

BACTERIOLOGICAL PATTERN OF CHRONIC OSTEOMYELITIS- A RETROSPECTIVE STUDYArvind Kumar¹, Usha Singh²¹Assistant Professor, Department of Orthopaedics, VIMS, Pawapuri, Nalanda, Bihar.²Consultant, Radiation Oncology, Mahavir Cancer Sansthan, Phulwari Sharif, Patna, Bihar.**ABSTRACT****BACKGROUND**

Chronic osteomyelitis is an infective inflammation of bone. This is a common problem in a developing country like India. Out of various reasons like open fractures, surgical interferences, nearby sepsis, penetrating injuries and haematogenous spread is the common cause of infection. This is very common in younger children and in majority of time it is due to haematogenous spread of bacteria. Bone involvement is common because of rich blood supply of growing skeleton in children.

The aim of this study is to evaluate epidemiology, pattern of bacteriological agent and site of bone involvement in cases of chronic osteomyelitis.

MATERIALS AND METHODS

This is a retrospective study in 41 patients conducted at a private hospital from January 2014 to December 2016. Cases attending in outpatient department with chronic osteomyelitis with discharging sinus were subjected to pus culture and sensitivity tests, Gram staining along with routine haematological investigations and radiological examination.

RESULTS

In our study, majority (36.5%) of patients belongs to 10-19 years of age range, 31.7% in 1-9 years range. Chronic osteomyelitis was more common in males (73.1%) than females (26.8%). 21 (51.2%) patients had compound fracture (trauma) and haematogenous spread in 11 (26.8%) patients. Most common site was tibia upper end (26.8%) and femur lower end (21.9%). Most common bacteriological agent were staphylococcus aureus 53.6%, coagulase-negative staphylococcus (14.6%), E. coli (12.1%), others are proteus, Klebsiella and pseudomonas.

CONCLUSION

Chronic osteomyelitis is most commonly a sequel of open fracture in our study. Careful antibiotic selection after culture and sensitivity is an effective treatment modality.

KEYWORDS

Chronic Osteomyelitis, Gram Stain, Culture and Sensitivity, Antibiotic.

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BACKGROUND

Chronic osteomyelitis is an inflammation of bone caused by an infecting organism. The infection is generally due to a single organism, but polymicrobial infections can occur, especially in the diabetic foot (Canale St et al 2008).¹ Chronic osteomyelitis; infective inflammation of bone is a common problem in a developing country like India. According to another author, chronic osteomyelitis is one of the commonest orthopaedic disease in the tropics among children and adolescents under age of twenty years (Ofiaeli 1993, Dich 1975, Okorom 1984).^{2,3,4}

There are various reasons like open fractures, surgical interferences, nearby sepsis, penetrating injuries and haematogenous spread is the most common cause of

infection. Haematogenous spread of sepsis from primary focus somewhere in body to bone is common because of rich blood supply of growing skeleton in children. Chronic osteomyelitis commonly involves long bones like femur and tibia (Abid AS et al 2008).⁵ Metaphysis of long bones are common site of infection because of hairpin arrangement of capillaries in metaphysis and decreased phagocytic action there. Multiplication of microorganism in metaphysis causes congestion, oedema, exudates, leucocytosis, necrosis and abscess (Reza M et al 2008).⁶ It is characterised by low-grade inflammation, presence of dead bone sequestrum, new bone apposition and fistulous tract (Zuluaga AF, et al 2006).⁷

The bacteria most commonly causing chronic osteomyelitis are *S. aureus*, coagulase-negative staphylococcus, *Pseudomonas* spp., *E. coli*, *Proteus* spp., *Klebsiella* spp., *Enterococcus* spp., *Enterobacter* spp. and anaerobes like *Peptostreptococcus* spp., *Bacteroides* spp., *Clostridium* spp. and rarely *Salmonella* spp. and actinomycetes (Mandell GL et al 2010).⁸ The mixed infection is obviously determined by gram-negative bacteria with their marked resistance to antibiotics (Augsburg J 1981).⁹ The beta-lactamases including Extended-Spectrum Beta-

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Lactamase (ESBL), AmpC beta-lactamase and Metallo-Beta-Lactamase (MBL) have emerged worldwide as a cause of antimicrobial resistance in gram-negative bacteria (Varun Goel et al 2013).

Multidrug resistance with beta lactamases is difficult to detect and treat and there is increased mortality (Umadevi S et al 2011, Sheehy SH et al 2010).^{10,11} The present retrospective study done to evaluate epidemiology, pattern of bacteriological involvement and site in case of chronic osteomyelitis.

MATERIALS AND METHODS

This is a retrospective study in 41 patients conducted at a private hospital in Patna, Bihar, from January 2014 to December 2016. Cases attending in an outpatient department with chronic osteomyelitis with discharging sinus were subjected to pus culture and sensitivity tests, Gram staining along with routine haematological investigations and radiological examination are done. Data regarding age, sex, comorbidity, source of infection, site of bone involved and bacteriological agent was collected.

RESULTS

Out of 41 patients, majority (36.5%) of patients belongs to 10-19 years of age range followed by 1-9 years age range (31.7%). The incidence of chronic osteomyelitis was more common in males (73.1%) than females (26.8%). Out of 41 patients, 21 (51.2%) patients had compound fracture (trauma), followed by haematogenous spread in 11 (26.8%) patients, iatrogenic in 9 (21.9%). Comorbidities associated with chronic osteomyelitis were malnutrition 31.7%, tuberculosis 17%, diabetes mellitus 14.6% and alcoholic 14.6%. For the site of bony involvement, most common site are tibia upper end (26.8%) followed by femur lower end (21.9%). Other bone involved are femur upper end (17%) followed by lower end (14.6%) tibia. Humerus lower end 5 (12.1%) and upper end 3 (7.3%).

Most common bacteriological agent were staphylococcus aureus (53.6%), coagulase-negative staphylococcus (14.6%), E. coli (12.1%), others are Proteus, Klebsiella and Pseudomonas.

Age (Years)	Numbers	%
1-9	13	31.7
10-19	15	36.5
20-29	4	9.7
30-39	2	4.8
40-49	4	9.7
50-59	3	7.3

Table 1. Age of Patients ($p = 0.4721$)

	Numbers	%
Male	30	73.1
Female	11	26.8

Table 2. Sex of Patients ($p = 0.1705$)

Predisposing Factor	Numbers	%
Haematogenous	11	26.8
Compound fracture/trauma	21	51.2
Postoperative infection/iatrogenic	9	21.9

Table 3. Predisposing Factors ($p = 0.0930$)

Comorbidities	Numbers	%
Malnutrition	13	31.7
Diabetes mellitus	6	14.6
Tuberculosis	7	17
Alcoholics	6	14.6

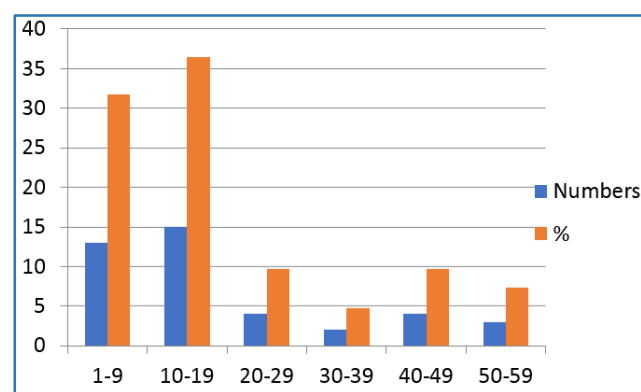
Table 4. Comorbidities and Addiction ($p = 0.2337$)

Site	Numbers	%
Femur upper end	7	17
Femur lower end	9	21.9
Tibia upper end	11	26.8
Tibia lower end	6	14.6
Humerus upper end	3	7.3
Humerus lower end	5	12.1

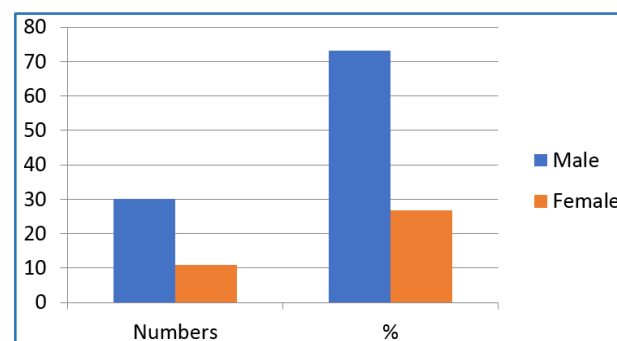
Table 5. Site of Involvement in Various Bone ($p = 0.8170$)

Agents	Numbers	%
Staphylococcus aureus	22	53.6
Coagulase-negative staphylococcus	6	14.6
Pseudomonas aeruginosa	3	7.3
Proteus mirabilis	2	4.8
Klebsiella aerogenes	2	4.8
S. epidermidis	1	2.4
E. coli	5	12.1

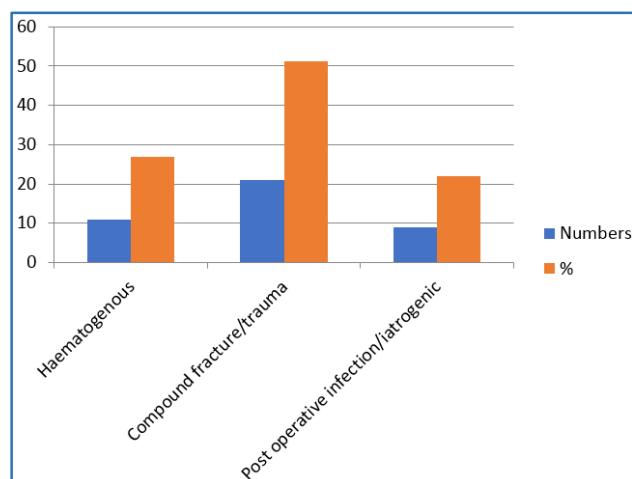
Table 6. Bacteriological Agents ($p = 0.5023$)



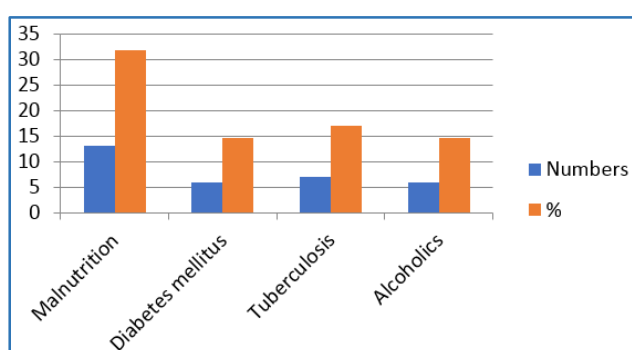
Graph 1. Age of Chronic Osteomyelitis Patient



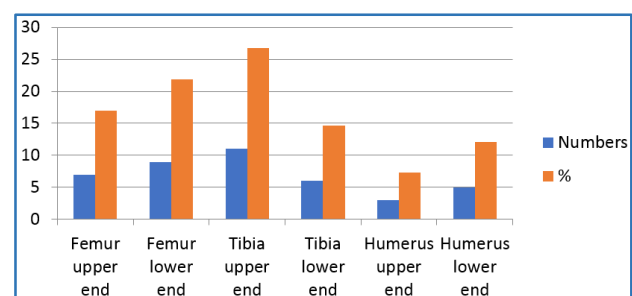
Graph 2. Sex of Chronic Osteomyelitis Patient



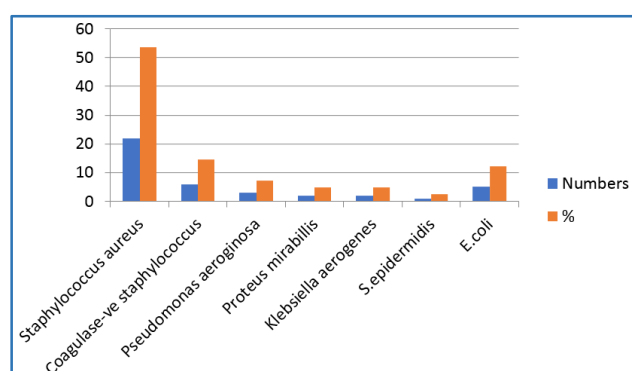
Graph 3. Predisposing Factors of Chronic Osteomyelitis



Graph 4. Comorbidities and Addiction



Graph 5. Site of Bone Involvement in Chronic Osteomyelitis



Graph 6. Bacteriological Agents

DISCUSSION

Chronic osteomyelitis is notoriously resistant to treatment and requires aggressive surgical debridement with proper

antibiotic coverage. Chronic osteomyelitis may require antimicrobial therapy for months to years after accurate identification of the pathogens. Chronic osteomyelitis were maximum seen in age group of 3-15 years (Waldvogel et al, 1970; Okoroma et al, 1984),^{12,4} which is in contrast to Espersen. According to him, there is fall in incidence of infection in paediatric age group due to early administration of antibiotics (Espersen et al, 1991).¹³

In our study, chronic osteomyelitis was most commonly seen in males of 10-19 years of age group. This age group is vulnerable to trauma and compound fractures. Males are more commonly affected than females, this shows males are more exposed to trauma. Malnutrition was most common factor associated with children, adolescents, which leads to decreased immunity, finally prone to infection. In children, bones of lower extremity are more often affected and of this upper end of tibia and lower end of femur are more liable to infection because of greater amount of growing bones in these areas. Vasculature of metaphysical side of growth plate explains involvement of long bones (William et al, 1998).¹⁴ In our study, tibia upper end 26.8% followed by femur lower end 21.9% were most common site.

In children, Staphylococcus aureus was the commonest organism, isolated because in them infection is mostly haematogenous (Lester SC et al 1990¹⁵ and Bassien IAJ 1994).¹⁶ In adult gram negative are commonly seen as infection is commonly secondary to contagious focus of infection. Surgical debridement followed by careful antibiotic selection after culture and sensitivity is an effective treatment modality (Mader JT et al 1994).¹⁷ In Staphylococcus-resistant cases, treatment is very challenging (Anupurba et al, 2003; Price et al, 1998).^{18,19}

CONCLUSION

Chronic osteomyelitis is most commonly a sequel of trauma. Isolation of causative agent and performance of antibiotic sensitivity are more important factor. Resistant causative organisms are isolated. Surgical debridement followed by careful antibiotic selection after culture and sensitivity is an effective treatment modality.

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