

# STAPH AUREUS AS THE MOST COMMON CAUSE OF OSTEOARTICULAR INFECTION IN DOST – 1 MAYO HOSPITAL, LAHORE

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## Abstract

**Background:** Infection of the bone or bone marrow simply means osteomyelitis. The classification is

based on the type of bacteria, route, duration, and anatomical location of the involved area. Commonly it occurs due to exposure of the bone to the local infection. It usually requires prolong treatment lasting from weeks to months and may require surgical intervention. Severe cases may lead to the loss of a limb.

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**Objective:** To determine the most common causative organism of osteoarticular infection in Department of Orthopaedics Surgery and Traumatology, Mayo Hospital, Lahore.

**Methodology:** This longitudinal interventional study was conducted at DOST, Mayo Hospital Lahore for period of two years. Total 200 patients with osteoarticular infections were included. Informed consent and demographic detail was obtained. Patients were followed-up in OPD for 24 weeks post-operatively to assess the outcome of the procedure.

**Results:** There were 180 (90%) males and 20 (10%) females. There were 39 (19.5%) patients who had upper limb infection, 147 (73.5%) patients with lower limb infections and 14 (7%) patients presented with septic arthritis of lower limb. Detailed clinical history of the patients shows that there were 186 (93%) patients who had previous history of trauma while 14 (7%) did not report trauma. Final outcome was assessed through a scoring system by Jaber FM. After assessment, it was revealed that Culture sensitivity was positive in 188 (61.5%) patients at 1<sup>st</sup> week, at 6<sup>th</sup> week 123 (61.5%) patients had positive culture sensitivity and at 16<sup>th</sup> week, 52 (26%) cases had positive culture sensitivity. Causative organism were also given in the

table Staph Aureus was the organism which cause infection in 96% of the patients.

**Conclusion:** Most cases are post-traumatic and Staph Aureus is the most common causative organism found. Chronic Osteomyelitis is prevalent than acute one.

**Key words:** Osteoarticular infections, osteomyelitis, Staphylococcus aureus, Discharge, Pain, Swelling.

## Introduction

Osteoarticular infection remains a formidable challenge to the orthopedic surgeons. It constitutes a major hazard to the hospitalized patient in terms of increased healthcare expenditures, morbidity and mortality. The bone and joints physiological and anatomical characteristics are different due to which antibiotics response obtained is not high when compared to antibiotics response to other disease. Illness, malnutrition, and inadequacy of the immune system can cause bone and joint infections.<sup>1</sup> The etiology of acute hematogenous osteomyelitis remains unknown, and the disease has no laboratory model.<sup>2</sup> We commonly encountered skin, soft tissue, bone and joint infection at our work place. The epidemiology and clinical data published on community and hospital acquired infection is low in number in a large population. The economic burden of community and particularly hospital acquired infection is quite significant.<sup>3</sup> Even with advance in antibiotics and surgical treatment, the long term recurrence rate remains at approximately 20 – 30%.<sup>4</sup> The consequences rang from minor nuisance of a draining tract to pathologic factor at the infected site and possible transformation to a malignant state. The chronic infection of bone results from avascular nature of the sequestrum as well as the porosity of bone. Despite advances in antibiotic therapy, osteoarticular infection has been difficult to cure. Osteoarticular infections are treated with surgical management has shown excellent results while soft tissue coverage with skin and muscle flap and bone graft where necessary. Currently, morbidity and mortality from osteoarticular infection are relatively low because of modern treatment methods, including the use of antibiotics and aggressive surgical treatment<sup>4</sup> except in children where it is still significantly high.<sup>5</sup> The incidence of bone and joint infections in patients undergoing emergency interventions or elective orthopedic surgery at this tertiary has not been systematically studied in recent years to allow us to establish realistic estimate of the scope, nature and magnitude of the problem. Such a paucity of bone and

joint infection related data does not permit us, for instance, to explore the impact of hospital – acquired infections on economic outcomes, increased hospital stay, antibiotics usage or infection – associated patient morbidity in orthopedic patients treated at the Mayo Hospital Lahore. Various treatment modalities used to treat fractures included open reduction and internal fixation with metal rods, plates, screws and/or pins may also cause infection of the bone. In most cases, it is necessary to remove the metal during surgical debridement and to stabilize the fracture using such means as an external fixator. The role of debridement and antibiotics in treating bone infections is vital. Literature revealed that all joint replacement becomes infected and it has one percent out of the total joint replacement. Some infections occur immediately following surgery. To eradicate and control chronic infection the removal of prosthesis is necessary.<sup>6</sup> Nosocomial infection has significant burden over economy and it lead noticeable rate of morbidity and mortality. It requires high institutional efforts and role of a teams work is also necessary. The patients who underwent common invasive orthopedics procedure may also develop infection. This risk is increased by physiologic immunodeficiency in some stages of the child's life; secondary immunosuppression caused by intensive treatment and primary disease of the patients and associated morbidities. Amongst nosocomial infection, urinary and respiratory infection is the most frequent infections reported in the literature are commonly associated with use of venous and urinary catheters and mechanical ventilation.<sup>7</sup> Inadequate wound coverage.<sup>8</sup> Infection rates in arthroplasty are variable from 1% TKR to 4% in THR.<sup>9</sup>

Therefore, the aim of this study is to prospectively determine the pathomorphology of osteoarticular infections, at the Department of Orthopedics Surgery and Traumatology, Unit I, Mayo Hospital Lahore. The information gathered through this study will, in future, serve as a baseline for the evaluation of progress achieved by implementing infection control measures in response to continuous quality improvement mandates of the day. This prospective study included all the infected cases presenting with osteoarticular infections of any etiology i.e. nasocomial, traumatic or hematogenous. This would help to know the causes, bacteriology and to establish their treatment options in patients of osteoarticular infections. It is hoped to identify potential sources of osteoarticular infection through this study and utilize the meager hospital resources at our disposal to achieve the best possible results through education and modification of the behavior of hea-

lthcare workforce or possibly through alterations of patient environment or both.

## Objectives

To determine the most common causative organism of osteoarticular infection in Department of Orthopaedic Surgery and Traumatology, Mayo Hospital, Lahore. (Culture and Sensitivity).

## Materials and Methods

This study included patients with osteoarticular infections. After taking proper history, clinical examination and investigations, infection was diagnosed. Osteoarticular infections were managed medically and surgically. Over a period of two years, our plan was to study all the infected cases who present with any of the three etiologies of bone and joint infections i.e. (nosocomial, traumatic or hematogenous) or 200 cases which comes first. This was a Longitudinal interventional study conducted at Department of Orthopedics Surgery and Traumatology (DOST) Unit I, King Edward Medical University / Mayo Hospital Lahore. Over a period of two year (24 months) all the infected cases were included in the study. This was a time-based study. During time period of 2010 – 2011 total 200 patients were included in the study. All the hemodynamically stable patients, of all age groups, both genders and with or without fractures with infected cases presenting with osteoarticular infections of any etiology i.e. nosocomial, traumatic or hematogenous were included. Patients with confounding factors such as multiple – trauma associated with traumatic head injury and those patients who are hemodynamically unstable upon presentation to the hospital were not considered candidates for this study. Patients were enrolled either from Accident and Emergency, outpatient department or from ward. All those patients with osteoarticular infection were included in this study. Every patient was questioned about demographic information which was recorded on prescribed Performa. Then complete history was taken including previous history of treatment and surgical procedure if any. Then the examination both systemic and local was documented. Then the patient was investigated, which include complete blood count, erythrocyte sedimentation rate, C reactive protein, serum albumin, serum albumin globulin ratio, liver function test, renal function, blood sugar random,

radiographs, culture and sensitivity, CT scan / MRI if needed. Patient's data was collected and information on elements of standard care provided in emergency room, on the ward and in the operating room was gathered in a prospective manner on forms specifically designed for this purpose for ease of data collection and subsequent analysis. The data collection comprised several important variables listed under. Patients Information, Pathomorphology, Treatment and follow up. A well designed and detailed Questionnaire / Proforma was used to collect the relevant information from the patients. All collected data was entered into Epi-info (a computerized soft ware). Data analysis was done by using SPSS 17 (Statistical Package for Social Sciences). All categorical variables were presented in form of rates and ratios also Pie- Chart may be used to express the frequencies. Mean, Standard errors and standard deviation was used to express the continuous variable; Histogram were used form graphical representation for continuous variable (s). Analysis of variance (ANOVA) was used to see that Osteoarticular infections are some on the average in different types of diseases. We used multiple logistic regression and multivariate analyses to determine associations of the osteoarticular infections of with patient age, duration of operation, delay in treatment, and length of hospital stay, prophylactic use and timing of antibiotics, underlying patient disease and other pertinent variables that can influence the Osteoarticular infections. Patients were followed immediate postoperative period and outpatients on a weekly basis for local signs and symptoms of infection as listed below under the study proforma.

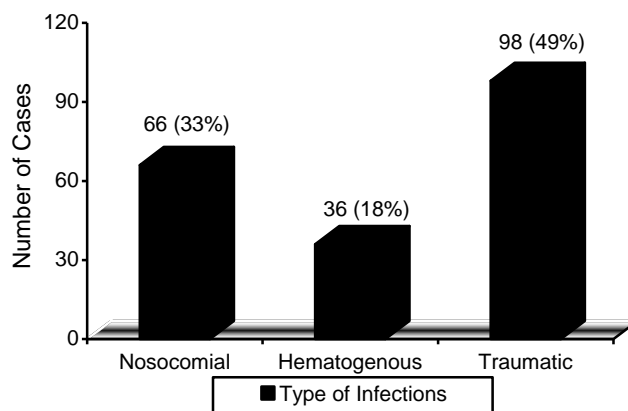


Fig. 1: Types of Infection.

## Results

Total 298 patients of osteomyelitis were seen in Ward, out patients department and in Emergency and Accident department. Among these osteomyelitis patients I had selected 200 patients for this study. There were 180 (90%) males and 20 (10%) females who presented with osteomyelitis. The male – to – female ratio was observed as 9:1. Mean duration of symptoms of patients was  $9.17 \pm 18.69$  months with minimum and maximum duration of 0.20 months to 144 months respectively. There were 109 (54%) patients who were unemployed, 87 (43.5%) were dependent and only 4(2%) patients were self-earning. There were 39 (19.5%) patients who presented with discharging sinus in upper limb region and 147 (73.5%) patients presented with discharging sinus in lower limb region. While only 14 (7%) patients presented with lower limb complaints with pain and swelling. Details are given in table above. There were 29% patients who had acute, 33% had sub-acute and 38% patients had chronic osteomyelitis. In this study 66 (33%) cases had nasocomial type of infection, 36 (18%) had hematogenous and 98 (49%) had traumatic infection. Culture sensitivity was positive in 188 (61.5%) patients at 1<sup>st</sup> week, at 6<sup>th</sup> week 123 (61.5%) patients had positive culture sensitivity and at 16<sup>th</sup> week, 52 (26%) cases had positive culture sensitivity. Causative organism were also given in the table Staph Aureus was the organism which cause infection in 96% of the patients.

## Discussion

Intravenous antibiotics are most frequently used for treating osteomyelitis. Osteomyelitis continuously changes in predisposing factors, causative agents and the treatment.<sup>10</sup> To determine the outcome with osteomyelitis is usually difficult because of the fact of having longer period of follow-up to assess the effect of any treatments and the nature of the infection. This belief evolved from cases of relapsing staphylococcus aureus osteomyelitis, because they are less frequent now a day due to presence of good antibiotic and surgical therapy. In Joint Food and Drug Administration (FDA)/ Infectious Diseases Society of America (IDSA) guidelines published in 1992 that a 12 months follow-up after the therapy is considered necessary to assess the new antibiotics.<sup>11</sup>

**Table 2:** Culture Sensitivity at Different Time Intervals.

		1 <sup>st</sup> Week	6 <sup>th</sup> Week	16 <sup>th</sup> Week
Culture sensitivity	Positive	188 (94%)	123 (61.5%)	52 (26%)
	Negative	12 (6%)	77 (38.5%)	148 (74%)
	Total	200 (100%)	200 (100%)	200 (100%)
Causative Organism				Percentage
	Staph Aureus			96
	Hamemophilus influenzae			1.2
	Escherichia Coli			2
	Pseudomonas Aeruginosa			0.8

In this study, we included 200 cases of Osteoarticular infection with the mean age of  $34.35 \pm 17.38$  years. Minimum and maximum ages were 3 and 80 years respectively. Literature also reported that hematogenous osteomyelitis occurring predominantly in age between 3 and 12 years old. Contiguous osteomyelitis is more frequently seen in adolescents and adults.<sup>12</sup>

According to our study, there were 180 (90%) males and 20 (10%) females who presented with osteomyelitis. In our study, male – to – female ratio was observed as 9:1. Literature also reported that males are at increased relative risk, which increases through childhood, peaking in adolescence and falling to a low ratio in adults. Males are two times more affected than females.<sup>13,14</sup>

It is reported that among all osteomyelitis the diabetic's patients are 30 – 40%.<sup>13</sup> But in our study, we observed that DM was present in 21% patient. In our study, 93% patients had history of trauma. One study reported that Posttraumatic osteomyelitis accounts for as many as 47% of cases of osteomyelitis.<sup>15,16</sup>

In our study, only 19.5% patients were presented with upper limb complaints, while 80.5% patients presented with lower limb complaints. In our study, 35% cases were positive for CRP (> 6 mg/dl) at baseline visit. Then number of cases reduced to 24% patients after 1st week of treatment, 16% after 3rd week, 7% after 6th week and 1% after 24th week. One study reported that complicated outcomes were associated with higher early CRP at diagnosis and lower CRP at the end of parenteral therapy, suggesting that clinicians were more conservative with prolonged initial parenteral therapy in this group.<sup>17</sup>

In this study, on radiographs, 50.5% had cases soft tissue swelling was most commonly observed. Even on ultrasonography 61.9% patients had soft tissue changes. We observed that there were 11% cases who had pus discharge from wound and this lead to complications which restrict the ROM of these patients that's why 89% cases had normal ROM and non-union was also occurred in these 11% cases. In these cases disability was observed, out of which stiffness was observed in 6.5% cases and joint contracture was found in 3.5% cases.

Final outcome was assessed through a scoring system. After assessment, it was revealed that 14.5% patients had excellent treatment outcome, 29.5% had good, 35.5% had fair and 20.5% patients had poor treatment outcome.

## Conclusion

Mean age of patients presented with Osteomyelitis was  $34.35 \pm 17.38$  years. Minimum and maximum age of patients was 3 and 80 years respectively. Osteomyelitis is common in males as compared to females and frequent site of presentation is lower limb. There were 29% patients who had acute, 33% had sub-acute and 38% patients had chronic osteomyelitis. Most cases are post-traumatic and Staphylococcus Aureus is the most common organism found. Chronic Osteomyelitis is prevalent than acute one.

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