Original Research Article

Clinical profile and outcome of diabetic foot ulcers

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ABSTRACT

Background: Diabetes mellitus is a common metabolic endocrine disorder, once prevalent in developed countries has become the leading 'global epidemic'. WHO estimated that in the year 2000. Roughly 3% of the total world population had Diabetes. In India around 61million of general population affected in 2011 which may rise to 101 million by 2030. The aim of the study was to study the clinical profile and outcome of diabetic foot ulcers. The clinical profile of 120 patients with diabetic foot ulcer was studied.
Methods: Patients with diabetic foot ulcer of both genders with age above 30 years willing to participate were included in the study. All patients were subjected to routine diabetic work up with Doppler study and X-ray foot to rule out bone involvement.
Results: The majority of patients with diabetic foot ulcers were of age group 51 to 60 years, male predominant, 84 patients out of 120 isolated included for study, 24 (28.6%) isolates had *Klebsiella*, 46(54.8%) isolates *Pseudomonas*, 14 (16.7%) isolates has *E.coli*.
Conclusions: Our study gives important information that diabetic foot ulcer is more common among middle-aged people with male predominance which gives the importance of screening diabetic patients for neuropathy and peripheral vascular disease.

Keywords: Diabetes, Foot ulcer, Clinical profile

INTRODUCTION

Diabetes mellitus (DM) is a common metabolic endocrine disorder, once prevalent in developed countries has become the leading 'Global epidemic'. WHO estimated that in the year 2000. Roughly 3% of the total world population had diabetes. In India around 61 million of general population affected in 2011 which may rise to 101 million by 2030. Among the various chronic serious complications of diabetes, foot related complications top the list. Development of foot ulcer changes the quality of life in patients leading to devastating consequences like limb amputation and remains the major risk factor for all non-traumatic foot amputations. More than a million lower leg amputations are performed each year worldwide due to diabetes and every 30 second at least one lower limb is amputated. Chronic lower extremity ulcers are those that do not progress through the healing process in a timely manner and have become a major challenge to healthcare systems worldwide. In the United States alone, these wounds affect an estimated 2.4-4.5 million people.[1]

Chronic leg and foot ulcers occur in many adults with vascular disease or diabetes and are attributed to chronic venous insufficiency, arterial disease, prolonged pressure, or neuropathy.[2] These ulcers last on average 12 to 13 months, recur in up to 60% to 70% of patients, can lead to loss of function and decreased quality of life, and are a significant cause of morbidity.[3] In India around 100,000 leg amputations are carried out per year. The life time risk

of developing foot ulcer is 25% with annual incidence 2-3% in diabetic population.[4,5] There are regional differences in the prevalence of diabetes in India varying from as low as 5.3% in Central India to as high as 13.6% in Northern India.[6]

Diabetic complications may be disabling or even life threatening.[7] According to the International Working Group on the Diabetic Foot (IWGDF), a diabetic foot ulcer (DFU) is a full thickness wound penetrating through the dermis (the deep vascular and collagenous inner layer of the skin) located below the ankle in a diabetic patient.[8] Eight out of 10 non-traumatic limb amputations are attributable to diabetes, of which 85% are due to DFU.[9]

The incidence of type 2 diabetes is rising to epidemic proportions in India and the whole world.[10,11] Because of its relatively low case fatality rate, prevalence of associated chronic complications is expected to increase. The burden of diabetic foot is set to rise further in the future since its contributory factors such as peripheral neuropathy and peripheral vascular disease (PVD) are present in >10% of the cases at the time of diagnosis.[12] In our study we focused clinical profile and outcome of diabetic foot ulcers.

METHODS

Study subjects

This prospective observational study was conducted at the Department of Surgery, in a tertiary care hospital attached to a medical college and research institute. 120 patients with diabetes attending general surgery ward for diabetic foot ulcer management at a tertiary care hospital, Sri Venkateshwaraa Medical College and Hospital, Redhills, Chennai, Tamilnadu were included during the study period from September 2022 to February 2023 (6 months). Patients willing to participate in the study were enrolled.

Data collection

Socio-demographic and anthropological data age, marital status, literacy status, occupation, life style (sedentary/active), familial history (parents/siblings), reasons for stress, duration and severity of disease, etc. were collected from patients.

Sample collection

Samples were collected from patients with diabetes having ulcers, surgical sites with infection and other wounds by needle aspirate method. In case of closed wounds, the skin or mucosal surface were disinfected with 2% chlorhexidine or 70% alcohol followed by iodine solution (1-2% tincture iodine or 10% solution of povidone-iodine). Prior to specimen collection, removal of iodine with alcohol was done. Tissue samples were obtained from depth of ulcers and transferred aseptically into labeled sampling vials with sterile saline and processed in the

Microbiology laboratory in the institutional medical centre.

Foot ulcers in diabetic patients were categorized into six grades (grade 0-5) based on Meggit Wagner classification system.[13]

Details regarding type of diabetes, its duration, treatment, compliance by the patient, awareness about complications, personal habits like smoking and alcohol consumption were recorded.

Meticulous clinical examination was done. Neuropathy was assessed by the ability to sense touch with a 10 g monofilament and tuning fork, ischemia by pulsations of dorsalis pedis and posterior tibial arteries, while osteomyelitis (to assess bone involvement) was diagnosed on X-rays.[14-16] Cases with ulcer on the other foot also, were considered as separate cases.

Antimicrobial susceptibility testing of aerobic isolates was performed by the Kirby Bauer disc diffusion method as recommended by the Clinical and Laboratory Standards Institute (CLSI).[17]

Inclusion criteria

The inclusion criteria of the study included patients those were those men and women of age group 30-70 years; diabetic patients, grade 1 and 2 Wagner's foot ulcers; those with duration of foot ulcers more than 4-6 weeks; and with good glycemic control and neuropathic ulcers.

Exclusion criteria

The exclusion criteria of the study included uncontrolled DM, Wagner's grade 3, 4, 5 ulcers, severely infected wounds and gangrene, neuroischemic ulcers, traumatic ulcers, peripheral vascular disease, coronary artery disease, varicose veins, deep venous thrombosis, malignancy and pacemakers.

Statistical analysis

Data was analyzed using student paired t test p value<0.05 was considered statistically significant. Statistical software SPSS version 22.0 used for analysis.

RESULTS

Out of 120 patients 72 were male and 48 were female. Most of patients affected in the age group were 51-60 years (43 patients) followed by 30-40 years (29 patients), 41-50 years (25 patients) and 61-70 years (23 patients).

Most of the patients in the duration of diabetes were 6-10 years (49 patients) followed by <5 years were (36 patients), 11-15 years (18 patients) and 16-20 years (17 patients). 63 patients had 2-3 months duration of ulcer

present followed by 25 had 1 month of ulcer, 20 had 3-5 month of ulcer and 12 had >5 months of ulcer.

Out of 120 patients Wagner's classification shows type I were 74 patients and type 2 were 46 patients. Out of 72 male patients 65 had single ulcer and 7 had multiple ulcer. Out of 48 female patients 44 had single ulcer and 4 had multiple ulcer. In total 120 patients 109 had single ulcer and 11 had multiple ulcer.

Out of 120 patients, 84 show the isolated pathogens. In which mostly presented in *Pseudomonas aerugionsa* (54.8%), 28.6% present in *Klebisella* and 16.7% present in *E. coli.*

Table 1: Age and gender distribution.

Age (years)	Male	Female	Total
30-40	19	10	29
41-50	13	12	25
51-60	25	18	43
61-70	15	08	23
Total	72	48	120

Table 2: Duration of DM among the study population (N=120).

Duration (years)	N	%
<5	36	30
6-10	49	40.83
11-15	18	15
16-20	17	14.17
Total	120	100

Table 3: Duration of ulcer (months).

Duration (months)	N
1	25
2-3	63
3-5	20
>5	12
Total	120

Table 4: Wagner's classification.

Wagner's classification	N
Type I	74
Type II	46
Total	120

Table 5: Type of ulcers.

Sex	N	Ulcer	
		Single	Multiple
30-40	19	10	29
41-50	13	12	25
51-60	25	18	43

Table 6: Demographic data and base line data (N=120).

Wagner's classification	N
Mean age (years)	51.4±3.16
Age range (years)	30-70
Mean duration of diabetes (years)	8.92±1.97
Mean ulcer duration (months)	2.42±0.82

Table 7: Prevalence of pathogens in the clinical specimens.

Isolated pathogens	N	%
Klebisella	24	28.6
Pseudomonas aerugionsa	46	54.8
Escherichia coli	14	16.7
Total	84	100

DISCUSSION

The annual population-based incidence of diabetic foot ulcers is estimated to be 1.0-4.1 per cent, while the lifetime rate extends to around 25%.[18] A common complication of these ulcers is infection, which if left untreated, results in the need for distal limb amputation.[19] A total of 120 patients enrolled in the study. Out of which 72 patients were male and 48 were female, as comparing to other study enrolled 374 patients of which males are dominant 227 comparing to counterpart 147 female patients.[20] The male preponderance for DFU reported by other studies, was also seen in our study, with the disease being 5 times more common in males than females.[21-23] The males high risk of developing diabetic foot complications because of increased prevalence of neuropathy, less joint mobility, and higher foot pressure.[24] In our study it was found that maximum patients affected were under the age of 51-60 years (43 patients) in comparison to other studies having 227 males and 147 females of mean 54.9±9.4 years. [20]

As per our study conducted, about 40.83% of patients are under the duration period of 6-10 years in DM. As comparing to other study duration of DM has higher significance in period of <10 years counting 154 patients out of 216 patients making 71.2%.[25] In our study duration of ulcer were 1 month (25 patients), 2-3 months (63 patients), 3-5 months (20 patients) and >5 months (12 patients).

In our study Wagner's classification shows type I were 74 patients and type 2 were 46 patients. Other study Amareswari et al shows 16 were type I and 14 were type II.[26] The patient's demographic data shows that the study group included 120 patients with mean age of 51.4±3.16 years. The mean duration of Diabetes is 8.92±1.97 years and the mean duration of ulcer is 2.42±0.82 months. Other study Amareswari et al shows thirty patients with mean age of 55.06±5.01 years.[26] The mean duration of diabetes is 7.8±1.47 years and the mean duration of ulcer is 4.9±1.2 months.

84 patients out of 120 isolated included for study, 24 (28.6%) isolates had *Klebsiella*, 46 (54.8%) isolates *Pseudomonas*, 14 (16.7%) isolates has *E. coli*. All the bacteria isolated were gram negative and out of them pseudomonas was the major isolate. Similar studies which shows, Seth, *et al* among gram positive organisms, *S. aureus* was the most common isolate which was present in 14 (21.54%) of the patients.[27] Gadepalli *et al* also observed that *S. aureus* was the most frequent organism isolated in DFI, being present in 13.7% of patients.[28]

Our finding is mostly isolated pathogen in our study is *Pseudomonas*, but previous studies reported by Mottola et al.[29] *S. aureus* is one of the most important micro-organisms that cause clinical problems resulting high-resistance to different antimicrobial agents. Diabetic foot ulcer is one of the most common devastating complications of diabetes mellitus and the leading cause of agonizing amputation throughout the world.[30,31] These infections may be colonized by pathogenic and anti-microbial resistant bacteria, harbouring several virulence factors that could impair its successful treatment.[32]

Moreover, recent studies from less developed countries, especially in hot, humid climates, report that even with standard microbiological methods aerobic gram-negative bacilli, especially Pseudomonas aeruginosa more often cause DFIs.[33]

CONCLUSION

The age group of patients affected with diabetic foot ulcers was predominantly 51-60. Males were affected more than females. Duration of diabetes mellitus was more than 6 years in the majority of patients. Our study gives important information that diabetic foot ulcer is more common among middle-aged people with male predominance which gives the importance of screening diabetic patients for neuropathy and peripheral vascular disease.

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