%) and diabetes mellitus type II (11.5%) [10].

The goal of the study was to ascertain the frequency and contributing variables of surgical site infections (SSIs) as still there is lack of exact overall frequencies of SSIs and the contributing factors and to expedite patient recovery, shorten hospital stays, and cost benefit, surveillance is required to assess the depth of the issue, identify risk factors, and thus then implement infection control strategies.

Methods

It was a Descriptive cross-sectional study conducted at Department of Surgery, Abbasi Shaheed Hospital, Karachi. The duration of study was six months. A sample size of 157 patients was obtained by taking into account the prevalence of type II diabetes (11.5%), [10] a margin of error of 5%, and a confidence level of 95% using the WHO software, this sample size was determined. Non-probability sequential sampling was the method used for sampling. Study inclusion criteria involves patients undergoing abdominal surgery of either gender and age 20-60 years while the exclusion criteria involve patients with a history of recent infections such as pneumonia, urinary tract infections (UTI), or cellulitis, a history of skin conditions such as psoriasis or dermatitis, hypo- or hyperthyroidism, a past of connective tissue disorders such as SLE, or any of these conditions. Pregnant patients proven by dating scan ad patients with history of stroke, renal impairment and chronic obstructive pulmonary disease, asthma, chronic liver disease, and congestive cardiac failure were also excluded.

With permission from the College of Physicians and Surgeons Pakistan, this study was carried out. Participants in the study were recruited from the Department of Surgery at the Abbasi Shaheed Hospital in Karachi meeting the inclusion criteria i-e; undergoing abdominal surgery. Before the study could be conducted, approval from the institutional ethical review committee was obtained. Each and every patient gave their informed consent before being placed in a sample or having their data used for research purposes. A brief medical history was obtained, including information on age, gender, and residency status. Type II diabetes, hypertension, and smoking status were also recorded. At the time of admission, BMI was computed, weight was measured to the closest kilogram using a weighing machine, and each participant's height in meter was recorded using a stadiometer. The blood sample was collected in a sterile manner for serum hemoglobin and anemia was labeled if hemoglobin is less than 12g/dl in males and less than 11g/dl in females. Surgical site infections were categorized into superficial and deep infections depending on involvement of skin, superficial layers and deeper layers within 30days of surgery associated with anyone of the following fever greater than 38 C, purulent discharge, positive culture from site of infection, or abscess. Abdominal surgery was performed by surgeon with over ten years of experience. Patients were followed by the researcher for 30 days post abdominal surgery. The results of the following variables were recorded in questionnaire with variables like surgical site infection, history of antibiotic prophylaxis, gender, occupational status, level of education, age, height, weight, and length of surgery; and factors leading to the occurrence of surgical site infection, type 2 diabetes, hypertension, smoking status, obesity, and anemia.

SPSS version 20 was used to enter and analyze the data. For continuous variables like age, height, weight, and length of surgery, mean and standard deviation were computed. Frequencies and percentages were computed for categorical variables such as gender, occupation, educational attainment, surgical type (elective vs emergency), history of prophylactic antibiotics for surgical site infection (yes/no), and factors (type II DM, high blood pressure, smoking status, obesity, and anemia) that contribute to the development of surgical site infections (yes/no). The impact on the outcome parameter (surgical site infection and factors contributing to its development), effect modifiers were controlled through stratification of age, socioeconomic class, occupational status, level of education, type of surgery (elective/emergency), and history of antibiotic prophylaxis. A p-value of less than 0.05 was deemed significant in the post-stratification chi-square test.

Results

157 patients who satisfied the inclusion were received abdominal surgery at the Abbasi Shaheed Hospital in Karachi were included in this study. The age range for all 157 patients was 20 years old at the lowest and 60 years at the most. With a standard deviation of ±8.74, the mean age in our sample was 49.87 years. Whereas, mean duration of surgery, BMI, height and weight in our study was 2.14±1.87 hours, 29.72±3.14 kg/m2, 158±7.28 cm and 78.7±9.87 kg respectively. (Table 1.) Out of 157 patients, 22 (14%) and 135 (86%) had and did not have surgical site infection. The frequency of diabetes mellitus type II, 50 (31.8%) and 107 (68.2%) had and did not have type II DM respectively. The hypertension frequency distribution revealed 44 (28%) and 113 (72%) had and did not have hypertension respectively. Obesity status showed that out of 157 patients, 61 (38.9%) and 96 (61.1%) had BMI>27.5 kg/m2 and BMI <27.5 kg/m2 respectively. Frequency distribution of smoking status showed 86 (54.8%) and 71 (45.2%) smoked and did not smoke respectively. Frequency distribution of anemia status showed 22 (14%) and 135 (86%) had and did not have anemia respectively. Out of 157 patients, 96 (61.1%) were male and 61 (38.9%) were female. (figure 1)

The age distribution frequency distribution of the 157 patients revealed that 86 (54.8%) and 71 (45.2%) of the patients belonged to the age category of 41-60 years and 20-40 years, respectively. Duration of surgery showed 92 (58.6%) and 65 (41.4%) had duration of surgery for < 2 hours and > 2 hours respectively. Frequency distribution of type of surgery showed 53 (33.8%) and 104 (66.2%) had elective and emergency surgery respectively. According to the frequency distribution of antibiotic prophylaxis history, 76 (48.4%) and 81 (51.6%) of the 157 patients had a history of antibiotic prophylaxis, respectively. of the 157 patients, 74 (47.1%) or 83 (52.9%) had an employment status, according to the frequency distribution of their occupational status. The educational status frequency distribution of 157 patients revealed that of them, 09 (5.7%), 31 (19.7%), 94 (59.9%), and 23 (14.6%) had primary, secondary, and higher educational statuses, respectively, and were illiterate.

Table 1: Descriptive variables

Variable	MEAN ± SD	Standard deviation
Age (Years)	49.87	±8.74
Duration Of Surgery (Hours)	2.14	±1.87
Body mass index (Kg/m2)	29.72	±3.14
Height (cm)	158	±7.28
Weight (Kg)	78.7	±9.87

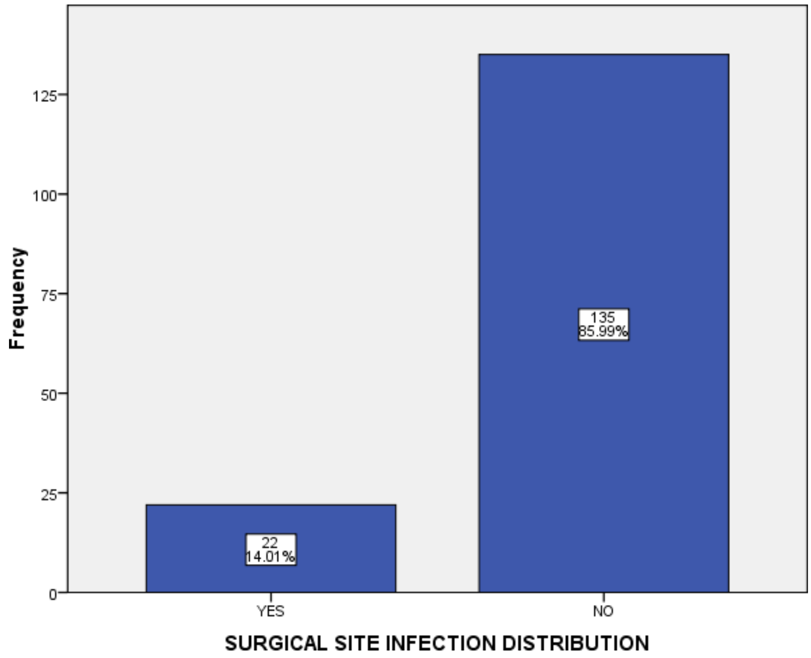

Figure-1: Surgical site infection distribution n=157

When it came to surgical site infections, age stratification revealed that 10 (45.5%) & 12 (54.5%) patients in the age groups of 20–40 and 41–60 years, respectively, had surgical site infections. However, among patients in the 20–40 year old and 41–60 year old age groups, respectively, 61 (45.2%) and 74 (54.8%) did not develop a surgical site infection. P-value came to 0.58. as displayed in Table 2.

According to the gender stratification of surgical site infections, 17 (77.3%) and 79 (58.5%) of the male group's members had surgical site infections, respectively. In contrast, 56 (41.5%) and 05 (22.7%) of the female group's members did not suffer from surgical site infections, respectively. P-value was 0.07. As presented in Table 2.

According to stratification based on surgical site infection duration, of patients whose surgery lasted less than two hours, 11 (50%) and 81 (60%) developed surgical site infections, respectively. In contrast, 11 (50%) and 54 (40%) of the patients who were hospitalised for longer than two hours had surgical site infections, respectively. P-value was 0.25. As shown in Table 2. According to stratification of diabetes mellitus type II, 06 (27.3%) and 44 (32.6%) of the patients with diabetes mellitus experienced surgical site infections, whereas the remaining patients did not. In contrast, 16 (72.7%) and 91 (67.4%) of the patients without diabetes mellitus experienced surgical site infections, respectively. The P-value was 0.41. Table 2.

Table-2: Surgical Site Infection According to Age

Variables n=157	**SSI Yes**	**SSI No**	**P value**
Age			
20-40yrs	10 (45.5%)	61 (45.2%)	**0.58**
41-60yrs	12 (54.5%)	74 (54.8%)	
Gender			
Male	17 (77.3%)	79 (58.5%)	**0.07**
Female	05 (22.7%)	56 (41.5%)	

Duration of surgery **< 2 Hours** **> 2 Hours**	11 (50%) 11 (50%)	81 (60%) 54 (40%)	**0.25**
DM **Yes** **No**	06 (27.3%) 16 (72.7%)	44 (32.6%) 91 (67.4%)	**0.41**
HTN **Yes** **No**	04 (18.2%) 18(81.8%)	40 (29.6%) 95 (70.4%)	**0.91**
Smoking **Yes** **No**	13 (59.1%) 09 (40.9%)	73 (54.1%) 62 (45.9%)	**0.42**
Obesity **Yes** **No**	09 (40.9%) 13 (59.1%)	52 (38.5%) 83 (61.5%)	**0.50**
Anemia **Yes** **No**	07 (31.8%) 15 (68.2%)	15 (11.1%) 120 (88.9%)	**0.01**

According to stratification for hypertension and surgical site infection, among patients with hypertension, 04 patients (18.2%) and 40 patients (29.6%) developed surgical site infections and did not, respectively. In contrast, 18 (81.8%) and 95 (70.4%) of the patients without hypertension experienced surgical site infections, respectively. The P-value was 0.19. as shown in Table 2. Patients who smoked, 13 (59.1%) and 73 (54.1%) had surgical site infections, and those who did not, according to stratification for smoking status and surgical site infection. In contrast, 62 (45.9%) and 09 (40.9%) of the patients who did not smoke experienced surgery site infections. P-value was 0.42. As presented in Table 2. According to stratification for obesity status and surgical site infection, among obese patients, 09 (40.9%) and 52 (38.5%) had surgical site infections and did not, respectively. In contrast, among the non-obese patients, 13 (59.1%) and 83 (61.5%) experienced surgical site infections, respectively. P-value was 0.50. Stratification for anemia status with respect to surgical site infection showed that patients who had anemia, 07 (31.8%) and 15 (11.1%) had and did not have surgical site infection respectively. Whereas patients who did not have anemia, 15 (68.2%) and 120 (88.9%) had and did not have surgical site infection respectively. P-value was 0.01. According to surgical site infection stratification by type of operation, out of patients who underwent optional surgery, 11 (50%) and 42 (31.1%) developed surgical site infections, respectively. On the other hand, of the patients who underwent urgent surgery, 11 (50%) or 93 (68.9%) experienced surgical site infections, respectively. P-value was 0.07. Stratification for history of antibiotic prophylaxis with respect to surgical site infection showed that patients who had history of antibiotic prophylaxis, 12 (54.5%) and 64 (47.4%) had and did not have surgical site infection respectively. Whereas patients who had no history of antibiotic prophylaxis, 10 (45.5%) and 71 (52.6%) had and did not have surgical site infection respectively. P-value was 0.34.

Based on the stratification of patients' occupational status in relation to surgical site infection, 11 (50%) and 63 (46.7%) of the patients who were employed had surgical site infection, respectively. In contrast, 11 (50%) and 72 (53.5%) of the patients who were unemployed experienced surgery site infections, respectively. P-value was 0.47. As presented in Table 2.

According to the stratification of educational status in relation to surgical site infection, patients with surgical site infection belonged to the following groups: illiterate, primary, secondary, and higher educated patients, 00 (00%), 04 (18.2%), 15 (68.2%), and 03 (13.6%).

In contrast, patients who did not develop a surgical site infection fell into the categories of illiterate, primary, secondary, and higher educated, respectively, 09 (6.7%), 27 (20%), 79 (58.5%), and 20 (14.8%). P-value was 0.61.

Discussion

Worldwide, Surgical site infections are the most commonest infections presenting within a month[1-5]. Our study too, has also found the increased similar duration of presentation of postoperative infections [12, 1]. nowadays the emerging cause behind serious infections is the development of drug resistance brought on by improper usage and administration of antibiotics. The recent emergence of multidrug-resistant (MDR) bacterial pathogens poses a significant additional aspect to the issue of surgical site infections [12]. Infections from surgical wounds have higher rates of morbidity and mortality, longer hospital stays, and more expensive patient care. Three factors primarily influence the probability of developing postoperative wound infections: the type of microbial contamination of the wound, its quantity, and the host's susceptibility. Postoperative wound infections have two main causes: external i-e; microorganisms and endogenous i.e; pathophysiological. Numerous nosocomial infections that are often reported for increasing treatment costs, extended hospital stays, and notable rates of morbidity and mortality [13-16].

Our study included a total of 157 patients undergoing abdominal surgery. In our study, the mean age, length of operation, BMI, height, and weight were 49.87±8.74 years, 2.14±1.87 hours, 29.72±3.14 kg/m2, 158±7.28 cm and 78.7±9.87 kg. 96 (61.1%) were male and 61 (38.9%) were female. Out of 157 patients, 22 (14%) and 135 (86%) had and did not have surgical site infection.

Recently another study by Saleema et al 18% surgical site infections with cause mostly because of not using proper medicine in 80% patients and 21% no wound care [12]. However, prospective study by Velin et al has found 5.7% SSI in women undergoing cesarean sections operated in rural areas [15]. A retrospective study revealed 15.9% prevalence of SSI [19, 2]. Another study included 330 patients has found 14.24% infections developing on 3rd day and then 13.03% infections on 5-7th day while 13.64% developing after 7 days [17]. While in our study the infections also occurred on 3rd and the 7th day with mostly patients having delayed wound infections and healing were diabetics with non-compliance for medications but when compared statistically it was not significant. The other patients developing wound infections like obesity and hypertension did not show statistically significant correlation. Duration of surgery however also did not show any statistically correlation as patients having surgical site infection equally common among both groups. A retrospective study revealed 15.9% prevalence of SSI [17, 19, 20]. In ours study Surgical site infections were more common after emergency surgeries than after elective ones. It was discovered that diabetes, wound class, age, and electivity of the procedure were the primary risk factors for the emergence of surgical site infections.

Patients and healthcare systems are significantly impacted by the SSIs. Pre-, intra-, and postoperatively variables must all be addressed in a comprehensive strategy for SSI prevention. In order to decrease SSI, a continuous long-term monitoring system should be set up to detect risk variables. Hospital infection control procedures should also be developed. Smoking, obesity, anaemia, diabetes, and hypertension were the most significant risk factors of surgical site infections, in descending order of frequency. The pathogen source in most SSI cases is the patient's skin, mucous membranes, or hollow viscera's native flora which can all be successfully combatted by iodine-based surgical antiseptics.

Attempts to shorten the surgical procedure without sacrificing the patient's safety or the positive result with regular and intensive drain care. Maximum post-operative care as well as initiatives to strengthen their immunity aid in reducing the incidence of SSI in this patient population.

In any case, every surgeon should be aware of the significant effects that surgical site infections (SSI) can have on patient health and healthcare costs. Additionally, comparing one's own operating room procedures to the body of current research is a critical first step in minimizing adverse effects and managing infection.

Conclusions

Our health care system therefore requires careful vigilance of patients with risk factors which affect surgical site infection. A targeted approach of pre, intra an postoperative factors surveillance is required in order to reduce infections.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

HUMAN AND ANIMAL RIGHTS

No animals were used in this study. The study on humans was conducted in accordance with the ethical rules of the Helsinki Declaration and Good Clinical Practice.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

None.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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