SPECTRUM AND MICROBIOLOGY OF DIABETIC FOOT ULCER

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ABSTRACT

Foot Ulcer is one of the leading causes of hospitalization among diabetic patients. The present study observed the microbiological profile of Diabetic Foot with special emphasis to the antimicrobial sensitivity pattern. Samples were collected for microbiological analysis and the antimicrobial sensitivity test was performed against the commonly used antibiotics. This study observed the predominance of monomicrobial gram-negative bacteria than gram-positive bacteria. The isolated bacteria showed differential sensitivity pattern against commonly used antibiotics.

Keywords: Antibiotic resistant, Diabetic foot ulcer, Resistant bacteria, Sensitivity pattern.

1. INTRODUCTION

DIABETES mellitus is a major and rapidly increasing health problem worldwide. Some 382 million people worldwide or 8.3% of adults are estimated to have diabetes. [1] If these trends continue, by 2035, some 592 million people, or one adult in 10, will have diabetes. Approximately 5.1 million people aged between 20 and 79 years died from diabetes in 2013, accounting for 8.4% of global all-cause mortality among people in this age group [2].

Foot disorders are a major source of morbidity and a leading cause of hospitalization for people with diabetes [3]. There are various risk factors, which are compounded by an increased risk of infection. Microbiologically, the outer surface of adult skin provides a supportive environment for microorganisms, which 'lie free' on its surface. It is highly likely that these microorganisms influence the infection life cycle. When skin is damaged the underlying tissue is exposed and this significantly increases the risk of infection [4], [5].

Approximately 25 percent of diabetes mellitus patients develop foot problems, and about 20 percent of diabetes mellitus patients entering the hospital are admitted because of foot problems [6]. Ulceration, infection, gangrene, and amputations are the significant complications of the disease [7].

In India, the clinical profile of diabetic foot differs and is influenced by factors like poor adherence to foot care practices such as walking barefoot or wearing inappropriate footwear and lack of awareness [8]-[10]. Despite progress in pharmaceutics with many new oral medications available to control diabetes, much diabetes continues to experience serious morbidity related to their disease. Infection related morbidities are common, with diabetes being susceptible to infection for a variety of reason. These infections need adequate management and appropriate antibiotic selection on basis of culture and susceptibility test report [11]. Study of microbes that cause infection is helpful in determining appropriate antibiotic therapy. With this context the present study was done to observe the microbes and it’s anti microbial sensitivity pattern from diabetic foot ulcers.

2. OBJECTIVE

Isolate and identify bacterial pathogens in Diabetic Foot Ulcer (DFU) and to find out their antimicrobial sensitivity pattern.

3. METHODOLOGY

The prospective study was conducted for duration of 12 months at the Department of Microbiology, GD Hospital & Diabetes Institute, Kolkata, during the year 2012-2013. During this time period 90 diabetic foot ulcer patients admitted in the hospital were included in the study. All subjects underwent detailed history and clinical examination. Demographical data that included age, sex were recorded for every case.

3.1 SAMPLE COLLECTION

After rinsing the wound area with saline and debriding the dead tissue, specimens [pus/wound exudates] for microbiological studies were obtained from ulcer region. To avoid isolation of colonizing flora, the wound was first thoroughly cleaned with normal saline, after which the samples were obtained. Pus and exudates were collected from the margins and base of the ulcers, which was then transported in a clean sterile test tube. All specimens were transported without delay to the hospital’s microbiology laboratory for further processing.

3.2 BACTERIAL CULTURE, ISOLATION AND IDENTIFICATION

Ulcer Specimen for microbiological study were examined as gram stained smear and was aerobically cultured on Nutrient agar, Blood agar and MacConkey agar plates at 37° for 24 hours. Pure culture of each bacterial isolates was obtained by repeated streaking on the agar plates.
Identification of isolated bacteria was performed based on gram staining.

3.3 ANTIBIOTIC SUSCEPTIBILITY TEST

Antibiotic sensitivity test for the isolated bacteria was performed by disc diffusion method against commonly used antibiotics for amino glycosides (amikacin, gentamicin), the beta lactam group (ampicillin, cloxacinil), cephalosporsins (ceftriaxone, cefotaxime, cefazidine, cefipime, cefixime), quinolone (Levofoxacin, ciprofloxacín), penicilin combinations (piperacillin-tazobactam), Carbapenems (Imipenem, meropenem) &Polymyxin B, Colistin, Vancomycin, Linezolid etc. The isolate was recognized as resistant or susceptible on the basis of CLSI guidelines.

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>E.coli</th>
<th>Klebsiella</th>
<th>Pseudomnas</th>
<th>Proteus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amikacin</td>
<td>87%</td>
<td>43%</td>
<td>25%</td>
<td>43%</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>87%</td>
<td>40%</td>
<td>25%</td>
<td>43%</td>
</tr>
<tr>
<td>Imipenem</td>
<td>100%</td>
<td>79%</td>
<td>100%</td>
<td>90%</td>
</tr>
<tr>
<td>Meropenem</td>
<td>100%</td>
<td>79%</td>
<td>64%</td>
<td>90%</td>
</tr>
<tr>
<td>Polymyxin B</td>
<td>100%</td>
<td>100%</td>
<td>-</td>
<td>100%</td>
</tr>
<tr>
<td>Cefepime</td>
<td>45%</td>
<td>30%</td>
<td>31%</td>
<td>22%</td>
</tr>
<tr>
<td>Piperacillin Tazobactam</td>
<td>42%</td>
<td>24%</td>
<td>16%</td>
<td>17%</td>
</tr>
<tr>
<td>Ampicillin Sulbactam</td>
<td>17%</td>
<td>20%</td>
<td>-</td>
<td>22%</td>
</tr>
</tbody>
</table>

TABLE -2: ANTIMICROBIAL SENSITIVITY PATTERN OF GRAM POSITIVE MICROBES FOUND IN PUS CULTURE

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>S. aureus</th>
<th>Enterococcus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piperacillin Tazobactam</td>
<td>29%</td>
<td></td>
</tr>
<tr>
<td>Co-Trimoxazole</td>
<td>47%</td>
<td></td>
</tr>
<tr>
<td>Clindamycin</td>
<td>47%</td>
<td></td>
</tr>
<tr>
<td>Linezolid</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Teicoplanin</td>
<td>90%</td>
<td>100%</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>96%</td>
<td>100%</td>
</tr>
<tr>
<td>Moxifloxacin</td>
<td>39%</td>
<td></td>
</tr>
</tbody>
</table>

4. RESULT

A total of 90 diabetic foot ulcer cases were included in this study, 71 out of 90 were male patients (79%) and 19 were female patients (21%) with mean (SD) age of 51.11(±11) years was observed. This may be due to higher level of outdoor activity and poor adherence to foot care practices among males than females. The mean duration of diabetes was 5.7 (±5.5) years. Specimens from 90 patients were collected out of which positive growth was observed in 76 (84%) samples. Out of 101 total isolates, 73% showed mono microbial infection followed by 27% of poly microbial infection. 64 (63.37%) gram-negative organisms and 32 (31.68%) gram-positive organisms were also recorded.

The most common isolate was E.coli 34(33.66%) followed by Staphylococcus aureus 24(23.76%), Klebsiella pneumonia 15(14.85%), Pseudomonas aeruginosa 10 (9.90%), Proteus spp. 5 (4.95%), and Enterococcus faecalis 7 (6.93%). 6 fungal infection were also recorded (Chart 1). Around 20 % of Klebsiella and
Proteus spp. was carbapenemase enzyme producer and 52% of Gram-negative microorganism were extended Beta-lactamase enzyme (ESBL) producer. Near about 42% of S. aureus was MRSA sensitive only to Vancomycin, Teicoplanin & Linezolid.

The bacteria that were isolated showed differential sensitivity pattern against frequently used antibiotics, as shown in [Table 1, 2] and [Chart 2, 3]. Majority of the isolates were found to be resistant to several antibiotics that are usually prescribed on an empirical basis.

5. DISCUSSION

In patients with diabetes, foot infection is an extremely common problem. The microbiology of diabetic lower extremity infection varies depending on the patient population studied. Knowledge of the microbial etiologies in DFI is crucial for the management, it is important in tailoring antibiotic therapy, and studying resistance in DFU [12]. Currently there is a gradual rise in antibiotic resistant organisms in DFU as a result of repeated hospitalization, frequent exposure to antibiotic therapy, and low antibiotic concentration in infected tissues due to poor arterial supply.

In this study of DFU patient’s gram-negative organism was commonly observed. Due to high resistance in gram-negative diabetic foot infection the empirical antibiotic of choice could be Carbapenems, Amikacin, whereas, Vancomycin and Linezolid are preferred for most of the infection with gram-positive aerobes. Patterns of microbial infection are not consistent in patients with DFU and therefore repeated evaluation of microbial characteristic and continuous surveillance of resistant bacteria is essential for appropriate selection of antibiotic therapy.

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REFERENCES


BIOGRAPHIES

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