BACTERIAL AETIOLOGY OF BONE LESIONS, IN A TERTIARY CARE HOSPITAL

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ABSTRACT
This study was planned to observe the bacteriological pattern of causative organisms of osteomyelitis reporting to orthopedic unit at Ghurki Trust Teaching Hospitals, (GTTH) Lahore. The objective of this study was to know the type / frequency of infection in orthopaedic surgery in a public hospital and its treatment. It is a retrospective study carried out between Dec 2006 and Jan 2008. A total of one hundred and sixty five (165) patient samples were received at Lahore Medical and Dental College Lahore (LM&DCC) during this period. They included 113 males and 52 females with age range of 01 to 80 years. All the patients were investigated in outpatient departments and Orthopaedic wards. Among the 165 patient investigated only 89 were found infected (63 males and 26 females). The commonest infecting organism isolated was Staphylococcus (54%) followed by enterobacteriaceae (23%) that included (proteus spp (12.5%), E.coli (8%), Klebsella (2.5%) Pseudomonas aeruginosa (18%), anaerobes (2.5%) and miscellaneous (2.5%). Two (2.5%) anaerobic bacteria were isolated, anaerobic bacteria were peptostreptococci and bacteroides either alone or as a mixed infection. The different kind of bacterial isolation shows no relation with age and gender. This increase in Pseudomonas aeruginosa as a significant bone pathogen is related to the increasing nosocomial nature of osteomyelitis.

INTRODUCTION
Infections of the bone have been known for a long time. Post-traumatic osteomyelitis is one of the most serious complications after fracture treatment. In orthopaedics, the surgical site infection after implant surgery is a disaster both for the patient and surgeon. This may lead to increased antibiotic use, prolonged hospital stay, repeated debridements, prolong rehabilitation, morbidity and mortality.\(^1\)

The pathogenesis of infection in fractures, fixation devices is related to micro-organisms, which grow in biofilm, and therefore its eradication is difficult.\(^2\) In human the most common route by which bacteria reach the bone is blood stream\(^3,4\). However, traumatic modes as penetrating injury\(^5\), fractures and intramedullary nailing\(^6\) implants and postsurgical complications\(^7\) have been identified. Intravenous drug users\(^8,9\) and the presence of foreign body\(^10\) also predispose to bone infection. The initial diagnosis of osteomyelitis is usually made on physical signs\(^11\) and by sonography for early soft tissue changes.\(^12,13\) Magnetic resonance imaging\(^14\) and bone scans\(^15\) are most sensitive and specific. Conclusive diagnosis requires isolation of pathogen in aspirate from bone lesion, bone debridement and blood culture.\(^15\)

The present study was undertaken to evaluate the microbiological pattern of cases of bone lesions at GTTH, Lahore.

MATERIAL AND METHODS
The study was conducted at the Microbiology Department of Lahore Medical and Dental College, Lahore. Specimens of pus from bone, blood and bone debridement were received from GTTH.

All samples were inoculated onto two blood agar and one MacConkey agar plates. All samples were inoculated onto two blood agar and one MacConkey agar plates. One blood agar plate was incubated aerobically for 48 hours and the other two plates aerobically for 24 hours. Smears were made from samples and stained by the Gram’s and Zeil Neelson staining. The colonies obtained were processed according to the standard technique of practical text book Mackie and MacCartney.

RESULTS
One hundred and sixty five patient samples were received from outpatient departments and Orthopaedic wards of GTTH Lahore. The patients included were from both sexes and all age groups. The age of the patients ranged from 1–80 years with a mean age (± SD) of 28.73 ± 16.64 years. There were 113 males and 52 females.

There were 70 specimens showing granulation tissue, two specimens of blood, eleven specimen of fluid (knee aspirates) and 82 specimens of pus. Among the 165 specimens 89 isolates were identified.

The commonest isolate is Staphylococcus aureus 48 out of 89 (54%), followed by Enterobacteriaceae 20
Table 1: Shows number of samples revealing positive culture both in males and females and their relative percentage in each group;

<table>
<thead>
<tr>
<th>Total No. of samples</th>
<th>Samples showing growth</th>
<th>Staph aureus</th>
<th>Enterobacteriaceae</th>
<th>Pseudomonas</th>
<th>Streptococci</th>
<th>Mix growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>165</td>
<td>89</td>
<td>48 (54%)</td>
<td>20 (23%)</td>
<td>16 (18%)</td>
<td>2 (2.5%)</td>
<td>2 (2.5%)</td>
</tr>
<tr>
<td>M / f</td>
<td>113/52</td>
<td>M / f</td>
<td>35/13</td>
<td>M/ f</td>
<td>M/ f</td>
<td>M/ f</td>
</tr>
</tbody>
</table>

Table 2: Distribution of isolates in various age groups of osteomyelitis patients.

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>No.</th>
<th>No. of Microbes</th>
<th>Staphylococcus aureus m/f</th>
<th>Entero bacteriaceae m/f</th>
<th>Pseudomonas m/f</th>
<th>strept m/f</th>
<th>Miscell Aneous M/f</th>
<th>% age</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 15</td>
<td>17</td>
<td>7</td>
<td>0.7</td>
<td>0/1</td>
<td>0/0</td>
<td>0.0</td>
<td>-</td>
<td>3.8</td>
</tr>
<tr>
<td>15-30</td>
<td>54</td>
<td>30</td>
<td>13/6</td>
<td>3/4</td>
<td>2/0</td>
<td>0.1</td>
<td>-/1</td>
<td>12.320.0</td>
</tr>
<tr>
<td>31-50</td>
<td>52</td>
<td>32</td>
<td>22/3</td>
<td>5/4</td>
<td>3/2</td>
<td>1/p</td>
<td>1/-</td>
<td>8.35</td>
</tr>
<tr>
<td>51-70</td>
<td>34</td>
<td>18</td>
<td>05/3</td>
<td>½/2</td>
<td>5/1</td>
<td>0.0</td>
<td>-</td>
<td>2.0</td>
</tr>
<tr>
<td>&gt;70</td>
<td>08</td>
<td>02</td>
<td>02/0</td>
<td>-</td>
<td>0/0</td>
<td>0.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>165</td>
<td>89</td>
<td>35/13</td>
<td>8/11</td>
<td>12/4</td>
<td>1.1</td>
<td>1/1</td>
<td>25.75</td>
</tr>
</tbody>
</table>

out of 89 (23%) Pseudomonas aeruginosa 16 out of 89 (18%), anaerobes 2 out of 89 (2.5%) and miscellaneous (2.3%). The distribution of isolates according to various age groups is shown in Table 2. Two (2.5%) anaerobic bacteria were isolated. Anaerobic bacteria were peptostreptococci, peptococci and bacteroides either alone or as a mixed infection. The miscellaneous group comprised of streptococci, staphylococcus epidermidis, diptheroids, micrococci and bacilli.

DISCUSSION

In this study, bacterial organisms responsible for infection are mainly single while in one fourth cases the aetiology was polymicrobial. Other studies, from Pakistan and some international studies,7,22,23 also report the predominance of monomicrobial aetiology. Recent studies20,24,25 all report an increasing incidence of polymicrobial infection than the other reported in the past26,27 was mainly monomicrobial infection in bone lesions.

Staphylococcus aureus remains the most frequent pathogen isolated in bone, the distribution varies from two third Staphylococcus aureus to one third Enterobacteriaceae and Pseudomonas aeruginosa. This significant increase in Pseudomonas aeruginosa as a bone pathogen is related to the increasing nosocomial nature of osteomyelitis.29

A slight predominance in the isolation rate of Enterobacteriaceae is reported by Mousa23. Even in this study there was a difference of only 3.24% between Staphylococcus aureus and Enterobacteriaceae group. Enterobacteriaceae are increasingly nosocomial pathogens.30 The third major group in our study was Pseudomonas aeruginosa, that remains a severe complication of hospitalisation.30 Mixed infections included two isolates belonging to aerobes as Staphylococci, Enterobacteriaceae, and Pseudomonas or with anaerobe. Enterbacteriaeiae alone as single organism were isolated in twenty cases. Proteus was the commonest Enterbacteriaeiae to be isolated (n = 11) in single pattern.

The reports from different cities have shown different bacteriological patterns. In a study at Karachi16. Among the 125 cases, 68.6% were reported to be infected with Staphylococci. From Rawalpindi Karamat et al27 have also reported a high frequency (79%) of Staphylococci, whereas Farooq and Ahmadi18 On the other hand have reported a very low (37.5%) frequency of Staphylococci. The predominant role of Staphylococci in bone infection is also supported in some international studies by Karwo-
wska et al. and Alonge et al.20 and Lobati et al.20 This proves the impor-
tance of culturing pus from osteo-
myelitis cases for aerobes, as well as anaerobes for
appropriate management and cure of chronic ill-
ness.

It is concluded that the present study highlights
the importance of microbiological examination
of bone in cases of osteomyelitis. Microorganisms could
not be detected in only 76 cases and one third of cases
had polymicrobial aetiology. Any bacterium, Gram
positive or negative, aerobic or anaerobic, either alone
or as a mixed infection, could be responsible for osteo-
myelitis. The modern era with high speed travel, war-
fare, use of implants and prosthetics will add to the
load of osteomyelitis. The clinicians should first obtain
a microbiological investigation and then treat their
patients to halt the chronic relentless course of this
crippling disease.

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