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ORIGINAL ARTICLE

ASSESSMENT OF MICROBIAL PROFILE IN THE PATIENTS WITH DIABETIC FOOT: A MICROBIOLOGICAL STUDY

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ABSTRACT:
Background: Diabetic foot is one of the most feared complications of the diabetes and is the leading cause of the hospitalization among diabetic patients. Neuropathy, peripheral vascular disease, foot ulceration and infection with or without osteomyelitis are few of the several pathological complications leading to the development of gangrene and which even necessitates limb amputation. While the foot infections in persons with diabetes are initially treated empirically, a therapy which is directed at the known causative organisms may improve the outcome. Hence; we evaluated the microbiological profile of the patients with diabetic foot. **Materials & Methods**: A total of 120 patients with diabetes who reported in the hospital from December 2012 to May 2015, for a period of six months, were included in this prospective study. The clinical history of the patients such as age, sex, types of diabetes, duration of diabetes, size of ulcer and duration of ulcer were recorded on a proforma. The ulcers were graded according to the Wagner's grade classification. A total of sixty swabs were collected and processed for bacteriological investigations. The samples were processed by direct inoculation on to culture media like Sheep Blood agar (SBA), Brain Heart infusion Agar (BHIA) and Nutrient Agar (NA) incubated at 37°C for 24 hrs. The bacterial isolates were identified and confirmed according to the Bergey's manual of Determinative Bacteriology. **Results:** 54% of the total patients included in the present study were male and rest were female. The mean age group was found to be 59 years. The duration of the ulcer ranged from 10 to 20 years and the enrolled cases were of Wagner's grade I to III. In our study, approximately 70% of patients were Grade I. Although in gram positive organism Staphylococcus aureus was the predominant isolate followed by Staphylococcus saprophyticus, while Pseudomonas aeruginosa was the predominant isolate followed by Escherichia coli in gram negative organism. **Conclusion:** Diabetic foot is one of the common infections with prevalence among diabetic patients. Also the gram negative infection was seen in higher quantity in diabetic foot patients in the present study.
Key Words: Diabetic foot, Microbiology

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INTRODUCTION

One of the most feared complications of the diabetes is the diabetic foot and is the leading cause of the hospitalization among diabetic patients.[1] Neuropathy, peripheral vascular disease, foot ulceration and infection with or without osteomyelitis are few of the several pathological complications leading to the development of gangrene and which even necessitates limb amputation. The Indian diabetic population is expected to increase to 57 million by the year 2025. The individuals with diabetes have at least a 10-fold greater risk of being hospitalized for soft tissue and bone infections of the foot than individuals without

diabetes.[2] The impaired micro-vascular circulation in patients with a diabetic foot limits the access of phagocytes, thus favouring the development of an infection.[3] Blood supply of the lower extremities is compromised by the local injuries and the improper foot wear.[1] While the foot infections in persons with diabetes are initially treated empirically, a therapy which is directed at the known causative organisms may improve the outcome.[4] Hence; we evaluated the microbiological profile of the patients with diabetic foot.

MATERIAL ANS METHODS

From December 2012 to May 2015, for a period of six months, this prospective study was conducted involving diabetic foot infection patients of both sexes, clinically suspected of having microbial infections in their foot presenting at outpatient unit of tertiary care hospitals. The clinical history of the patients such as age, sex, types of diabetes, duration of diabetes, size of ulcer and duration of ulcer were recorded on a proforma. The ulcers were graded according to the Wagner's grade classification.[5] A total of sixty swabs were collected and processed for bacteriological investigations. The samples were processed by direct inoculation on to culture media like Sheep Blood agar (SBA), Brain Heart infusion Agar (BHIA) and Nutrient Agar (NA) incubated at 37°C for 24 hrs. The bacterial isolates were identified and confirmed according to the Bergey's manual of Determinative Bacteriology.[6] All the results were analyzed by SPSS software. Chi-square test was used to evaluate the level of significance. P-value of less than 0.05 was taken as significant.

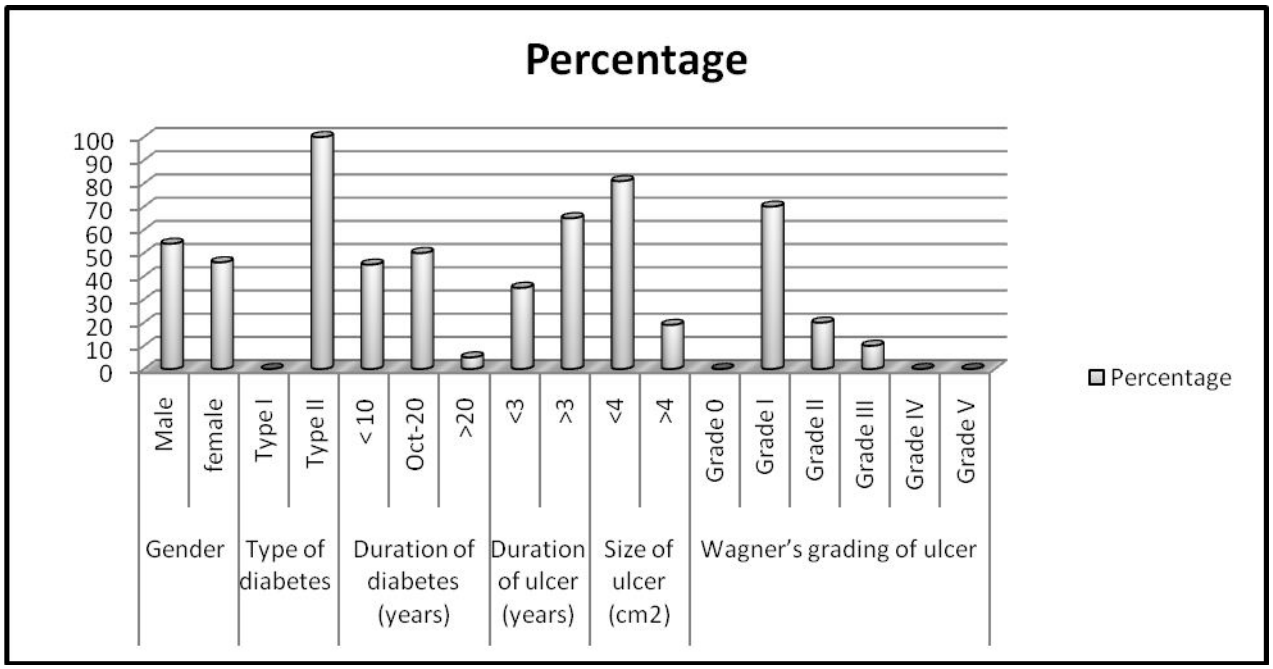
RESULTS

A total of 120 patients with Type 2 diabetes were included in the present study, which included 54% male and rest were female. The mean age group was found to be 59 years. The duration of the ulcer ranged from 10 to 20 years and the enrolled cases were of Wagner's grade I to III. In our study, approximately 70% of patients were Grade I as shown in **Graph 1.** Although in gram positive organism Staphylococcus aureus was the predominant isolate followed by Staphylococcus saprophyticus, while Pseudomonas aeruginosa was the predominant isolate followed by Escherichia coli in gram negative organism (**Table 1**).

Table 1: Microbiological distribution in patients with diabtetic foot.

Gram's reaction	Organisms	Percentage of isolates
Gram positive	Staph. Aureus	26
	Staph. Saprophyticus	16
	Staph. Epidermidis	8
	Stepto. Pneumonia	2
	Pleisomonas spp.,	2
	Micrococcus spp.,	4
	Bacillus spp.,	8
Gram negative	Pseudomonas aeruginosa	24
	Escherichia coli	3
	Klebsiella spp.,	2
	Salmonella	2
	Vibrio spp.,	1
	Enterococcus spp.,	1

Graph 1: Dempgraphic details of the patients with diabetic foot.



DISCUSSION

One of the serious health problems worldwide is the Diabetes Mellitus (DM). As per WHO reports, about 150 170 million populations are suffering from this diseases worldwide and the prevalence of diabetes will be double by 2025.[7] The top 10 countries with high number of diabetics according to world health organization (WHO) are India, China, USA, Indonesia, Japan, Pakistan, Russia, Brazil, Italy and Bangladesh. The estimates for India include 31.7 million in the year 2000 to a drastic increase to 79.4 million diabetics by the year 2030.[8] One of the frequent complications of patients suffering with diabetes mellitus (DM) is the Foot ulcer which accounts for up to 20% of diabetes-related hospital admission.[9] This wound infection begins superficially, but with delay in treatment and impaired body defense mechanisms, can spread to the other subcutaneous tissues and to deeper structures ultimately leading to dreaded complications such as gangrene and amputations.[10] An increased risk of skin infections is seen in poorly controlled diabetes because of elevated blood sugar which reduces the effectiveness of bacteria fighting cells. Even small cut may progress to a deep, open sore, called an ulcer.[11] The ulcers become infected, and can develop in the skin, muscle or bone of the foot as a result of the nerve damage and poor circulation as a major causal factor for lower limp amputation.[9] These infections are polymicrobial in nature. Escherichia coli, Proteus spp., Pseudomonas spp., Staphylococcus aureus and Enterococcus spp., are reported as frequent organism isolated from cases of diabetic foot infections.[12] Hence; we investigated the microbiological profile of diabetic foot ulcer patients.

Out of the 120 patients, 85% patients were positive for culture while 15% patients did not grow any organism. In that, more than 50% had mono microbial infection and remaining had polymicrobial infections. Mono microbial infections were in greater percentage than the poly microbial infection. The findings of the study is similar to the one reported by Dhanasekaran et al.[13] A possible reason for such low incidence of poly microbial infection might be due to the role of severity of these infections.[14] Gram positive organisms accounted to higher numbers than gram negative organisms, similar to the report of Abdulrazak et al.[15] Mehta et al isolated and identified the bacterial pathogens associated with diabetic foot ulcer and assessed their antibiotic susceptibility pattern to reduce the risk of complications. They collected pus samples of 100 patients having diabetic foot ulcer, during July to October 2012 and processed them. They observed that Out of 100 pus samples, 73% yielded growth of organisms making total of 92 isolates. Out of 92 bacterial isolates, 72 were gram negative and 20 were gram positive. From the results, they concluded that Pseudomonas sp. was the most common cause of infections while most isolates were multi drug resistance.[16] De Oliveira et al identified the microbiological profile and resistance to antimicrobial drugs in a series of patients with infected diabetic feet. They carried retrospective and descriptive analysis of medical records from diabetic patients with plantar lesions who underwent surgical treatment over a 24-month period at a public hospital. From the results, they concluded that germs found in the community were the most common etiologic factor in causing diabetic foot infections. Bacterial resistance was one of the common feature being encountered thesedays, especially with clindamycin and cephalexin.[17]

CONCLUSION

From the above results, it can be concluded that diabetic foot is one of the common infection with prevalence among diabetic patients. Also the gram negative infection was seen in higher quantity in diabetic foot patients in the present study.

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