The Prevalence of Postoperative Wound Infection in Orthopedic Surgery at Bangabandhu Sheikh Mujib Medical College (BSMMC), Faridpur, Bangladesh.

ABSTRACT

Background: *Prevalence of Surgical site infections (SSI) in orthopedic surgery is ranges from 1 to 22%. It leads to increase case cost, prolongs antibiotic use/abuse, increases morbidity and rehabilitation.*

Aim of the Study: *The aim of the study to describe the prevalence of SSI following elective orthopedic surgeries; second, to describe the epidemiological characteristics of SSIs, including the timing of SSI development and the causative bacteria; and to identify the independent risk factors associated with SSI.*

Methods*: This is a prospective study conducted in Department of Orthopedics, Bangabandhu Sheikh Mujib Medical College (BSMMC), Faridpur, Bangladesh from June 2021 to July 2022.*

Result: *Total of 100 patients were enrolled for this study, out of 80 cases, 6 cases were found to have infection at the operative site on postoperative day 5. The overall incidence in this study was 7.50 %. The surgical site infection findings of gram positive and gram negative bacteria was isolated 3 (42.9%) cases had E. Coli and 4 (57.1%) cases had Staphylococcus aureus respectively. We have found the significant negative Correlation between time of antibiotic administration and Pre-Operative stay.*

Conclusion*: In addition, many surgical techniques are not standard, and a wide range of perioperative situations will need variations from established preventive regimens. Prophylactic antibiotic regimens should be offered for a wide range of surgical operations, according to my prospective investigation of antibiotic prophylaxis. The types of harmful microorganisms and the level of antibiotic resistance differed greatly between hospitals.*

Keywords: *Surgical site infection, orthopaedic surgery, risk factors*

INTRODUCTION

Surgical site infections (SSIs) following elective orthopedic surgeries, such as total joint arthroplasty or orthopedic spine surgeries, are rare but are associated with inferior outcomes and increased health care costs [1, 2]. With the increase in orthopedic surgeons in Bangladesh and the aggressive marketing by manufacturing companies, high-technology orthopedics. Surgery is often performed in this country. This is especially true in implant surgery, such as joint replacement, internal fixation of the spine, and long bone fractures. Postoperative sepsis complicating such surgery can have disastrous consequences. No data are available in this country on the incidence of infections after orthopedic surgery in general or orthopaedic surgery in particular. Most surgeons cite very few cases reported by excellent orthopedic centers in the West. We are well aware of the wide variety of operating environments in different hospitals worldwide and in our country. So a wide variation in infection rates can be expected. A zero infection rate is ideal for elective orthopedic surgery, though it appears unattainable. Most orthopedic centers now report an incidence of lower than 2% [3, 4]. Compared with younger patients, older patients have more prevalence of comorbid conditions, such as hypertension, diabetes mellitus, poor nutrition, etc. Furthermore, older patients are more vulnerable to adverse health or functional effects of postoperative SSIs or other complications. Mc. Garry et al. reported that SSI was associated with a greater than fivefold mortality rate and twofold prolonged duration of hospitalization in elderly patients than that of younger patients [2]. Lee et al. demonstrated that SSI was an independent risk factor for mortality (odd ratio [OR], 3.8) and increased hospitalization duration (multiplicative effect, 2.49) after adjustment for the effects of confounding variables [1]. Efforts have always been made to reduce the incidence of SSI following surgeries, such as antibiotic prophylaxis, surgical site preparation, laminar airflow in the operating room, and screening for *Staphylococcus aureus* carriers preoperatively [5]. b In addition, various studies provided helpful information about the risk factors for SSI following orthopedic surgeries. However, many of the studies were designed as a single institution and might be limited by the inadequate sample size. In addition, some studies included only a fraction of potential risk factors for SSI in the analyses, and therefore, the findings might be less generalizable to multiple settings. In order to more accurately identify independent risk factors for SSIs, studies with a relatively large sample size of patients, including a wide variety of risk factors, and controlling for multiple risk factors within individuals should be warranted. This study aimed to describe the prevalence of SSI following elective orthopedic surgeries; second, to describe the epidemiological characteristics of SSIs, including the timing of SSI development and the causative bacteria; and to identify the independent risk factors associated with SSI.

METHODOLOGY & MATERIALS

This is a prospective study conducted in Department of Orthopedics, Bangabandhu Sheikh Mujib Medical College (BSMMC), Faridpur, Bangladesh from June 2021 to July 2022. The incidence of postoperative wound infections and the impact on orthopedic surgeries by evaluating the efficacy of preoperative and postoperative systemic antibiotics, the role of sterile measures such as scrub suits, masks, sterile gloves, gowns, drapes, and operating room environments in reducing surgical site infection, and assessing the efficacy of surgical asepsis (surgeons hand scrub, antibiotics used prior to surgery).

- **Inclusion criteria:**
    - Patients above the age of 18 years.
    - Patients who underwent elective orthopedic surgery.

- **Exclusion criteria:**
    - Immune deficiency.
    - Patients on long-term corticosteroids.
    - Patients undergoing immunosuppressive therapy.
    - Patients with open fractures require external fixation devices in the operating room.

All conventional aseptic protocols were followed, including autoclaved gowns, drapes, sterile gloves, and equipment. A routine surgical scrub was performed for 5 minutes before the operation. The incision site was painted with spirit and 5% povidone-iodine during the procedure. Surgical concepts such as minimizing tissue manipulation and ensuring proper hemostasis were followed in all patients. Drains were employed when they were required. Suture material or skin staples were utilized to close the incision. Suture/staples were treated with betadine ointment or Neosporin ointment before being covered with an adhesive bandage, with Ceftriaxone injection continued throughout the postoperative phase. The wound was examined for signs of infection beginning on the third day and continuing through the 8th and 12th postoperative days. Patients were kept under observation until discharge. For patients who met any criteria for wound infection, a wound specimen was sent to the clinical microbiology laboratory for routine culture operation. All data were presented in a suitable table or graph according to their relationship. A description of each table and graph was given to understand them clearly. All statistical analysis was performed using the statistical package for the social science (SPSS) program and Windows. Continuous parameters were expressed as mean ±SD and categorical parameters as frequency and percentage. The student's t-test made comparisons between groups (continuous parameters). Categorical parameters compared by Chi-Square test. The significance of the results, as determined by a 95.0% confidence interval and a value of $P<0.05$, was considered statistically significant.

RESULT

We have found in table No1. Total of 80 patients were enrolled for this study, out of 80 cases, 6(7.50%) cases were found to have infection at the operative site on postoperative day 5. The overall incidence in this study was 7.50 %. It was found incidence in relation to age the maximum number of cases had postoperative infection present among 41-60 years of age group i.e. 4(14.3%) out of 28 cases. And another 1 case present in group 21-40 years and >60 years of age 2 cases were found, respectively. The mean age of SSIs absent group was 38.45±12.21and SSIs present was 52.00±14.32, the average mean age of both groups was 39.45±12.32. There was no significant different in age, p value was 0.245. Incidence in relation to sex females was predominantly high in SSIs present cases. i.e. 15.2 %(5 cases). Whereas male were 3.0 %(2 cases) respectively. In between the groups the chi-square value was 5.0273 and p value was 0.024(S). The mean pre-operative stay in the SSIs Absent group was 4.22±0.84 days, compared to 1.45±0.45 days in the SSIs Present group, which is statistically significant ($p<=0.04$). In contrast, the SSIs present group spent more time in the hospital than the SSIs absent group. In both groups, the mean and SD value of hospital stay were 17.45±3.44 and 8.75±2.33, respectively, which were statistically significant. 0.01 was the p value. We have found the significant negative Correlation between time of antibiotic administration and Pre-Operative stay, the r value was -.397** and p value was0.005. We have found the significant positive Correlation between time of antibiotic administration and Post-Operative stay, the r value was .821** and p value was 0.005. The surgical site infection findings of gram positive and gram negative bacteria was isolated 3 (42.9%) cases had E. Coli and 4

(57.1%) cases had Staphylococcus aureus respectively. This was done by the KIRBY-BAUER Disc Diffusion Method according to the Clinical Laboratory Standards Institute (CLSI guide lines). This was done by the KIRBY-BAUER Disc Diffusion Method according to the Clinical Laboratory Standards Institute (CLSI guidelines).

Table-1: Distribution of surgical site infection among study population (N=80).

Surgical site infection	Frequency	Percentage
Present	6	7.50
Absent	74	92.50
Total	100	100.00

Table-2: Age distribution of the study population (N=80).

Age group	SSIs Absent (n=74)		SSIs Present (n=06)		P-value
	N	%	No	%	
18-20	25	33.78	2	33.33	0.245
21-40	24	32.43	2	33.33	
41-60	4	14.3	1	16.67	
>60	6	8.11	1	16.67	
Total	74	100.00	6	100.00	
Mean±SD	38.45±12.21		52.00±14.32		

Table-3: Sex distribution of the study population (N=80).

Sex	SSIs Absent (n=74)		SSIs Present (n=06)		P-value
	N	%	N	%	
Male	52	70.27	2	3.0	0.024
Female	22	29.73	4	15.2	
Total	74	100	7	100	

Table-4*:* Incidence in relation to the hospital stay.

Variables	Mean±SD	Mean±SD	P Value
Pre-operative Stay	4.22±0.84	1.45±0.45	0.04
Post-operative stay	8.75±2.33	17.45±3.44	0.01

Table-5: Correlation between the time of antibiotic administration and Pre-Operative stay.

Correlation	Pre-operative stay	Antibiotic administration	P-Value
Pearson Correlation	1	-.397**	<0.0001
No cases	80	100	

Table-6: Correlation between the time of antibiotic administration and Post-Operative stay.

Correlation	Pre-operative stay	Antibiotic administration	P-Value
Pearson Correlation	1	.821**	<0.0001
No cases	80	100	

Table-7: Organism Isolated.

Organism Isolated	Frequency	Percentage
Staphylococcus aureus	3	42.9
E. Coli	4	57.1
Total	7	100.00

Table-8: Sensitivity pattern of gram-positive bacteria.

Antimicrobial agents	Staphylococcus aureus (n=3)		
	Sensitive	Intermediate	Resistant
Gentamycin (GEN)	4	0	0
Nitrofurantoin (NIT)	2	2	0
Ciprofloxacin (CIP)	0	0	4
Teicoplanin (TEI)	0	4	0
Cefoxitin (CX)	0	2	2

Tetracyclin(TE)	2	4	0
Vancomycin (VA)	4	2	0
Piperacillin	6	0	0
Tazobactam	6	0	0

Table-9: Sensitivity pattern of gram-negative bacteria.

Antimicrobial agents	Escherichia Coli (n=2)		
	Sensitive	Intermediate	Resistant
Gentamycin (GEN)	1	2	0
Nitrofurantion (NIT)	1	2	0
Ciprofloxacin (CIP)	2	0	0
Amoxy+Clavulanic (AMX)	0	0	3
Imipenem (IPM)	3	0	0
Amikacin (AK)	1	2	0
Co-Trimoxazole (COT)	2	0	1
Ceftazidime (CAZ)	0	0	3
Cefepime	2	0	1
Piperacillin	3	0	0
Tazobactam	3	0	0

DISCUSSION

According to the current study, surgical site infections occur at a rate of 6.0 percent. The presence of more people in the operating room, contaminated or filthy wounds and dirty wounds were all found to be independent risk factors for surgical site infections. It was discovered that the highest number of cases had postoperative infection present among 41-60-year-olds, i.e. 4 (14.3 percent) out of 28 cases. In addition, 1 case was detected in the 21-40-year age group, and 2 instances were found in the >60-year age group. The mean age of the SSIs absence group was 38.4512.21, and the mean age of the SSIs present group was 52.0014.32, for a total mean age of 39.4512.32. There was no statistically significant difference in age, with a p-value of 0.245. In SSIs present cases, the incidence of sex females was disproportionately high. 15.2 percent, to be exact (5 cases). Males made up 3.0 percent of the total (2 cases). The chi-square value between groups was 5.0273, and the p-value was 0.024. (S). the incidence rate in our study was higher than that of orthopaedic patients in wealthy countries, 8, 9 but also higher than that of some emerging countries. The CDC classified 50% of cases as Class-II (Clean and Contaminated), while 25% were classified as Class-I and Class-III. Other investigations reported higher rates of infection stratified by wound class [6] in our study, dirty, unclean, and trauma-related wounds may have contributed to surgical site infections. Increased surgical site infection rates in clean wounds, on the other hand, can be attributed to a lack of financial resources, antiquated equipment, inadequate operating room ventilation, and infection control measures. Despite the fact that several studies revealed no link between the NNIS index and surgical site infections, many nations utilize it as a predictor of surgical site infections [7]. our investigation found a robust link between the NNIS score and surgical site infections. The average pre-operative stay in the SSIs Absent group was 4.220.84 days, compared to1.450.45 days in the SSIs Present group, which was statistically significant (p=0.04). The SSIs present group, on the other hand, spent a longer time in the hospital than the SSIs absent group. The mean and SD values of hospital stay in both groups were 17.453.44 and 8.752.33, respectively, which were statistically significant. The p-value was 0.01. The bulk of surgical site infections are caused by the growing trend of short-stay hospitalization [8]. When compared to the SSIs lacking group, the current group took the longest to operate. This compares to 147.50 minutes for the current set of SSIs. SSIs were absent for72.45 minutes. We discovered significant differences amongst the subjects. P 0.004. Previous research found that Staphylococcus aureus and gram-negative bacteria were the most prevalent causal agents [6]. While mupirocin was successful in lowering Staphylococcus aureus nasal carriage, it did not diminish surgical site infections [9]. Gram-positive and gramme negative bacteria were recovered from surgical sites in three (42.9 percent) of the cases. Staphylococcus aureus was found in 4 (57.1 percent) of the cases. Increased operating room population can raise surgical site infection rates by 1.5 to 3.8 times [10]. Our operating rooms are old and poorly ventilated. Because air is a primary source of infection transmission, ultra-clean air systems and exhaust-ventilated clothes are recommended in joint prosthesis surgeries. Reducing the number of people in the operating room, for example, may have a similar effect. The standard wound categorization, as demonstrated in our study, is an important predictor of surgical site infection. The ASA score is well established to be a powerful predictor of surgical site infection, and our findings are consistent with previous research [11]. The most recent study verified the well-known fact that shaving can raise infection risk, and the CDC advised against shaving before or shortly before surgery, preferably with electric clippers [12]. Our findings support previous research indicating that infection following surgery lengthens inpatient stay [13]. There are some faults in the study. Because of its short lifespan, it may not account for seasonal fluctuations. The demographics of the hospital population (such as age) may change over the winter. A single phone contact within 30 days of the procedure may not be enough to monitor surgical site infections. We infer that the number of postoperative surgical site infections was low because the median total hospital stay was 28 days, as postoperative infections normally emerge within 4 weeks of surgery. Because of the limited patient group, the study's power was insufficient to determine the influence of less prevalent traits; thus, a larger patient population would be preferable. May all influence the decision and duration of perioperative prophylaxis? There are no studies that can assist in these situations. Surgical wound care and antimicrobial prophylaxis necessitate ongoing monitoring of prophylaxis failures and perioperative data changes.

Limitations of the study: Every hospital-based study has some limitations and the present study undertaken is no exception to this fact. The limitations of the present study are mentioned. Therefore, the results of the present study may not be representative of the whole of the country or the world at large. The number of patients included in the present study was less in comparison to other studies. Because the trial was short, it was difficult to remark on complications and mortality.

CONCLUSION AND RECOMMENDATIONS

Many surgical procedures and postoperative situations need to deviate from standard preventive regimens. Preoperative infections of non-wound locations, penicillin or cephalosporin allergy, trauma and other emergency surgeries, and preoperative infections of non-wound sites may all influence the decision and duration of perioperative prophylaxis. There are no studies that can assist in these situations. Surgical wound care and antimicrobial prophylaxis necessitate ongoing monitoring of prophylaxis failures and perioperative data changes.

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