Diabetes & Metabolic Syndrome: Clinical Research & Reviews 8 (2014) 129–132

Contents lists available at ScienceDirect

Diabetes & Metabolic Syndrome: Clinical Research & Reviews

journal homepage: www.elsevier.com/locate/dsx

Original Article

Microbiological profile of bacterial pathogens from diabetic foot infections in tertiary care hospitals, Salem

P. Sugandhi, D. Arvind Prasanth *

Medical Microbiology Laboratory, Department of Microbiology, Periyar University, Salem 636 011, Tamil Nadu, India

ARTICLE INFO

Keywords:
Antimicrobial susceptibility
Bacterial profile
Diabetic foot ulcer
Staphylococcus aureus
Wagner's grade

ABSTRACT

Background: Worldwide, diabetic foot infections are one of the most serious complications resulting in long term hospitalization among the diabetic patients.
Aim: The aim of this study was to determine the microbial profile and the antibiogram pattern of the patients with diabetic foot infections.
Methods: Pus samples were taken from 50 patients presenting with diabetic foot infections over a period of 10 months. The samples were processed by standard microbiological methods.
Results: A total of 51 bacterial isolates were obtained from 50 patients with diabetic foot infections. The age group of these patients ranged from 30 to 80 years and the maximum number of patients were in the age group of 51–60 years. Gram negative (51%) were more prevalent than Gram positive (49%) organisms in this study. The commonest isolate was *Staphylococcus aureus* (41%) followed by *Pseudomonas aeruginosa* (35%), *Enterococcus* spp., (4%), *Escherichia coli*, (4%), *Salmonella* spp., (4%), *Bacillus* spp., (4%), *Micrococcus* spp., (2%), *Listeria* spp., (2%), *Shigella* spp., (2%) and *Proteus* spp., (2%). The antibiotic sensitivity pattern showed Meropenem, Piperacillin, Cefoperazone/Sulbactam, Piperacillin/Tazobactam and Amikacin as the most effective antimicrobial agents for the gram positive and Gram negative bacterial species. In this study, 8(44%) isolates of Gram negative bacilli were ESBL producers and 4 (19%) isolates were MRSA strains.
Conclusion: The results of the study indicate that effective planning of therapy is very essential for the prevention of drug resistant organisms.

1. Introduction

Diabetic foot ulcerations are one of the leading causes of mortality and morbidity, in the developing countries [1]. The major factors that are predisposed to this condition are usually related to peripheral neuropathy and an impaired circulation, which limits the access of the phagocytes [2,3]. However, the microbial aetiology of these infections is usually complex. Many of these infections are either monomicrobial or polymicrobial in nature. In recent years, the presence of multidrug resistant organism has been reported very frequently which has further complicated the treatment regimes as well as increased the hospital stay and the cost involved in the treatment to these patients [4]. The management of these infections usually involves empirical treatment based on the antimicrobial susceptibility testing [5]. The association of multi drug resistant (MDR) pathogens with diabetic foot ulcers increases the clinical conditions, complicate the treatment process further and possess a great challenge to the physicians or the surgeon in treating this condition [6]. Many studies have reported the bacteriology of diabetic foot infections (DFIs), but the results obtained so far have shown varying pattern based on the type and the severity of the infection, and are usually contradictory. Further there is a paucity of data with regard to the multi drug resistant organism namely ESBL-producing and the carbanemase producing organisms from this part of the country. Hence in this study an attempt has been made to study the microbiological profile of bacterial pathogens from the diabetic foot infections and determine the *in vitro* susceptibility pattern of these organisms to the routinely used antibiotics.

2. Materials and methods

2.1. General

A total of fifty patients with diabetes foot presenting at the outpatient department of the diabetic centre of a tertiary care

* Corresponding author. Tel.: +91 9444080796.
E-mail addresses: medicalmicro2012@gmail.com, prasanthviji@gmail.com (D. Arvind Prasanth).

http://dx.doi.org/10.1016/j.dsx.2014.07.004
1871-4021/

hospital in Salem, Tamil nadu, India for a period of 10 months were included in this study. The institutional ethical clearance was obtained prior to the study. The informed consent was obtained from the patients prior to sampling. The clinical history of the patients was taken with regard to the age, sex, socioeconomic status, duration of diabetes; types of diabetes were recorded on a proforma exclusively meant for this study. After clinical assessment of the enrolled cases, the ulcers were graded according to the Wagner's grade [7].

2.2. Sample collection

Two swabs were taken to collect the pus sample from deeper portions of the ulcer by making a rotatory movement with the swab. The samples were obtained using aseptic techniques to avoid contamination and were promptly transported to the laboratory in a sterile swab in ice-cold conditions.

2.3. Processing of wound sample

The samples were processed by inoculation on to culture media like Sheep Blood Agar (SBA), Brain Heart Infusion Agar (BHIA), Nutrient Agar (NA) and incubated at 37 °C for 24 h. The bacterial isolates grown on the media were confirmed by standard Biochemical test.

2.4. Antimicrobial susceptibility pattern

The antimicrobial susceptibility testing of the bacterial isolates isolated during this study was performed as per the CLSI guidelines, 2012 [8]. The antimicrobial discs that were used in this study included Aztreonam (30 μg), Amoxyclav (30 μg), Cefpodoxime (10 μg), Cefepime (30 μg), Cefoperazone (75 μg), Cefoperazone/Sulbactam (75/10 μg), Cefixime (5 μg), Piperacillin (100 μg), Ceftazidime/Clavulanic acid (30/10 μg), Ceftriaxone (30 μg), Amikacin (30 μg), Rifampincin (5 μg), Meropenem (10 μg), Cefoxitin (30 μg), Ticarcillin/Clavulanic acid (75/10 μg), and Piperacillin/Tazobactam (100/10 μg) for the Gram negative bacilli. Erythromycin (15 μg), Methicillin (5 μg), Chloramphenicol (30 μg), Clindamycin (10 μg), Vancomycin (30 μg), Tetracycline (30 μg) and Ciprofloxacin (5 μg) were used to study the susceptibility patterns of the Gram positive cocci. All discs were obtained from Hi-Media Labs, Mumbai, India.

2.5. ESBL confirmatory test

While performing antibiotic testing, Ceftazidime (30 μg) and Ceftazidime/Clavulanic acid (30/10 μg) discs were placed on Muller Hinton Agar (MHA) plate on which 0.5 McFarland of test organism was swabbed. Organism was considered as ESBL producer if there was ≥5 mm increase in zone diameter of Ceftazidime/Clavulanate disc and that of Ceftazidime disc alone.

2.6. MRSA confirmatory test

Methicillin resistances of the *Staphylococcus* species isolated in this study was evaluated as per the CLSI guidelines, 2012 [8] by using Oxacillin (1 mcg) disc.

3. Results

A total of 50 patients were presented in this study, which included 27 (54%) males and 23 (46%) females. The maximum number of patients was in the age group of 30–80 years. Most of the patients were in the age group of 51–60 (Fig. 1). The mean age of the patients found in this study was 57 years. In this study, 35 patients presented with Grade I ulcer, 14 patients presented with Grade II ulcer, and 1 patient presented with Grade III ulcer (Fig. 2). The demographic details of the patients presenting in this study are summarized in Table 1.

Out of the 50 samples, 42 (84%) samples were culture positive and 8(16%) samples were culture negative. A total of 51 bacterial isolates were obtained from 42 patients. In this study the gram positive cocci accounted for 49% which included

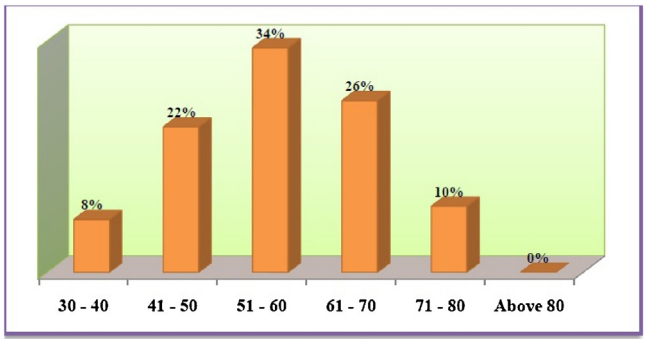

Fig. 1. Age wise distribution pattern of patients presented in this study.

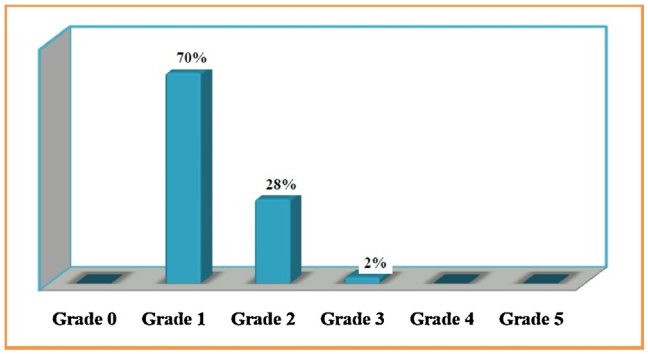

Fig. 2. Distribution of patients according to Wagner's grade classification.

Table 1
Demographic detail of diabetic foot patients in this study.

Demographic details	No. of patients	Percentage
Age (mean)	57 years	–
Sex		
Male	27	54
Female	23	46
Types of diabetes		
Type 1	–	–
Type 2	50	100
Duration of diabetics (years)		
<10	21	42
10–19	25	50
≥20	4	8
Duration of ulcer (months)		
≤3	41	82
>3	9	18
Size of ulcer (cm^2)		
≤4	47	94
>4	3	6
Nature of ulcer		
Necrotic	2	4
Non necrotic	48	96