Osteomyelitis in Pediatric Patients, Isolation of Most Common Bacteria: Our Hospital Study

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ABSTRACT

Introduction: Osteomyelitis is a kind of bone infection. Though bacteria are the most common cause, fungus may also play a role. Prognosis of untreated or delayed treatment onset osteomyelitis is often bad and leads to adverse outcomes. Very few Research articles of osteomyelitis are reported from Pakistan as compared to other infectious conditions. In this study we aim to study the number of patients, male: female ratio, type of osteomyelitis and the bacterial profile associated with osteomyelitis.

Methods: After obtaining Institutional Ethics approval, the present study was conducted from January 2019 to January 2020 at Orthopaedic department of Peoples University of health and Sciences for Women Nawabshah Pakistan. Blood and sample like fluid aspirate or discharge collected was subjected to microscopy and culture. Antibiotic susceptibility testing was done using disk diffusion methods. Radiological data of the patients was also collected.

Results: Bacteria were isolated from 35 cases. The most affected age group was of 6-10 years of age (45.73%). Males were more affected as compared to females and male: female ratio was 3:1. Maximum number of patients were of acute osteomyelitis (85.75%) followed by subacute osteomyelitis (11.4%) and chronic osteomyelitis was found in just a single patient (2.85%). Long bones like tibia (56.25%), femur (18.75%), humerus (12.5%) were mostly affected. Blood culture was positive in 65.62% cases. Methicillin Sensitive Staphylococcus Aureus (MSSA) was the most common isolate (56.25%) followed by, Methicillin Resistant Staphylococcus Aureus (MRSA), Acinetobacter, Coagulase Negative Staphylococcus (CONS), Streptococcus pyogens, E. coli and Pseudomonas.

Conclusion: Thus, S. aureus was the most common cause of acute bacterial osteomyelitis and mostly affected school age group children.

Key words: Osteomyelitis, *Staphylococcus aureus*, Organism

INTRODUCTION

Osteomyelitis is a wide term for a set of illnesses characterized by bone and/or bone marrow inflammation or infection. In 1852, Chassaignac published the first description of osteomyelitis [1]. The terms osteon (meaning bone) and muelinos are combined to form the term "osteomyelitis" (meaning marrow).

The inoculation of metaphyseal arteries at the transition point between arteriolar and venous sinusoids slows blood flow and increases vascular turbulence, which is the pathophysiology underlying this [2]. Acute, subacute, and chronic osteomyelitis are the primary forms of osteomyelitis [3]. Acute osteomyelitis lasts for less than two weeks, subacute osteomyelitis lasts for two to three

months, and chronic osteomyelitis lasts for more than three months [4,5].

The causes of osteomyelitis can be secondary to a contiguous focus of infection following trauma, surgery, or the insertion of a prosthetic joint; or secondary to a contiguous focus of infection associated with vascular insufficiency, primarily occurring in patients with diabetes mellitus and/or peripheral vascular disease, and following hematogenous spread of infection, which is a major mechanism for vertebrate infection [6,7].

S. aureus, *Enterobacter spp.*, Streptococcus (groups A and B), and Hemophilus influenzae are the most often involved causal agents in pediatric osteomyelitis, according to the literature. Bacteria such as Mycobacterium, Bartonella, Coxiella, and fungus such as Histoplasma, Cryptococcus, and Blastomyces, as well as Candida, are among the uncommon causes of osteomyelitis that are observed in immunocompromised individuals or those who have been to an endemic area [8].

Fever, discomfort at the infection site, reluctance, and trouble using the afflicted extremity are all frequent clinical symptoms [9]. Anorexia, malaise, and vomiting are less common clinical symptoms. On examination, there is generally focal edema, pain, warmth, and erythema [10].

Drainage of purulent material may take place with fistula. Early diagnosis and prompt treatment leads to very less mortality (around zero) and the complication rate around 5%. The aim of the study is to study type of osteomyelitis and the bacterial profile associated with osteomyelitis.

MATERIAL AND METHODS

The present study was conducted from January 2019 to January 2020 at Orthopedic department of Peoples University of health and Sciences for Women Nawabshah Pakistan.

Institutional Ethics Committee approval was obtained. Pediatric patients coming with the complaints of fever, bone pain with clinical diagnosis of osteomyelitis were included in the study.

Study was performed only with informed consent from the patient's legal guardian. Patients were examined for signs like tenderness, oedema or warmth. X ray or computerized tomography (CT) scan of the patients was done, and data was collected. Specimens like, discharge from that site or fluid by aspiration were collected depending on the case presentation.

Blood culture was done in all the patients. Samples were sent for Gram staining and culture. Culture was done on blood agar and MacConkey agar. Conventional methods (biochemical tests) were used for bacterial identification.

Antibiotic Susceptibility testing was performed using disk diffusion method. Treatment was decided and started based on the reports of Antibiotic susceptibility tests.

RESULTS

In our 1-year duration, there were 35 cases presenting with signs and symptoms of osteomyelitis i.e. clinical osteomyelitis. We could isolate bacteria in all the cases. Maximum number of cases (45.73%) were seen in 6-10 years' age group. Males were affected 3 times more as compared to females.

Overall incidence was found to be 1.67%. Acute osteomyelitis was the most common type in our study (85.75%). Tibia was the most commonly affected (56.25%) site followed by femur (18.75%). Thus, 65.71% cases were positive by blood culture while 34.28% cases were negative. MSSA was the most commonly isolated, in about 56.25% cases. MRSA was isolated in 12.5% cases, *Acinetobacter* in 9.38%, CONS, *S. pyogens* and *E. coli* were isolated in 6.25% each. *Pseudomonas* was isolated in 3.12% (Tables 1 to Table 4).

Table 1: Age distribution in cases of osteomyelitis.

Age (Years)	Number (n=35)	Percentage (%)
0-5	10	28.57
6-10	16	45.73
10-15	9	25.7
Total	35	100

Table 2: Sex distribution in patients presenting with osteomyelitis.

Sex	Number (n=35)	Total admissions	Incidence
Males	26 (75%)	2077 (52.72%)	1.25%
Females	9 (25%)	1862 (47.27%)	0.42%
Total	35 (100%)	3939 (100%)	1.67%

Table 3: Type of osteomyelitis.

Type of osteomyelitis	Number(n=35)	Percentage (%)
Acute (< 2 weeks duration)	30	85.75
Sub-acute (2weeks-3 months)	4	11.4
Chronic (> 3 months)	1	2.85
Total	35	100

Table 4: Samples on blood culture.

Blood culture result	Number(n=35)	Percentage
Positive	23	65.71
Negative	12	34.28
Total	35	100

DISCUSSION

In our study 6-10 years age group was the most affected (45.73%), as seen in table 1. This finding correlates well with the study of Puccini et al who found maximum number of cases in 6-14 years' age group (61.9%) cases [11]. This finding also correlates with Zaoutis et al, who studied children aged 2 months to 17 years and found detection rate of 42% in < 5 years and 58% for 6-17 years. As per results seen in table 2, males were more affected (75%) as compared to females (25%). Similar findings were seen in other studies and reviews [12]. Our study reports an overall incidence of 0.812% pediatric osteomyelitis. Cases of acute osteomyelitis (Table 3) were much more (85.75%) as compared to subacute (11.4%) and chronic osteomyelitis (2.85%). This may be due to the fact that in our study, 28.13% cases were of < 5 years and in this age group it is difficult to elicit pain as compared to older age group. This brings the older pediatric age group (>5 years) more quickly to hospital as compared to younger group [13].

A western study mentioned that acute osteomyelitis is seen more commonly among children. We found tibia (56.25%), femur (18.75%) and humerus (12.5%) were more involved as compared to other bones. The reason for such a finding could be due the possibility of these bones being more prone to injury as compared to other bones. This finding correlates well with a similar study by Puccini et al. Two cases of foot osteomyelitis found in our study had a history of trauma.

Blood culture was found to be positive in 65.71% cases (Table 4), which as per literature is able to detect around 50% cases. Discharge from the site has more detection rate. Like other studies also, *S. aureus* was most common isolate (68.75%) amongst cases. *S. aureus* attaches to bone by expressing receptors (adhesins) for components of the bone matrix (fibronectin, laminin, collagen, and bone sialo glycoprotein); the pathogen's attachment to cartilage is enabled by the expression of the collagen-binding adhesion. Gram-Negative bacteria such as *Acinetobacter, E. coli,* and *Pseudomonas* were isolated.

CONCLUSION

Osteomyelitis is a sort of infection of the bone. Even if the most prevalent cause is bacteria, fungus can also play a part. The forecast that treatment beginning osteomyelitis is ignored or delayed is typically bad and leads to severe consequences. *S. aureus* was the most prevalent cause of acute and primarily impacted child bacterial osteomyelitis in school age groups. Very few incidences of osteomyelitis in Pakistan have been recorded compared with other infectious diseases.

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