ORIGINAL ARTICLE

# Incidence of Early Surgical Site Infection (SSI) in Elective Orthopaedic Implant Surgeries

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## ABSTRACT

**Objective:** To evaluate the frequency of SSI and isolated infectious micro-organisms with length of hospital stay.

**Methods:** Patients with closed fractures planned for elective surgeries admitted in Orthopaedic department from February 2017 till July 2017. Data of this retrospective descriptive study was recorded on a proforma covering patient's demographics, length of hospital stay, provisional diagnosis, procedure performed, culture sent and micro-organism isolated. Total 155 patients male and female, age range 5- 75 years were included. Exclusion criteria were patients with open injuries, soft tissue operations, emergencies, non-implant surgeries, comorbid patients (other than hypertension). This data was analyzed for frequency and percentages of the variables.

**Results:** 155 patients of age were grouped into 3 categories. Out of which, 119(76.77%) male and 36(23.23%) were female. Among these, infectious micro-organisms isolated from 11(7.09%) patients. Klebsiella species found to be most prevalent in 4(36.36%) followed by pseudomonas aeruginosa 3(27.27%), Coagulase negative staphylococci 3(27.27%) and Methicillin susceptible S. aureus 1(9.09%) in the descending order. 6(54.54%) of these patients were treated in the ward for more than 2 weeks and most common isolate in correlation with the prolong stay was pseudomonas aeruginosa.

**Conclusion:** The incidence of SSI in elective procedures for closed fractures was found in 11 (7.09%) with Klebsiella species being the most common. On the other hand, Pseudomonas aeruginosa was found to be most prevalent in patients with prolong hospital stay which could be due to nosocomial abundance and pre-operative colonization.

**Key words:** Incidence, Surgical site infection, Orthopaedic implants, Micro-organism, Closed fracture.

## INTRODUCTION

The surgical site infection (SSI) occur in thirty days after surgery or within the 1 year if an implant was placed. [1]. SSI is also explained as microbial contamination of the surgical lesion. In orthopedic implant surgery, the surgical site infection is destructive complication for both surgeon and patient. Surgical site infection (SSI) is a frequent post-operative incident with frequency rate from 1 to 22% subsequent to orthopedic implant surgeries [2-4]. Illness in orthopedics implant surgery causes increase in cost by 300% by utilization of antibiotic and also amplify disease and treatment [5]. In implant surgeries, it is very difficult to get rid of infection, because fixation provide exterior for bacterial devotion & origination of biofilm that slow down diffusion of antibiotics [6]. Obesity, smoking, advance age, immune, impairment, diabetics, anemia and different body infections are the main source for factors due to which the infection is occurred [7].

Earlier surgical site infection (SSI) present within thirty (30) days from the procedure of surgery. However, if an infection occurs between one & three months it is called as intermediate and if it develops for more than three months after surgery then it is Known as late SSI [8]. Highly virulent microorganisms e.g. Staphylococcus aureus and gram-negative bacilli are most common cause of early infections, on the other hand, late surgical site infections are sourced by low virulence microorganism like coagulase-negative staphylococci [9]. The pathogenesis of infection in

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fractures fixation devices is related to micro-organisms which rise in biofilm due to which, its elimination is difficult [10]. The aseptic measures and use of antibiotics reduced the rate of infection in early 19$^{th}$ century.

This study is design to estimate the infection rate and identify the microorganism that causes surgical site infections (SSI) in elective Orthopaedic implant surgery.

## METHODS

This retrospective descriptive study was carried from February 2017 to July 2017. Patients who have close fractures of long bones planned for elective surgery, age 5 to 75 years both male and female were included. Patients, who had open injuries, soft tissue surgery, emergency cases, non-implant surgeries, comorbid patients (other than hypertension) and leave against medical advice (LAMA) patients were excluded. After obtaining informed written consent all patients underwent elective implant surgeries. The patients were also observed for wound infections after operation. As per local protocol, Inj. Ceftriaxone 2 gm iv 1 hour before surgery and then 1 gm twice daily for 5 days given to the patients. Discharge the patient on Tab. Augmentin 1 gm twice daily for 5 days. Before taking Pus culture all antibiotics were stop for 48 hours and then culture taken under aseptic conditions. Further, in accordance with protocol, proper follow up was done after surgery to evaluate the post-operative wound infection up to thirty days. Data compiled on a pro forma covering patient's demographics, length of hospital stay, provisional diagnosis, procedure performed, culture sent and micro-organism isolated for analysis.

## RESULTS

Out of total 155 patients, there were 119 (76.77%) males and 36 (23.23%) were females with Mean age 41.97±15.61 years as shown in Table 1. Only 11 patients (7.09%) have infections while 144 patients (92.90%) have no infection (Fig. 1). Among these, infectious micro-organisms were isolated from 11

**Table 1:** Patients Demographic information (n = 155)

| Variable | No. | % |
|---|---|---|
| **Gender** | | |
| Male | 119 | 76.77 |
| Female | 36 | 23.23 |
| **Age (years)** | | |
| 5 – 30 | 31 | 20.0 |
| 31 – 60 | 109 | 70.3 |
| 61 –75 | 15 | 9.7 |
| Mean±SD | 41.97±15.61 | |

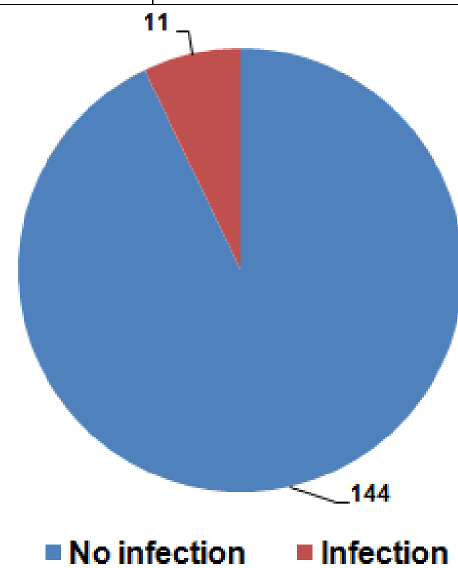


**Fig. 1:** Frequency of surgical site infections (n = 155)

**Table 2:** Isolated micro-organism (n = 11)

| Micro-organism | No. | % |
|---|---|---|
| Klebsiella | 4 | 36.4 |
| Pseudomonas aeruginoa | 3 | 27.3 |
| Coagulase negative Staphylococci | 3 | 27.3 |
| Methicillin susceptible S. aureus | 1 | 9.0 |

**Table 3:** Length of stay in patients with bacterial isolates (n = 11)

| Micro-organism | Period of stay >14 days | % | Period of stay ≤14 days | % |
|---|---|---|---|---|
| Klebsiella | 2 | 18.18 | 2 | 18.18 |
| Pseudomonas aeruginoa | 3 | 27.27 | - | - |
| Coagulase negative Staphylococci | 1 | 9.09 | 2 | 18.18 |
| Methicillin susceptible S. aureus | 1 | 9.09 | - | - |

(7.09%) patients; Klebsiella species were found to be most frequent in 4 cases (36.36%) followed by pseudomonas aeruginosa 3 cases (27.27%), Coagulase negative staphylococci 3 cases (27.27%) and Methicillin susceptible S. aureus 1 case (9.09%) in the descending order (Table 3). Six (54.54%) of these patients were treated in the ward for more than two weeks and most common isolate in correlation with the prolong stay was pseudomonas aeruginosa. The length of hospital stay in patients with bacterial isolates and co-morbidities were narrated in Table 4 & Fig. 2.

## DISCUSSION

The frequency of surgical site infections (SSI) found in this study is 7.09%, which is higher than acknowledged average for post-operative wound infection. The average for post-operative wound infection is less than 1%. The infection rate which we describe in this study is similar to other study which contained infection rate was 5% [10] and is lower than other study by Dhillon [11] who found infection rate in 6.8% while Onche [12] found 7.5 % and Ngim [13] found infection rate as 9.38%.

Marston described 5% superficial and 0.25% deep infection in replacement of hip [14]. In view of other studies, the overall superficial and deep infection rate is 7.8% and 10% [15] but we described 7.09% infection in our study. As juxtapose to the use of prophylactic antibiotic, the frequency of post-operative lesion without prophylactic antibiotic is higher [16]. Our rate of infection with prophylactic antibiotic is 7.09% which is superior as juxtapose to other study i.e. 3.97% [17].

The disparity in frequency rate of surgical site infection (SSI) in other studies may be linked to dissimilar surgical set-ups, different inclusion criteria, as well as facilities available.

We also found that surgical site infection is mostly common in patients of higher ages. Probably in higher age patient’s low resistance, rising catabolism, growing co-morbidities and little lesion healing rates exists [18]. Apanga [19], Masagala [20], Afifi [21], Akinyoola [22], and Khan [23] also reported that surgical site infection mostly common in old aged patient.

The administration timing of antibiotics prophylaxis is serious issue in expansion of surgical site infection. The management of antibiotics, two hours or extra, earlier the surgery or postoperatively was absolutely linked with a prominent rate of surgical site infection. The antibiotics should be managed preferably during thirty minutes and definitely during 2 hours of the instance of surgery cut [24]. Consequently the choice of precise antibiotics and time of management can reduce the frequency of surgical site infection to the large level.

Although elimination of Staphylococcus aureus nasal carriage with mupirocin was establish to be effectual, it reduced the rate of surgical site infections [25]. Dressing, instruments and bedsheets also play a pivotal role as stockpile of S. aureus. Singh [26] indicate gram negative infections as main risk and inaccessible gram-negative organisms.

This study has some limitations as it covered a period of 6 months and thus may not account for seasonal variations. We have followed post-operative patients for less period of time, but in implant surgeries, surgical site infection can evolve one year after surgery.

## CONCLUSION

In orthopaedic patients, the Surgical Site Infection (SSI) is a considerable/significant problem. Infection rate entirely elevated and required appropriate and precise procedures to control it as it has a huge budgetary load on patients as well as on resources of hospital. It could also lead to increase the mortality and morbidity in the patients. This study is differing from other studies in term of Klebsiella i.e. gram-negative pathogen being the most prevalent bacterial isolate and the most common isolate in correlation with prolong hospital stay was Pseudomonas auruginosa. The possible risk factors for surgical site infection are old age, long period of pre and postoperative stay in hospital, lengthy period of surgery and nosocomial abundance in postoperative period.

Drawback of this study is small sample size, it should be large in number to look infective organism and its cause.

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**AUTHORSHIP AND CONTRIBUTION DECLARATION**

| No | Author Name | Contribution to Paper | Signature |
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| 2 | Miss Ghulam Zainab | Data Collection | |
| 3 | Adeel Ahmed Siddiqi | Literature review | |
| 4 | Jagdesh Kumar | Data analysis | |
| 5 | Malik Waseem Ahmed | Data collection | |
| 6 | Ghulam Mustafa Kaim khani | Proof reading | |
| 7 | Mehtab Ahmed Pirwani | Topic selection and conceptualization | |