

Postoperative Surgical Site Infection in Orthopaedic Surgeries: Incidence, Risk Factors, and Clinical Outcomes

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Abstract

Background: Surgical site infection (SSI) is one of the most common postoperative complications in orthopaedic surgeries and contributes significantly to prolonged hospital stay, increased morbidity, delayed rehabilitation, and healthcare costs. Identification of associated risk factors and early management are essential for reducing postoperative complications. The present study aimed to assess the incidence, risk factors, microbiological profile, and clinical outcomes of surgical site infections in orthopaedic surgeries.

Materials and Methods: This prospective observational study was conducted among 150 patients undergoing orthopaedic surgeries over a period of 18 months. Patients were evaluated for development of surgical site infection based on clinical examination and microbiological culture. Demographic profile, comorbidities, duration of surgery, implant use, wound classification, and postoperative outcomes were recorded. Statistical analysis was performed using SPSS software version, and $p < 0.05$ was considered statistically significant.

Results: Surgical site infection was observed in 18 patients (12%). The incidence of SSI was significantly higher among patients with diabetes mellitus, prolonged operative duration, open fractures, and implant surgeries. Staphylococcus aureus was the most commonly isolated organism. Patients with SSI demonstrated prolonged hospital stay and delayed functional recovery. Early diagnosis and appropriate antibiotic management resulted in satisfactory clinical outcomes in most patients.

Conclusion: Surgical site infection remains a significant postoperative complication in orthopaedic surgeries. Diabetes mellitus, prolonged surgery, implant use, and open fractures were important risk factors associated with SSI. Strict aseptic precautions, perioperative antibiotic prophylaxis, and early wound management are essential for reducing infection-related morbidity.

Keywords: Surgical site infection, orthopaedic surgery, postoperative infection, implant infection, wound infection, Staphylococcus aureus.

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Introduction

Surgical site infection (SSI) is a major postoperative complication in orthopaedic surgeries and remains an important cause of morbidity, prolonged hospitalization, increased healthcare expenditure, and delayed rehabilitation.[1] Orthopaedic procedures frequently involve implants,

prosthetic materials, and extensive soft tissue dissection, making prevention of postoperative infection particularly important. Surgical site infection is defined as infection occurring within 30 days of surgery or within one year in cases involving implants.[2] Orthopaedic SSIs

may involve superficial soft tissues, deep fascia, muscles, bones, or implanted hardware. Infection following orthopaedic surgery can lead to osteomyelitis, implant failure, nonunion, prolonged antibiotic therapy, and repeated surgical procedures.[3]

The incidence of SSI in orthopaedic surgeries varies depending on patient factors, type of surgery, duration of procedure, implant use, wound contamination, and hospital infection control practices.[4] Common risk factors include diabetes mellitus, smoking, obesity, malnutrition, prolonged operative duration, open fractures, immunosuppression, and prolonged hospital stay.[5]

Staphylococcus aureus remains the most common causative organism in orthopaedic surgical site infections, although gram-negative organisms and multidrug-resistant bacteria are increasingly encountered.[6]

Early diagnosis through clinical examination and microbiological culture is essential for prompt treatment and prevention of serious complications.

Several preventive strategies including perioperative antibiotic prophylaxis, strict aseptic precautions, laminar airflow operation theatres, proper sterilization, glycemic control, and wound care protocols have significantly reduced the incidence of SSI.[7]

Despite advances in surgical techniques and infection control measures, SSI continues to pose a significant challenge in orthopaedic practice.

Assessment of incidence, risk factors, microbiological profile, and clinical outcomes of surgical site infections is important for improving postoperative care and reducing complications.

Therefore, the present study was undertaken to evaluate surgical site infections in orthopaedic surgeries.

To assess the incidence, risk factors, microbiological profile, and clinical outcomes of surgical site infections in orthopaedic surgeries.

Materials and Methods

This prospective observational study was conducted over a period of 18 months in the Department of Orthopaedics at Rama Medical College and Research Centre among patients undergoing orthopaedic surgeries. A total of 150 patients who underwent elective or emergency orthopaedic procedures were included in the study. Patients of all age groups undergoing fracture fixation, joint surgeries, implant procedures, and trauma surgeries were included. Patients with pre-existing active infection, pathological fractures, immunodeficiency disorders, or incomplete follow-up were excluded from the study.

Detailed demographic profile, comorbidities, smoking history, body mass index, type of surgery, implant use, operative duration, wound classification, and perioperative antibiotic usage were recorded. Surgical wounds were evaluated regularly during postoperative hospital stay and follow-up visits for signs of infection including redness, swelling, discharge, tenderness, fever, and wound dehiscence.

Microbiological culture and sensitivity testing were performed in suspected cases of surgical site infection. Surgical site infections were classified as superficial or deep infections according to CDC criteria. Postoperative outcomes including duration of hospital stay, need for secondary procedures, implant removal, and functional recovery were assessed.

Statistical analysis was performed using SPSS software. Continuous variables were expressed as mean \pm standard deviation, while categorical variables were expressed as frequencies and percentages. Chi-square test and Student's t-test were used for analysis. A p-value less than 0.05 was

considered statistically significant. A total of 150 patients undergoing orthopaedic surgeries were included in the study. Surgical site infection was observed in 18 patients, resulting in an overall incidence of 12%. The mean age of patients with SSI was higher compared to patients without infection. Male predominance was observed among infected cases.

The incidence of SSI was significantly higher among patients with diabetes mellitus, smoking history, obesity, and prolonged operative duration. Open fractures and implant surgeries demonstrated higher infection rates compared to clean elective procedures. Patients undergoing surgeries lasting more than 2 hours showed significantly increased risk of postoperative infection.

Staphylococcus aureus was the most commonly isolated organism followed by *Klebsiella* species and *Pseudomonas aeruginosa*. Most superficial infections responded well to antibiotic therapy and regular wound dressing, whereas deep infections required surgical debridement and prolonged antibiotic treatment.

Patients with surgical site infection demonstrated significantly prolonged hospital stay and delayed functional rehabilitation compared to non-infected patients. Implant removal was required in a small proportion of patients with persistent deep infection. Overall, strict aseptic precautions, early diagnosis, appropriate antibiotic therapy, and wound management contributed to satisfactory clinical outcomes in most cases.

Table 1: Baseline Characteristics of Study Population

Variables	Total Patients (n=150)
Mean Age (years)	44.8 ± 13.2
Male	98 (65.3%)
Female	52 (34.7%)
Diabetes Mellitus	32 (21.3%)
Smoking History	40 (26.7%)
Obesity	28 (18.7%)
Implant Surgeries	96 (64%)
Open Fractures	36 (24%)

Table 2: Incidence and Risk Factors Associated with Surgical Site Infection

Risk Factors	SSI Present (n=18)	SSI Absent (n=132)	p-value
Diabetes Mellitus	10 (55.6%)	22 (16.7%)	<0.01
Smoking History	8 (44.4%)	32 (24.2%)	<0.05
Obesity	6 (33.3%)	22 (16.7%)	<0.05
Operative Duration >2 hrs	12 (66.7%)	38 (28.8%)	<0.01
Implant Surgery	14 (77.8%)	82 (62.1%)	>0.05
Open Fractures	9 (50%)	27 (20.5%)	<0.01

Table 3: Microbiological Profile of Surgical Site Infection

Organisms Isolated	Number of Cases	Percentage
<i>Staphylococcus aureus</i>	9	50%
<i>Klebsiella</i> species	4	22.2%
<i>Pseudomonas aeruginosa</i>	3	16.7%
<i>Escherichia coli</i>	2	11.1%

Table 4: Clinical Outcomes of Patients with Surgical Site Infection

Outcomes	SSI Group	Non-SSI Group	p-value
Mean Hospital Stay (days)	16.4 ± 4.2	8.1 ± 2.6	<0.001
Need for Surgical Debridement	6 (33.3%)	—	—
Implant Removal	2 (11.1%)	—	—
Delayed Functional Recovery	10 (55.6%)	18 (13.6%)	<0.001

Discussion

The present study evaluated the incidence, microbiological profile, risk factors, and clinical outcomes of surgical site infections in orthopaedic surgeries. The overall incidence of SSI in the present study was 12%, which is comparable to previously reported studies in orthopaedic practice.[8]

Diabetes mellitus emerged as one of the most important risk factors associated with SSI. Poor glycemic control impairs wound healing, leukocyte function, and immune response, thereby increasing susceptibility to postoperative infections.[9] Similar findings have been reported in several orthopaedic infection studies. Prolonged operative duration and open fractures were significantly associated with increased infection rates. Longer surgical procedures increase tissue exposure and contamination risk, whereas open fractures involve direct communication with the external environment leading to bacterial contamination.[10]

Staphylococcus aureus was the most commonly isolated organism in the present study, consistent with previous reports on orthopaedic surgical infections.[11] Early microbiological diagnosis and antibiotic sensitivity testing are essential for appropriate antimicrobial therapy and infection control.

Patients with SSI demonstrated significantly prolonged hospital stay and delayed rehabilitation. Deep infections often required repeated debridement and implant removal, leading to increased morbidity and healthcare costs.[12] The findings of the present study highlight the importance of strict aseptic precautions,

perioperative antibiotic prophylaxis, glycemic control, and meticulous wound care in reducing surgical site infections in orthopaedic surgeries.

Conclusion

Surgical site infection remains an important postoperative complication in orthopaedic surgeries and is associated with increased morbidity and delayed rehabilitation. Diabetes mellitus, prolonged operative duration, smoking, obesity, and open fractures were major risk factors associated with SSI. *Staphylococcus aureus* was the most common causative organism. Early diagnosis, appropriate antibiotic therapy, and strict infection control measures are essential for reducing postoperative complications and improving surgical outcomes.

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