

ORIGINAL RESEARCH

SSI and Implants: A threat to orthopedic patients

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ABSTRACT

Background: Implant associated Surgical site infection are a considerable concern in clinical practice due to their potential complication and adverse outcome. They can lead to significant morbidity, increased healthcare cost, prolonged hospital stays and even implant failure. **Methods:** All the patients of Open Reduction and Internal Fixation were enrolled for the study. The study was done in Department of Microbiology, Bundelkhand Medical College, hospital, Sagar, Madhya Pradesh. **Result:** The study was done in 138 patients. In the present study, the most common location for the fracture was the distal femur (29.7%). The most common age group was 40-60 yrs (33.2%). The most common bacteria in the present study was Staphylococcus aureus (54.3%) followed by E. coli (18.1%) and Pseudomonas aeruginosa (12.5%). **Conclusion:** Implant associated Surgical site infection is a significant complication in orthopedic patients. By understanding the nature of these infections and implementing preventive measures, healthcare professionals can minimize the occurrence of Implant associated Surgical site infection and improve patient outcome.

Keywords: Implant, fracture, surgical site infection, biofilm

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INTRODUCTION

Implant associated Surgical site infection refers to development of an infectious process in the vicinity of a surgically implanted device or prosthesis. These infections can occur after surgical procedure involving implants such as joint replacement and other orthopedic surgeries. Implant associated Surgical site infection are a considerable concern in clinical practice due to their potential complication and adverse outcome. They can lead to significant morbidity, increased healthcare cost, prolonged hospital stays and even implant failure. These infections are often caused by bacteria or other microorganisms that damage the implant surface, form a biofilm that is difficult to eradicate and contribute to persistent infection. They are very difficult to eliminate with antimicrobial therapies. Therefore, inhibiting bacterial adhesion is essential to prevent implant-associated infection, because biofilm are extremely resistant to both the immune system and antibiotics. (1,2) Several factors contribute to the development of Implant associated surgical site infection including patient related factors (e.g. advanced age, obesity, diabetes, immunosuppression), surgical factors (e.g. prolonged operation time, inadequate

aseptic technique, improper wound closure) and implant related factors (e.g. material type). It is one of the major types of Hospital acquired infections and accounts for around 31% of Hospital acquired infections. This study aims to provide a comprehensive overview of implant associated Surgical site infection.

MATERIAL AND METHODS

Study Design: This study was done in Department of Microbiology, Bundelkhand Medical College, hospital, Sagar, Madhya Pradesh. It is a Prospective cross-sectional study done from 27/07/2021 to 27/07/2022.

All patients who underwent open reduction and internal fixation (ORIF) for bone fracture at the department of orthopaedics were screened for signs and symptoms of SSIs. Those screening positive were approached for enrolment into the present study.

Pus Sample or discharge material was Collected under all aseptic precaution and Kept in a swab with sterile test tube and then sent to the Microbiology laboratory.

A Gram-stain smear was prepared and the isolates were identified by colony morphology, Gram's stain, and conventional biochemical test. Mueller-Hinton agar (MHA) medium was used for susceptibility

testing by Kirby-Bauer Disk Diffusion Method. For gram-positive cocci, Catalase test, Coagulase test, Bile esculin hydrolysis test were done. Some antimicrobial susceptibility tests are also done for bacterial identification such as: Novobiocin susceptibility test, Optochin susceptibility test and Bacitracin susceptibility. For gram-negative bacilli: Common biochemical tests routinely done are: Indole test, Citrate utilization test, Urea hydrolysis test, Triple sugar iron test (TSI), MR (methyl red) test, OF test (oxidation-fermentation test), Nitrate reduction test.

RESULTS AND OBSERVATIONS

Total 138 inpatients admitted in the orthopedic ward were enrolled in the present study.

Location of fracture: In the present study, the most common location for the fracture was the distal femur (29.7%), followed by the proximal tibia (25.3%) and fracture of forearm bones (radius & ulna) (2.17%), humerus (1.44%). The fracture of metacarpal (0.72%) was the least common type of fracture.

Table 1: Location of the fracture

Location of Fracture	Type of Fracture		
	Open	Closed	Total
Distal Femur	23	18	41
	25.56	37.50	29.71
Proximal Tibia	26	9	35
	28.89	18.75	25.36
Distal Tibia	17	8	25
	18.89	16.67	18.12
Femur Neck	10	7	17
	11.11	14.58	12.32
Intertrochanteric Femur	12	2	14
	13.33	4.17	10.14
Others	2	4	6
	2.22	8.33	4.35
Total	90	48	138

Age Distribution of Participants: The study shows that infection was high in age group 40-60. It was 32.2% and the least no. of patients were infected in age group above 60 (17.78%).

Table 2: Age group of participants

Age Group	Type of Fracture		
	Open	Closed	Total
<=30	20	8	28
	22.22	16.67	20.29
31-45	25	16	41
	27.78	33.33	29.71
46-60	29	13	42
	32.22	27.08	30.43
>60	16	11	27
	17.78	22.92	19.57
Total	90	48	138
	100.00	100.00	100.00

Isolated bacteria: The most common bacteria in the present study were Staphylococcus Aureus (54.3%) followed by E. coli (18.1%) and Pseudomonas aeruginosa (12.5%). Among the 5 other bacteria, there were 3 cases of Staph. Epidermidis and 2 cases of Staph saprophyticus.

Table3: Isolated bacteria

Pathogen	Type of Fracture		
	Open	Closed	Total
Staph aureus	46	23	69
	66.7	33.1	54.3
E.Coli	17	6	23
	73.9	26.1	18.11
Pseudomonas aeruginosa	12	4	16
	75.0	25.0	12.5
Klebsiellapneumoniae	7	3	10
	70.0	30.0	7.9
Proteus Vulgaris	3	1	4
	75.0	25.0	3.1
Others	2	3	5
	40.0	60.0	3.9
Total	87	40	127



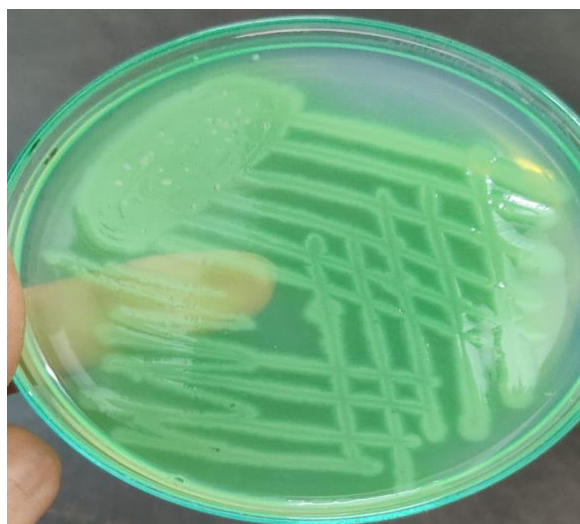
Golden yellow colonies of Staphylococcus Aureus on Nutrient agar



Flat, pink lactose fermenting colonies of E. coli on macconkey agar



Mucoid, pink color colonies of *Klebsiella Pneumonia* on MacConkey agar



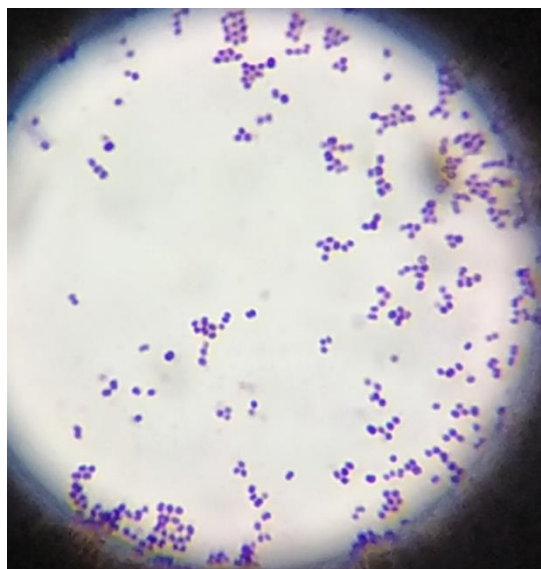
Blue Green pigmented colonies of *Pseudomonas Aeruginosa* on Nutrient agar.



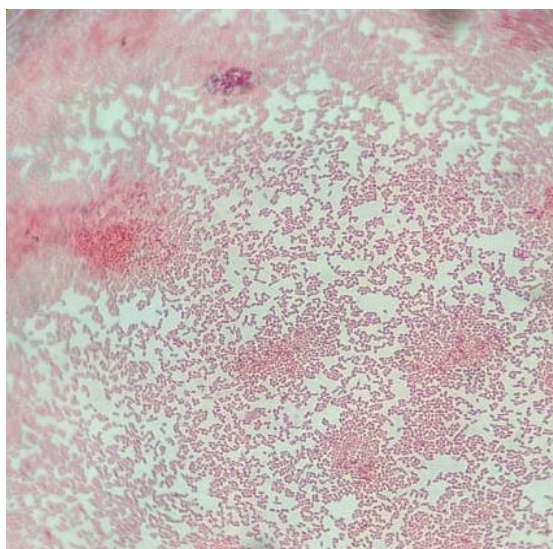
Swarming growth of *Proteus Vulgaris* on Blood agar



Staphylococcus Epidermidis on Blood agar



Gram Positive cocci



Gram negative Bacilli

DISCUSSION

Due to the high prevalence of orthopaedic surgery site infection, differences in pathogens causing infection, differences in bacterial resistance to antibiotics, and consequently the need to initiate different antibiotics, epidemiologic studies evaluating the frequency distribution of bacterial infection and associated risk factors are deemed essential.

The present study showed *Staphylococcus aureus* (54.3%) as the most common bacteria followed by *E. coli* (18.1%) and *Pseudomonas aeruginosa* (12.5%). Several studies have reported that *Staph aureus* is the most common bacteria isolated in fracture. Several studies have concluded that nasal carriers of *Staph aureus* are at increased risk of SSI. Kalmeijer MD et al. (2015)(3) reported that the main causative pathogen was *S aureus*. The authors concluded that high-level nasal carriage of *S aureus* was the most important and only significant independent risk factor for developing SSI with *S aureus*. Similar to our findings, Madu KA et al. (2011)(4) also reported that *staphylococcus aureus* was the most common causative organism in 55.6% of cases (75). The most common location for the fracture was the distal femur (29.7%), followed by the proximal tibia (25.3%) and fracture of forearm bones (2.17%), fracture of humerus and metacarpal was the least common type of fracture in this study. A similar report was done by Norris GR et al., (2019)(5) in which they reported that the most commonly cultured bacteria specimens were found in periarticular knee infections (10). The study shows that infection was high in age group 40-60. It was 32.2% and the least no. of patients were infected in age group above 60 (17.78%). This was different from the study done by Stephen Apanga et al, [6] Aikaterini Masagala et al, [7] Ibtesam K Afifi et al, [8]. they reported that SSIs are more common in patients above 60 years of age. A.L. Akinyoola et al [9] and Khan MS et al [10] also reported that SSI is common in old aged patient.

CONCLUSION

Surgical site infections are a considerable problem in orthopedic patients. It needs proper measures to control as it had great financial burden on patient and on hospital resources and could lead to increased morbidity and mortality in patients.

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