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Original Article

# Retrospective Study of Surgical Site Infection in an Urban Centre of Eastern India

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## Abstract

**Background:** In compromised operation room and ward environment does extended prophylactic antibiotic for beyond 24 h do better for preventing surgical site infection (SSI)?

**Materials and Methods:** In this retrospective transverse cross-sectional study 899 (major = 699 and minor = 230) post-operated patients are investigated for the incidence of infection. The patient population is distributed in trauma, arthroplasties, and others as 508, 106, and 285, respectively.

**Results:** In major procedures infection developed as superficial incisional, deep incisional, and deep organ space are 4.33%, 1.20%, and 1.05%, respectively, and average total being 6.93%. In minor procedure, the values are 2.17%, 0.43%, and 2.70%. The incidence of SSI in arthroplasties was 11 (10.38%). Minimum period for identification for SSI 6 days in 11 cases and as late as 53 days in 1 case. Organism prevalence was *Staphylococcus aureus* 51.92% (MRSA = 51.85%), *Staphylococcus epidermidis* in 8, *Streptococcus* in 12, *Escherichia coli* in 2, *Klebsiala* in 1, and *Pseudomonas* in 2 cases. Combining debridement and suitable antibiotics SSIs controlled in 27 cases and failed in 25 cases.

**Conclusion:** Prolonged prophylactic antibiotic use cannot reduce the incidence of SSI. It makes delay in identification of SSI leading to difficulties in controlling it. Prophylactic antibiotic is never an alternative for the antiseptic surgical protocol.

**Key words:** Arthroplasty, Orthopedic operation, Prophylactic antibiotic, Surgical site infection

## INTRODUCTION

Surgical site infection (SSI) is a major problem in clean non-contaminated orthopedic operations. Reasons, as defined in literature, are compromised operation room (OR) environment including inadequate sterilization, unrestricted entry of people,[1] improper hand washing,[2] and gowning[3] ward environment[4] and hygienic sense of patients and accompanying persons,[5,6] compromised immunological status of patients, obesity[7] and smoking, and lack of appropriate prophylactic antibiotic administration.[8] Prolonged pre-operative hospital stay is a potential cause of SSI.[9] Many orthopedic surgeons believe that in a compromised situation where OR and ward environment are not up to the expected level the standard prophylactic antibiotic therapy may not be adequate and use to use more extended period of prophylactic antibiotic therapy for more than 5 days postoperatively. We conducted this retrospective study in a new rural Medical College in Eastern India, which is overcrowded and where 5 days post-operative prophylactic antibiotic was used, to determine the overall rate of SSI.

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## MATERIALS AND METHODS

It is a retrospective transverse cross-sectional study of patient undergone clean orthopedic operations from January 1, 2012, to December 31, 2015, in Murshidabad

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Medical College excluding open injuries, definite immune-compromised state, and infections. Ethical committee approval is obtained duly. Study tools are in-patient hospital records.

899 patients (male = 642 and female = 257) of age ranging from 2 years to 87 years are included in this study. Pediatric (0–18 years) and adults (≥19 years) patients were 285 and 614, respectively. Included major and minor surgeries were 669 and 230 [Table 1]. Invasive surgical procedures that penetrate and expose a body cavity or have the potential for permanent anatomic or physiologic impairment or need extensive tissue dissection or transection are major surgery whereas minor surgery neither penetrates a body cavity nor causes permanent impairment of any bodily functions. Needle biopsies are included in minor surgery category. 420 major operations were done for various traumas at different body parts and that for arthroplasty in 106 cases. Major operation was done other causes were 143 which include tumor, deformity correction, osteonecrosis, arthrodesis of ankle, congenital deformities, entrapment syndromes, non-unions, and few others [Table 2]. Total of arthroplasties were 106 (hip = 93, knee = 8, shoulder = 2, and below = 3). Prophylactic antibiotics used were cefuroxime (1.5 g) in 212 and ceftriaxone (1 g) in 687 cases within 15–60 min before incision intravenously. Per-operative a second dose was administered in 97 cases. They were continued for 3 days in 411 and 5 days in 488 cases. In infected cases, the first debridement was done as early as 6th post-operative day (11 cases) and as late as 53rd post-operative day (3 cases). Rest of the cases were debrided in between. Second debridement was done in 10 cases.

**Table 1: Distribution of patients according to major and minor procedures and their age groups**

| Category of surgery | Age (2–18) | Age (19–87) | Total |
|---|---|---|---|
| Major | 147 | 522 | 669 |
| Minor | 138 | 92 | 230 |
| Total | 285 | 614 | 899 |

**Table 2: Regional and etiological distribution of major and minor procedures**

| Region | Numbers | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Trauma | | Arthroplasty | | Others | | Total | |
| | Major | Minor | Major | Minor | Major | Minor | Major | Minor |
| Foot and ankle | 20 | 4 | - | - | 11 | 61 | 31 | 65 |
| Leg | 44 | 6 | - | - | 6 | 13 | 50 | 19 |
| Knee | 22 | 2 | 8 | - | 6 | 21 | 36 | 23 |
| Thigh | 68 | 14 | - | | 19 | 4 | 87 | 18 |
| Hip | 58 | 12 | 93 | | 31 | 12 | 182 | 24 |
| Pelvis | 7 | - | - | - | 2 | 2 | 9 | 2 |
| Spine | 9 | - | - | - | 2 | - | 11 | - |
| Shoulder | 40 | - | 2 | - | 2 | 5 | 44 | 5 |
| Arm | 21 | 2 | - | - | 6 | 8 | 27 | 10 |
| Elbow | 66 | 34 | 3 | - | 18 | 10 | 87 | 44 |
| Forearm and wrist | 61 | 6 | - | - | 31 | 3 | 92 | 9 |
| Hand | 4 | 8 | - | - | 9 | 3 | 13 | 11 |
| Total | 420 | 88 | 106 | - | 143 | 142 | 669 | 230 |

## RESULTS

Infection developed in 46 (6.93%) cases in major procedure group where superficial incisional, deep incisional, and deep infection were 29 (4.33%), 8 (1.20%), and 7 (1.05%), respectively. The infection in minor procedure group was 6 (2.70%) which include superficial incisional infection in 5 (2.17%) and deep incisional infection in 1 (0.43%) cases, and none had Organ/space infection [Table 3]. Thus, the total average infections were 52 (5.78%) of 899 cases. Of the 106 cases of arthroplasties, 11 had an infection which includes 10 infections of 93 hip arthroplasties (superficial incisional = 5, deep incisional = 3, and deep = 2) and one infections of 8 knee arthroplasties. None of the other arthroplasties (shoulder = 2 and elbow = 3) had infection [Table 4]. After surgical management infection was controlled in 27 (51.92%) cases and in 25 (48.08%) cases including 5 arthroplasties implants were sacrificed. The most infecting microbes were *Staphylococcus aureus* 51.92% (MRSA = 51.85%). Other microbes were *Staphylococcus epidermidis* in 8, *Streptococcus* in 12, *Escherichia coli* in 2, *Klebsiala* in 1, and *Pseudomonas* in 2 cases [Table 5].

## DISCUSSION

In the present series, the overall SSI rate in orthopedic major procedure is 6.93% and that of arthroplasty cases are 10.38%. Edwards *et al.* reported that the SSI after arthroplasties of hip and knee is around 2%.[10] Possible reasons for this significantly higher SSI are (a) third-generation cephalosporin is used in almost half of the cases, (b) bacterial biofilm production on the interface implant and bone, (c) decolonizing mupirocin is used in none of the cases, (d) OR environment particularly number of person entry is compromised, (e) hygienic sense of most patients is below average, and (f) long pre-operative stay and overcrowding of patients in wards. In arthroplasty group, as it is a new medical college and arthroplasties are a new operation, restriction of unwanted person entry is further compromised.

Post SSI is recognized earliest on 6th and latest on 53rd post-operative day. This intervention is also delayed leading to poorer control of infection. This is because of continued antibiotic beyond 24 h which musk the clinical features of infection.

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**Table 3: Overall different types of infection and their percentage of major and minor groups**

| Type of surgery | Number of surgery | Infection | | | |
|---|---|---|---|---|---|
| | | Superficial incisional | Deep incisional | Organ/space | Total |
| Major | 669 | 29 (4.33) | 8 (1.20) | 7 (1.05) | 46 (6.93) |
| Minor | 230 | 5 (2.17) | 1 (0.43) | - | 6 (2.70) |

**Table 4: Number of different arthroplasties and their incidence of infection**

| Type of arthroplasties | Number of arthroplasties | Infection | | | |
|---|---|---|---|---|---|
| | | Superficial incisional | Deep incisional | Organ/space | Total |
| Hip | 93 | 5 | 3 | 2 | 10 |
| Knee | 8 | 1 | - | - | 1 |
| Shoulder | 2 | - | - | - | - |
| Elbow | 3 | - | - | - | - |
| Total | 106 | 6 (5.66) | 3 (2.83) | 2 (1.88) | 11 (10.38) |

**Table 5: Prevalence of microbes in tissue collected during debridement in SSI cases and their sensitivity**

| Microbes | Number | MSSA | MRSA | Result | |
|---|---|---|---|---|---|
| | | | | Controlled | Sacrificed |
| *Staphylococcus aureus* | 27 (51.92) | 13 (48.15) | 14 (51.85) | 11 | 16 |
| *Staphylococcus epidermidis* | 8 (15.38) | | | 5 | 2 |
| *Escherichia coli* | 2 (3.85) | | | - | 2 |
| *Streptococcus* | 12 (23.08) | | | 10 | 3 |
| Others | 3 (5.77) | | | 1 | 2 |
| Total | 52 | | | 27 | 25 |

noted the incidence of *S. aureus* and MSRA as 31% and MRSA as 49%. In the present series, incidence of *S. aureus* is 27 (51.92%) of which MRSA was 14 (51.85%). The higher incidence may be as a result of developing bacterial resistance due to a prolonged period of beta-lactam antibiotic therapy, non-use of decolonizing Mupirocin spray and higher prevalence of *S. aureus* in the hospital.

Bratzler *et al.*[7] recommended as clinical guidelines that no prophylactic antibiotic is needed for clean orthopedic operations where no implant is inserted. However, it is supported by poor evidence. However, in any clean orthopedic operation with implantation and arthroplasties, single dose prophylactic first generation or second generation is adequate. In situations with beta-lactam hypersensitivity, clindamycin and aminoglycoside are to be considered. Perioperative dose repetition is dependent on duration of surgery or amount of blood loss. Decolonizing Mupirocin nasal or armpit spray is useful to prevent SSI by MRSA microbe. In the present study, these guidelines are not followed.

The limitation of this study is that it a retrospective one. Hence, maintenance of stringent aseptic protocol cannot be ascertained completely.

## CONCLUSION

Prolonged prophylactic antibiotic use cannot reduce the incidence of SSI. It makes delay in identification of SSI leading to difficulties in controlling it. Prophylactic antibiotic is never an alternative for the antiseptic surgical protocol.


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