Research Article

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MICROBIOLOGICAL AND CLINICAL CORELATION OF DIABETIC FOOT IN DURGAPUR POPULATION

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ABSTRACT

Background: Identifying and isolating related microorganisms is necessary for the proper management of diabetic foot infections. A suitable antibiotic medication should be chosen depending on the pathogen's culture and sensitivity.

Aim: The purpose of this study was to evaluate the clinical profile, microbiologic makeup, and prevalence of individuals with diabetic foot disease.

Methods: In this retrospective clinical study, participants with diabetic foot who were hospitalized to the institute had their bacterial cultures evaluated on tissue samples, pus swabs, and bacterial pus isolates.
Results: MRSA was seen in 1 subject with Grade 2 disease, 1 in Grade 3, and 3 subjects with Grade 4 disease, and a total of 5.68% (n=5) study subjects. Enterococcus spp. was seen in 1 subject with Grade 3 disease, streptococcus spp. in 1 subject with Grade 3 disease, and 2 subjects with Grade 4 disease. With 5, 3, 4, 2, and 8 study participants with grades 1, 2, 3, 4, and 5, Pseudomonas spp. had the highest prevalence, accounting for a total of 25% (n=22) study subjects. In 14,77% (n=13) of the study participants with 4, 2, 3, and 4 subjects with grade 2, 3, 4, and 5 disorders, respectively, proteus species were observed.

Conclusion: The current investigation suggests that when Wagner's grade rises, gram-negative bacteria become more prevalent. Frequent tracking of antibiotic resistance patterns is necessary to determine the empirical antibiotic therapy.

Keywords: infections of the diabetic foot (DFI), Profile of microbiology and clinical conditions, polymicrobial Pattern of sensitivity, Wagner's Grading Overview

INTRODUCTION

Patients with diabetes mellitus frequently experience chronic foot infections, which are typically difficult to treat conservatively. According to published data, hospitalization for soft tissue infections in the foot region is ten times more common in diabetic people than in non-diabetic subjects. It is projected that by the end of 2025, there would be close to 57 million diabetics in India.1.

Due to gangrenous alterations, an infection in subcutaneous tissues can quickly migrate to deeper tissues and result in limb amputation. Uninfected ulcerations become more problematic in diabetic people with neuropathy following modest trauma, resulting in tissue necrosis, neuropathic ulcers, osteomyelitis, and sinusitis, which typically drains.2.

The length of the infection is a major factor in the development of moist gangrene. Proteus species, Enterococcus species, and pseudomonas species are the organisms that continue to produce gangrenous infections. These

organisms cause significant tissue loss as a result of the affected foot's poor blood circulation.3. Identification and isolation of related microorganisms as well as suitable antibiotic medication selection based on culture and sensitivity are necessary for the appropriate and correct management of infections in diabetic feet.4

The purpose of this retrospective study was to evaluate bacterial pathogens linked to diabetic foot and their impact on outcomes after diabetic foot treatment. In this study, the prevalence, microbiologic makeup, and clinical characteristics of participants with diabetic foot infections susceptible to antibiotics were evaluated. These characteristics were also evaluated using different Wagner classification grades and the subjects' outcomes.

MATERIALS AND METHODS

In order to determine the prevalence, microbiologic makeup, and clinical profile of individuals with diabetic foot infections who are susceptible to antibiotics, as well as to evaluate these characteristics based on different Wagner classification grades and patient outcomes, a retrospective clinical study was carried out. The study was carried out with approval from the relevant ethical committee. The participants who visited the institute with gangrenous foot infections in diabetic subjects made up the study population.

Subjects who met the following criteria were eligible to participate in the study: they had to be in good mental health, not be terminally ill, have a confirmed diagnosis of diabetes, have chronic foot infections that do not go better with conventional antibiotic therapy, and be willing to participate. Subjects who refused to participate in the trial or who had concomitant conditions that increased the risk of infection were excluded.

Tissue samples, pus swabs, and bacterial pus isolates were obtained from each patient admitted to the institute with diabetic feet following their final inclusion. The samples were collected and then processed according to established techniques for bacterial identification, antibiotic susceptibility pattern, and culture. Records pertaining to isolated bacteria, sensitivity patterns, and first- and second-line antibiotic medication were kept up to date. Evaluations were conducted based on patient outcomes, risk factors, and ulcer gradings.

The gathered data were statistically evaluated using SPSS software version 21 (Chicago, IL, USA), with the t-test and one-way ANOVA being used to formulate the results. The data were presented as a mean, standard deviation, percentage, and number. At $p < 0.05$, the significance threshold was maintained.

RESULTS

In order to determine the prevalence, microbiologic makeup, and clinical profile of individuals with diabetic foot infections who are susceptible to antibiotics, as well as to evaluate these characteristics based on different Wagner classification grades and patient outcomes, a retrospective clinical study was carried out. A total of 132 participants, ranging in age from 58 to 72 years, were enrolled in the study, representing both genders. Table 1 lists the study participants' demographic and illness-related details. The average age of the research participants was found to be 63.4±3.67 years.

In the current study, there were 20.45% (n = 27) females and 79.54% (n = 105) males. When the microbial growth was evaluated, 78.78% (n=104) of the study patients showed monomicrobial growth, whereas 21.21% (n=28) showed polymicrobial development. Wagner's grade I was possessed by 10.60% (n=14) of the bacterial isolates, grade II by 12.87% (n=17), grade III by 25.75% (n=34) of the subjects, and grade IV by 22.72% (n=30) of the subjects (Table 1).

After analyzing the distribution of gram-positive cocci in different W grades in study participants with diabetic foot, it was observed that one participant had Grade 3 disease, one subject had Grade 4 disease, and two subjects had Grade 3 disease. In total, 3.40% (n=3) subjects had MRSA in one subject each of Grade 2 and Grade 3 and Grade 4 disease, and 5.68% (n=5) study participants had staphylococcus aureus in two subjects each of Grade 1 and Grade 3 and 4 and 1 subject each of Grade 5 disease, and in a total of 10.22% (n=9) study participants (Table 2).

Acinetobacter spp. was detected in 3 (3.40%) of the individuals with grade 3 disease, while NFGNB was found in 1, 1, 2, and 2 of the patients with grades 1, 2, 3, and 5 of the study subjects, for a total of 6.81% (n=6) subjects.

With 5, 3, 4, 2, and 8 study participants with grades 1, 2, 3, 4, and 5, Pseudomonas spp. had the highest prevalence, accounting for a total of 25% (n=22) study subjects. In 14,77% (n=13) of the study participants with 4, 2, 3, and 4 subjects with grade 2, 3, 4, and 5 disorders, respectively, proteus species were observed. 4.54% (n=4) of the study participants had enterobacter spp., with two of them having grade 4 and grade 5 illnesses.

11.36% (n=10) of the study subjects had Klebsiella spp., with 1, 2, 2, 3, and 2 study subjects, respectively.Table 3 shows that E. coli was detected in 13.63% (n=12) of the study individuals, which included 2, 3, 4, and 5 subjects with grade 2, 3, 4, and 5-grade sickness. In the current retrospective clinical study, the prevalence, microbiologic makeup, and clinical profile of individuals with diabetic foot infections susceptible to antibiotics were evaluated. These aspects of the microbiologic and clinical profiles were evaluated using different Wagner classification grades and the subjects' outcomes. A total of 132 participants, ranging in age from 58 to 72 years, were enrolled in the study, representing both genders. The average age of the research participants was found to be 63.4±3.67 years.

In the current study, there were 20.45% (n = 27) females and 79.54% (n = 105) males. When the microbial growth was evaluated, 78.78% (n=104) of the study patients showed monomicrobial growth, whereas 21.21% (n=28) showed polymicrobial development. Bacterial isolates with Wagner's grade I included 10.60% (n=14), grade II comprised 12.87% (n=17), grade III comprised 25.75% (n=34), and grade IV comprised 22.72% (n=30). These results aligned with those of studies conducted in 2017 by Bajuri MY et al. and in 2013 by Alva KA et al., in which the authors evaluated patients with similar demographics to those of the current study.

The distribution of gram-positive cocci in the various W grades was also assessed in this study among study subjects with diabetic foot. It was observed that one subject had Grade 3 disease, one subject had Grade 4 disease, and two subjects had Grade 3 disease. In total, 3.40% (n=3) of the subjects had MRSA disease, one subject had Grade 2 disease, one subject had Grade 3 disease, and three subjects had Grade 4 disease. Additionally, 5.68% (n=5) of the subjects had staphylococcus aureus disease, which was detected in two subjects with grade 1 disease, two subjects with grade 3 disease, four subjects with grade 4 disease, and one subject with grade 5 disease.

These findings corroborated those of research published in 2019 by Stacey HJ et al7 and in 2010 by Girish MB et al8 that found comparable gram-positive cocci in pus cultures from diabetic foot wounds. Acinetobacter spp. was detected in 3 (3.40%) of the individuals with grade 3 disease, while NFGNB was found in 1, 1, 2, and 2 of the patients with grades 1, 2, 3, and 5 of the study subjects, for a total of 6.81% (n=6) subjects. With 5, 3, 4, 2, and 8 study participants with grades 1, 2, 3, 4, and 5, Pseudomonas spp. had the highest prevalence, accounting for a total of 25% (n=22) study subjects.

In 14,77% (n=13) of the study participants with 4, 2, 3, and 4 subjects with grade 2, 3, 4, and 5 disorders, respectively, proteus species were observed. 4.54% (n=4) of the study participants had enterobacter spp., with two of them having grade 4 and grade 5 illnesses. 11.36% (n=10) of the study subjects had Klebsiella spp., with 1, 2, 2, 3, and 2 study subjects, respectively. 13.63% (n=12) of the study patients had E. Coli, including 2, 3, 4, and 5 grade 2, 3, 4, and 5 illness.

These results were comparable to the results by the studies of Goh TC et al[9] in 2020 and Mahamoud BA et al[10] in 2013 where authors reported a similar pattern of distribution for gram-negative bacilli in the culture from the samples of subjects with a diabetic foot infection.

CONCLUSION

Within its limitations, the present study concludes that the prevalence and predominance of gram-negative microorganisms increase with the increased grade of Wagner's disease. For deciding the empirical antibiotic therapy, regular antibiotic-resistance pattern surveillance should be conducted. The antibiotics given to these subjects should be assessed based on culture and sensitivity. However, the present study had a few limitations including a small sample size, shorter monitoring period, and geographical area biases. Hence, more longitudinal studies with a larger sample size and longer monitoring period will help reach a definitive conclusion.

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TABLES

S. No	Characteristics	Percentage (%)	Number (n=132)
1.	**Mean age (years)**	63.4±3.67	
2.	**Age Range (years)**	58-72	
3.	**Gender**		
a)	Males	79.54	105
b)	Females	20.45	27
4.	**Microbial Growth**		
a)	Monomicrobial	78.78	104
b)	Polymicrobial	21.21	28
5.	**Wagner's grades**		
a)	I	10.60	14
b)	II	12.87	17
c)	III	25.75	34
d)	IV	22.72	30

Table 1: Demographic and disease-related characteristics in the study subjects

S. No	Gram-positive cocci	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Total (n=18)	Percentage (%)
1.	**Enterococcus spp**			1			1	1.13
2.	**Streptococcus spp**			1	2		3	3.40
3.	**MRSA**		1	1	3		5	5.68
4.	**Staphylococcus aureus**	2		2	4	1	9	10.22

Table 2: Distribution of gram-positive cocci in the study subjects

S. No	Gram negative bacilli	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Total (n=70)	Percentage (%)
1.	**Acinetobacter spp**			3			3	3.40
2.	**NFGNB**	1	1	2		2	6	6.81
3.	**Pseudomonas spp**	5	3	4	2	8	22	25
4.	**Proteus spp**		4	2	3	4	13	14.77
5.	**Enterobacter**				2	2	4	4.54
6.	**Klebsiella spp**	1	2	2	3	2	10	11.36
7.	**E. coli**		2	3	3	4	12	13.63

Table 3: Distribution of gram-negative bacilli in the study subjects