Original Article

Prevalence of Antibiotic Resistant Pathogens in Post-Orthopedic Implant Site

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ABSTRACT

Objective: To assess the frequency of infective organisms and their changing antibiotic sensitivity trends in surgical site infection after orthopedic implant surgeries.

Study Design: Cross sectional study.

Place and Duration of Study: This study was conducted at the Department of Orthopedic Surgery, Divisional HQ Hospital Mirpur AJK from January 2018 to December 2018.

Materials and Methods: Ninety six patients of both genders and age between 16-80 years with surgical site infection after elective surgeries were included. Patients' demographics were recorded. Type of most common pathogen and its sensitivity pattern were recorded.

Results: The mean age of patients was 45.93±10.58years. There were 51 (53.1%) males and 45 (46.9%) females. There was Staphylococcus aureus was found in 33 (33.96%) cases, MRSA was found in 18 (18.75%) cases, E. coli was found in 15 (15.63%) cases. Ceftriaxone was sensitive in 88 (91.7%) cultures, Ampicillin was sensitive in 62 (64.6%) cultures, and Metronidazole was sensitive in 58 (61.4%) cultures.

Conclusion: The frequency of Staphylococcus aureus was found to be most common pathogen in SSI and ceftriaxone was most sensitive antibiotic for SSI management.

Key Words: Surgical site infection, Pathogen, Antibiotic sensitivity

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INTRODUCTION

Infections caused by antibiotic-resistant pathogens are a major public health concern, and their treatment can bechallenging.[1] The increasing rates of orthopedic surgery across many countries emphasize the importance of implementing strategies to minimize the risk of surgical site infection.[2,3] In advance trauma and orthopaedic surgery device related infections remains a major complication.[4] The SSI was reported 3.8%, which is below the reported worldwide incidence of 2.6% to 41.9%.[5,6] Despite best practice in medical and surgical management, neither prophylaxis nor treatment of orthopedic device–related infection is effective in all cases, and can lead to infections that negatively impact clinical outcome and significantly increase healthcare expenditure.[7]

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In developing countries like Pakistan hospitalization still suffers lack of proper surgical instrument sterilization resulting into various pathogen growth at SSI. The present study will help in assessing the prevalence of such pathogens.

MATERIALS AND METHODS

This cross sectional study was done from 1st January 2018 to 31st December 2018 at Department of Orthopedic Surgery, Divisional HQ Hospital Mir AJK and comprised 96patients of surgical site infection. Patients of age 16-80years, of either gender underwent surgery for bony fractures and developed SSI were included. Patients with diabetes, osteomalacia and patients on antibiotics for previous infections were excluded from the study. Written informed consent was taken from each case. Demographic and clinical details as name, age, sex, duration of surgery, symptoms and infection site involved were obtained. Patients were evaluated for infection and pus sample was obtained under aseptic measures and sent to the hospital laboratory for reporting. Reports were assessed and type of pathogen found in culture and its antibiotics sensitivity was noted. All the collected data was then analyzed through SPSS version 21.

RESULTS

The mean age of patients was 45.93±10.58years. There were 51 (53.1%) males and 45 (46.9%) females. The mean duration of surgery was 23.84±11.35days. In the sample, 44 had femur fracture, 23 had humerus

fracture, 17tibial fractures, 9 had radial fracture and 3 had fibula fracture (Table 1). Out of 96, Staphylococcus aureus was found in 33 (33.96%) cases, MRSA was found in 18 (18.75%) cases, E. Coli was found in 15 (15.63%) cases, Pseudomonas A was found in 12 (12.5%) cases, BHS group A in 10 (10.4%) cases, Enterococcus in 9 (94%) and salmonella in 9 (9.4%) cases (Table 2). Different antibiotics were applied on pus culture Ceftriaxone was sensitive in 88 (91.7%) cultures, Ampicillin was sensitive in 62 (64.6%) cultures, Metronidazole was sensitive in 58 (61.4%) cultures, Gentamicin was sensitive in 29 (30.2%) cultures while cefoxitin was sensitive in 13 (13.5%) cultures (Table 3).

Table No.1: Characteristics of patients (n=96)

Age	45.93±10.58years
Gender (Male / Female)	51 (53.1%) / 45 (46.9%)
Duration of surgery	23.84±11.35days
Site of fracture	
Femur	44
Humerus	23
Tibial	17
Radius	9
Fibula	3

Table No.2: Pathogens found in culture

Bacteria	**No. (%)**
Staph Aureus	33 (33.96%)
MRSA	18 (18.75%)
E. Coli	15 (15.63%)
Pseudomonas A	12 (12.5%)
BHS Group A	10 (10.4%)
Enterococcus	9 (9.4%)
Salmonella	9 (9.4%)

Table No.3: Antibiotic sensitivity of pathogens

Antibiotic	**Sensitive**
Ceftriaxone	88 (91.7%)
Ampicillin	62 (64.6%)
Metronidazole	58 (61.4%)
Gentamicin	29 (30.2%)
Cefoxitin	13 (13.5%)

DISCUSSION

The most prevalent species in orthopaedic device-related infection are Staphylococci.[8,9] Staphylococcus aureus accounts for between 20% and 30% of cases of infection after fracture fixation and prosthetic joint infections, with coagulase-negative staphylococci accounting for 20–40% of cases, including small colony variants.[10]

The most common isolated infective organism was Staphylococcus species including Methicillin Resistant Staphylococcus aurous 33 (33.2%), MRSA 18 (18.75) Pseudomonas 12 (12.5%), Enterococcus species in 9 (9.4%) and Escherichia coli in 15 (15.6%). There were 53 patients (72.6%) infected by a single organism, (21.9%) by two infecting organisms, and 4 (5.5%) patients infected by more than two organisms.[11] In all patients who had two or more organisms, Staphylococcus aureus was the common organism. The following prophylactic antibiotics were used: ampicillin, gentamicin, cefoxitin, metronidazole and ceftriaxone.[12]

The Gram-positive cocci including Streptococci (1-10%) and Enterococci (3-7%) are less frequently encountered. Infection caused by Gram-negative bacilli, including Pseudomonas aeruginosa and Enterobacteriaceae account for approximately 6-17% and anaerobes (including Propionibacteria and Peptostreptococci) are comparatively rare at approximately 4–5%.[8-12] Shoulder orthopedic device–related infections, however, may have higher Propionibacterium acnes prevalence, at up to38%.[13] Recently more attention has been focused upon polymicrobial infections, which may account for 10-20% ofcases.[8.9.12] Furthermore, studies using molecular diagnostic techniques indicate that, in addition, there is a significant proportion (5-34%) of culture-negativeinfections.[14,15]

Others are anaerobes, gram-negative bacilli such as Pseudomonas species or E. coli, and especially in hematogenous infections streptococci.[16,17] Tunney et al[18] isolated Propionibacterium species in 60% of orthopedic device-related infections by using strict anaerobic bacteriologic practices during the processing of samples considered associate with orthopedic device–related infections. Propionibacterium species are the second most frequent contaminant found in jointaspiration.[19]

Hidayatullahet al[20] found that Staphylococcus aureus (13 cases) including MRSA (5 cases) was the most common infecting organism in our study, involving 18 (50%) patients. Other studies show the frequency of Staphylococcus aureus to be 25-29%.[21,22] The frequency of MRSA among Staphylococcus aureus was 27.8% (5 out of 18). Staphylococcus aureus was most sensitive to fusidic acid, vancomycin linezolid, clindamycin and erythromycin. There was a mixed sensitivity pattern to gentamycin, cotrimxazole and oxacillin. In majority of cases Staphylococcus aureus was resistant to pencillin, levofloxacin and tetracyclin.[20]

CONCLUSION

The frequency of Staphylococcus aureus and MRSA were most common pathogens in SSI and ceftriaxone, ampicillin and metronidazole were most sensitive antibiotic for SSI management. Now in future, we can implement the use of ceftriaxone, ampicillin and metronidazole for management of SSI keeping in mind most common pathogens.

Author's Contribution:

Concept & Design of Study:	Akkad Rafiq
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Revisiting Critically:	Akkad Rafiq, Ahsan-ul-Haq
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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