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FREQUENCY OF SURGICAL SITE INFECTION AFTER ORTHOPEDICS IMPLANT SURGERY AT NORTHWEST GENERAL HOSPITAL PESHAWAR

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ABSTRACT

Background:
Surgical site infections (SSIs) are a significant complication following orthopedic implant surgeries, often resulting in prolonged hospital stays, increased healthcare costs, and adverse patient outcomes. Despite advances in surgical techniques and infection control, SSIs continue to be a concern, particularly in resource-limited settings. This study aimed to determine the frequency, risk factors, and microbiological profile of SSIs in patients undergoing orthopedic implant surgeries at Northwest General Hospital, Peshawar.

Materials and Methods:
A prospective descriptive study was conducted from August 2023 to January 2024, involving 78 patients undergoing orthopedic implant surgery. Patients aged 5–75 years were included, while those with previous SSIs, open fractures requiring external fixation, or non-implant surgeries were excluded. Data on

demographics, comorbidities, implant types, and postoperative outcomes were collected. SSIs were diagnosed based on clinical signs and confirmed with microbiological culture. Data were analyzed using SPSS version 25; associations were tested using Fisher's exact and chi-square tests.

Results:

The mean age was 40 ± 2.13 years; 51.3% were male. The most common procedure was ORIF (44.9%), and plates/screws were the most frequently used implants (39.7%). Only one superficial SSI (1.3%) was observed, with no deep infections. No statistically significant associations were found between SSIs and patient age, gender, implant type, or comorbidities.

Conclusion:

A low SSI rate (1.3%) was observed, with no deep infections. Rigorous aseptic techniques, early postoperative follow-up, and standardized antibiotic prophylaxis likely contributed to favourable outcomes.

INTRODUCTION:

One of the most serious side effects of orthopedics implant procedures is still surgical site infections (SSIs). SSIs, which are defined as infections that develop at or close to the surgical incision within 30 days of surgery or within a year if an implant is in place, can lead to extended hospital stays, higher medical expenses, and serious patient outcomes, such as implant failure and the need for additional interventions. The risk is further increased by the presence of foreign materials like screws, plates, or prosthetic joints because biofilm formation on implants makes treatment more difficult and prolongs infection **[1]**.

SSIs in orthopedics implant surgery remain a significant medical concern despite improvements in surgical methods and preventative measures. Higher morbidity, longer hospital stays, and even deaths are linked to them. Although better infection control has decreased rates in some areas, the incidence varies based on surgical techniques, patient characteristics, and healthcare settings **[2,3].** To reduce risks, preventive measures like aseptic procedures, appropriate skin preparation, antibiotic prophylaxis, and shorter surgical times are still essential **[4]**.

These infections are primarily caused by microorganisms, with the most common pathogens being Staphylococcus aureus and Escherichia coli. Treatment is difficult because of their resistance to antibiotics due to their capacity to form biofilms. Resistance patterns are still changing, even though ampicillin and vancomycin are still effective against S. aureus and gentamicin, levofloxacin, and amikacin are still effective against E. coli. Additionally, both organisms have demonstrated susceptibility to imipenem, tazobactam, ceftriaxone, and cefoperazone-sulbactam **[5–8]**.

There are three types of risk factors for SSIs: staff, hospital, and patient-related. Inadequate sterilization, poor operating room airflow, and prolonged procedures increase hospital and staff-related risks, while comorbidities, malnourishment, dirty wounds, and immunosuppressive therapy increase patient susceptibility **[9]**. SSI rates after orthopedics implant procedures vary from 0.5% to 10% worldwide, with lower rates frequently documented in LMICs. The burden in Pakistan is exacerbated by disparities in infection control practices and a lack of resources.

In order to assess the prevalence of SSIs, the bacteria that cause them, and the patterns of antibiotic sensitivity in this area, this study was carried out at Northwest General Hospital and Northwest Teaching Hospital in Peshawar **[10]**.

MATERIALS AND METHODS:

This prospective descriptive study was carried out at the Department of Orthopedics Surgery at Northwest General Hospital and Research Centre Peshawar from August 2023 to January 2024 after ethical approval. Using OpenEpi software, the sample size was determined to be 78 participants, based on a 95% confidence interval, a 5% margin of error, and an expected surgical site infection (SSI) frequency of 5.30% in orthopedics implant surgery. Participants were chosen using non-probability consecutive sampling.

The study included patients who had orthopedics implant surgery, regardless of gender, and who were between the ages of 5 and 75. Pregnant women, cases with significant visceral injuries, soft tissue surgeries without implants, open fractures requiring external fixation devices, pathological fractures, and patients with prior SSIs were all excluded based on stringent guidelines. Prior to data collection, approval was acquired from the hospital-based Institutional Review Board and Research Committee. After obtaining written informed consent, all eligible patients who met the inclusion criteria were admitted to the orthopedics ward and enrolled. Participants received information about the study's goals, methods, and their freedom to discontinue participation at any time without jeopardizing their care, and confidentiality was guaranteed.

Sociodemographic information such as name, age, gender, residence, hospital record number, and dates of admission, surgery, and discharge were among the data gathered. Comorbidities, implant type, presence of SSI, postoperative fever, body mass index (BMI), length of infection and treatment were also documented. Patients were monitored for 24 hours following surgery, and a month later, they were assessed in outpatient clinics. Clinical characteristics such as pain, swelling, redness, and purulent material discharge at the surgical site were used to diagnose SSI. For the purpose of culture and antibiotic sensitivity testing, infected wounds were swabbed and brought in sterile containers to the hospital laboratory.

SPSS version 25 was used for data analysis. After determining normality using the Shapiro-Wilk test, means and standard deviations or medians and interquartile ranges were computed for numerical variables like age, BMI, and infection duration. Frequencies and percentages were used to summarize categorical variables such as gender, residency, comorbid conditions, presence of SSI, implant type, postoperative fever and treatment. To account for effect modifiers, surgical site infections following implant surgery were categorized by age, gender, and implant type. Following stratification, Fisher's exact or chi-square tests were used; a p-value of less than 0.05 was deemed statistically significant.

RESULTS:

The sample size was 78, patients were lean (mean BMI 21 ± 1.84 kg/m2) and comparatively young (mean age 40 ± 2.13 years). There were 51.3% of males (n=40) and 48.7% of females (n=38). Seventy-five percent of the participants were from rural areas. Gender differences are generally nonsignificant, and age effects are inconsistent once thresholds are specified. However, a lower-risk profile for SSIs is represented by a younger average age and a predominantly normal BMI, which is consistent with recent meta-analytic data showing higher SSI odds with elevated BMI and diabetes.

Table 1: Demographic Details (N = 78)

Variable	Value
Mean BMI	21 ± 1.84 kg/m²
Mean Age	40 ± 2.13 years

Variable	Value
Male Participants	51.3% (n = 40)
Female Participants	48.7% (n = 38)
Rural Participants	75%

The mean hospital stay was 3 ± 1.47 days. The most common procedure was Open Reduction Internal Fixation (ORIF) (44.9%), which was followed by Close Reduction Internal Fixation (CRIF) (26.7%) and arthroplasty (28.2%). The most popular implants were screws and plates (39.7%). Nineteen patients (24.4%) had at least one comorbidity; 10.3% had hypertension and 14.1% had diabetes. In the first 48 hours following surgery, 8.9% of patients experienced postoperative fever, primarily on Day 0. This distribution is typical of non-infectious postoperative inflammatory responses.

Table 2: Early outcomes and clinical characteristics (N = 78).

Variable	Value
Mean Hospital Stay	3 ± 1.47 days
ORIF Procedures	44.9%
CRIF Procedures	26.7%
Arthroplasty Procedures	28.2%
Screws and Plates Used	39.7%
Patients with Comorbidity	24.4% (n = 19)
Hypertension	10.3%
Diabetes	14.1%
Postoperative Fever (48 hrs)	8.9%
Superficial SSI	1.3%
Deep SSI	0%

SSI were stratified by age, gender, and implant type but there was no statistical significance hence not presented here. The one superficial SSI was having negative culture results hence no organism was found and no antibiotics sensitivity was reported.

This study was limited by its small sample size and single-centre design, which may restrict the generalizability of the findings. Additionally, the low incidence of SSIs reduced the ability to draw statistically significant associations between risk factors and infection outcomes.

DISCUSSION:

In contrast to many studies on surgical site infections (SSIs) following orthopedics implant surgeries, the mean age of the patients in this study was 40 years old. Due to comorbidities and delayed wound healing, older age is a known risk factor, while younger patients typically recover more quickly and have lower infection rates [1–3].

The majority of participants fell within the normal range, as indicated by their average BMI of 21. Patients with a BMI greater than 30 have been found to have more than twice the risk of infection, indicating a strong correlation between obesity and SSIs [4,5]. The low infection rate (1.3%) in this cohort was probably caused by its healthy BMI distribution.

There was no discernible variation in the prevalence of SSI, and the distribution of genders was almost equal. Some studies find no significant association, while others suggest higher rates in males [6,7]. In a similar manner, although access to healthcare is frequently mentioned as a problem for rural populations, living in a rural area did not seem to increase SSI risk in this study [8].

In line with other recent reports, the average length of stay in the hospital was three days [9, 10]. The positive results might have been influenced by shorter hospital stays, which are linked to fewer hospital-acquired infections.

The most widely used implants were plates and screws. According to the literature, because prostheses require more time to operate on and have larger implant surfaces than plates, screws, or nails, they are generally more prone to infection [11,12]. The only instance of superficial SSI in this study involved a patient who had a plate and screw implant.

The most common procedure was Open Reduction and Internal Fixation (ORIF), which was followed by CRIF and arthroplasty. Invasive procedures like arthroplasty may be more susceptible to infection, according to prior research [13,14]. Nonetheless, no deep SSIs were found, indicating that the study centres' infection control procedures were successful. Although they were present, comorbid conditions like diabetes and hypertension were not substantially linked to SSI in this study. Despite diabetes being a recognized independent risk factor [15,16], no SSI happened in diabetic patients, perhaps as a result of good perioperative glucose management.

Nine percent of patients had postoperative fever, primarily on day 0. This corroborates research showing that early fever is frequently not infectious and instead represents typical postoperative inflammatory reactions [17].

All things considered, the 1.3% SSI rate was either slightly lower or in line with other recent studies that report rates ranging from 1.5% to 4% [18–20]. It is especially encouraging that there were no deep SSIs, indicating that stringent aseptic procedures, suitable antibiotic prophylaxis, and perioperative care were very successful.

CONCLUSION:

With just one superficial infection and no instances of deep surgical site infections (SSIs) after orthopedics implant procedures, this study showed a remarkably low incidence of SSIs. There was no discernible correlation found between the incidence of infections and either implant type or patient demographics, indicating that preventive measures worked well for a range of patient populations. The results highlight how important rigorous aseptic procedures, prompt antibiotic prophylaxis, and thorough postoperative care are in reducing the risk of SSI. These results highlight the need for ongoing vigilance and further optimization of preventive practices to sustain low infection rates, while also offering significant regional evidence in favor of current infection control measures in orthopedics surgery.

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