

Assessment Of Predisposing Factors, Clinical Profile and Outcomes Of Diabetic Foot Ulcer

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ABSTRACT

Background: Diabetic foot ulcer (DFU) is the most common consequence of diabetes mellitus. DFUs result from a combination of multiple causes including peripheral neuropathy and peripheral arterial disease. It is preventable if the risk factors are identified and treated early.

Objectives: The aim of present study is to evaluate the predisposing factors, clinical profile and outcome of diabetic foot ulcer (DFU).

Methods: All DFU patients who were aged >18 years and admitted during the study period were enrolled in this study. The socio-demographic characteristic, predisposing factors, clinical profile, examination of foot lesion, microbiological profile and outcome were recorded.

Results: A total of 300 patients with DFU were evaluated in this study. Most of the patients were 45-60 years age group, predominantly male. 95.3% were type 2 DM. A significant association between duration of diabetes, glycemic control, peripheral neuropathy, and ulcer size were found with diabetic foot ulcer healing. The most common isolates from culture were monomicrobial and Gram-negative bacteria. DFU outcomes (healing & amputation) were statistically significantly associated with the severity of the Diabetic foot infections.

Conclusion: Modifiable factors like good glycemic control, early management of ulcers and early treatment of peripheral neuropathy can influence Diabetic foot ulcer outcomes

Keywords: Diabetic foot ulcers, Predisposing factors, ulcer severity, outcomes, Amputation

INTRODUCTION

Diabetic foot ulcer (DFU) is a term used to designate lesions that can occur in a diabetes patient's foot. It has a neuropathic etiopathogenic basis, caused by chronic hyperglycemia which, in the absence or presence of PVD, and due to prior trauma in the foot, causes ulceration. This problem represents one of the most serious complications of diabetes, affecting approximately 15% of all diabetic individuals, and constitutes the leading cause of non-traumatic amputation of lower limb [1-2]. Diabetic foot ulcers (DFUs) represent one of the most common causes of hospitalization of diabetic patients. DFUs are complex, chronic wounds which have a major long-term impact on patients' morbidity, mortality, and quality of life [3]. DFUs are relatively common. Once the protective layer of a skin is broken, deep tissues are exposed to a bacterial infection that progresses rapidly. Patients with DFUs frequently require amputation of the lower limbs, and in more than half of the cases, infection is the predominant factor. It has been reported that around 25% of people with diabetes will develop a DFU during their lifetime [4]. DF causes more than a million diabetics to lose at least a portion of their leg annually. It illustrates how a limb is lost in the world some place every 20 s [5]. In fact, every year 5% of the patients with diabetes develop foot ulcers, and 1% requires amputation [6]. Diabetic foot (DF) places a significant financial and medical strain on our health-care system. Foot ulcers are the most prevalent cause of hospitalization for diabetic patients (30%) and account for roughly 20% of all health care costs, more than all other diabetic complications. Because an infected neuropathic foot frequently leads to amputation, the great majority of these cases are likely avoidable [7]. Twenty percentages of infections result in amputation, and over half of all foot ulcers become infected and necessitate hospitalization [8].

Fifty percentages of patients who suffer a major amputation will have their other limb amputated within 2 years. The 10-year mortality rate is 40% higher in those having a history of DF ulcers than in those with diabetes alone. In India, the clinical profile of diabetic foot differs and is impacted by variables such as walking barefoot or in improper footwear, illiteracy, faith in alternative medicine, and lack of expertise in the treatment by primary care physicians [7]. Foot ulceration is preventable, and relatively simple interventions can bring down amputation rates by up to 80 percent. Though there is an obvious increase in diabetic foot care awareness, there are tremendous gaps in routine foot evaluations. To prevent the development of foot ulcer, early detection of the foot at risk should be afforded a high clinical priority [9].

Aim of the study: The aim of this study was to evaluate the predisposing factors, clinical profile and outcome in DFU Patients in a tertiary care hospital.

MATERIALS AND METHODS

This was a cross sectional observational hospital based study conducted in the Department of Surgery at a tertiary care hospital, India. All patient admitted in Department of Surgery with Diabetes Mellitus having foot problem during the study period were enrolled. This study was conducted in accordance with the Declaration of Helsinki.

Inclusion Criteria

- Patients age > 18 years of age with both gender
- All diabetic patients who and admitted with DFU
- Patients who provided consent for the study

Exclusion Criteria

- Patients age < 18 years of age
- Any patient clinically suspected with incidental ulcers, having Charcot foot and traumatic amputations
- Gestational diabetic and patients who were seriously ill
- Patients who not provided consent for the study

Diabetic people who were presented with non traumatic lesions of the skin on the foot distal to malleoli were considered as diabetic foot ulcer. At discharge when previously open wound were covered by continuous viable epithelial were defined as healed. In other hand incomplete re-epithelialization of the wound were defined as persisting unhealed. Amputations restricted to the foot were defined as minor amputation where as any other amputation took place above the levels of the ankle were defined as major amputation.

All the patients underwent detailed socio-demographic characteristics including duration of diabetes, presenting features and clinical examination at baseline including details of ulcer, and evaluation of palpable pulses. The discharge from the ulcer was sent for microbiological examination. Patients were classified as per the IWGD-FIDSA classification into mild, moderate, and severe diabetic foot infections (DFI). The patients were followed up every month for 3 months. The outcome was assessed in terms of ulcer healing, readmission, minor/major amputation, and mortality during the 3 months.

Statistical analysis: Data were analysed using the Statistical Package for Social Sciences software (SPSS), version 22. Data was described using frequencies and percentages for categorical variables. Percentages were compared using a chi-square test. A p-value of less than 0.05 was considered statistically significant

RESULTS

A total of 300 patients with diabetic foot ulcers, were enrolled and analysed in this study. Majority of the patients (45%) were 45-60 years of age, predominantly male (62.3%). Most of them (59.3%) either overweight or obese and 40% belongs to lower socio-economic class [Table: 1].

Table 1: Socio-demographic characteristics of the DFU participants

Variables	Frequency (%)	
Age group in years	18-30	25 (8.3%)
	31-45	105 (35%)
	45-60	135 (45%)

	>60	35 (11.7%)
Gender	Male	187 (62.3%)
	Female	113 (37.7%)
Residence	Rural	162 (54%)
	Urban	138 (46%)
BMI	Normal	125 (41.7%)
	Overweight	98 (32.7%)
	Obese	77 (25.6%)
Socio-economic status	Lower	120 (40%)
	Middle	105 (35%)
	Upper	75 (15%)

Among the distribution of predisposing factors for DFU, maximum number of patients (95.3%) had type 2 DM, 36% patients taking insulin therapy and 34% was taking oral Antidiabetic. Longer duration of DM, poor glycemic control, peripheral neuropathy and size of ulcer were common predisposing factors significantly associated with the prognosis of DFU [Table: 2].

Table 2: Predisposing factors related to diabetic foot ulcer

Variables	Frequency (%)	
Type of DM	Type 1 DM	14 (4.7%)
	Type 2 DM	286 (95.3%)
Duration of DM	< 5 years	90 (30%)
	5 to 10 years	115 (38.4%)
	≥10 years	95 (31.6%)
HbA1c (%)	<7 (good control)	12 (4%)
	7.1–8% (fair control)	35 (11.7%)
	8.1–10% (poor control)	75 (15%)
	>10% (very poor control)	178 (59.3%)
Treatment of DM	Oral Antidiabetics	102 (34%)
	Insulin	108 (36%)
	Combined	85 (28.3%)
	No treatment	5 (1.7%)
Type of ulcer	Pure neuropathic	125 (41.7%)
	Pure ischemic	30 (10%)
	Neuro-ischemic	90 (30%)
	Non-classified	55 (18.3%)
Ulcer Size	< 1 cm	140 (46.7%)
	1-5 cm	135 (45%)
	> 5 cm	25 (8.3%)

Among clinical presentation of DFU patients, ulcer was the most common complaint followed by discharge, swelling, gangrene, pain and fever [Fig:1].

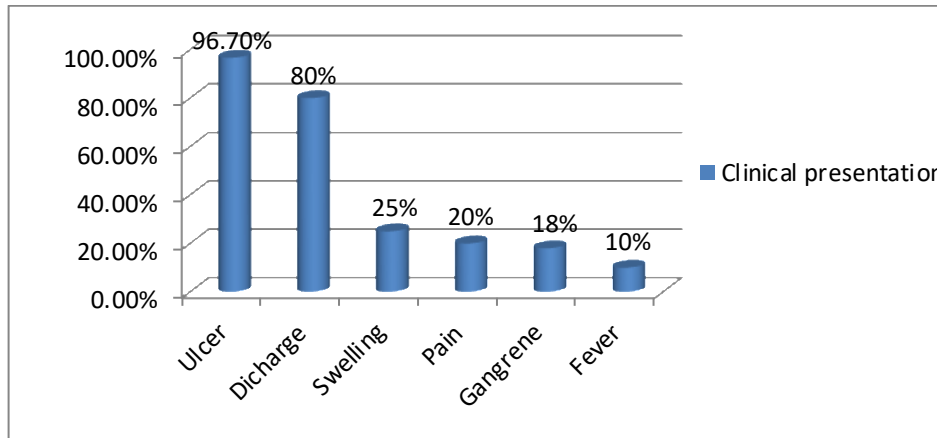


Figure 1: Clinical presentation of diabetic foot ulcer patients

The microbiological profile of our patients showed that monomicrobial growth was present in 55% whereas polymicrobial growth was present 10% of patients. Among all patients, the culture was sterile in 32%. Majority of isolates were Gram negative 54%, whereas Gram positive isolates were present in 22% cases [fig.2].

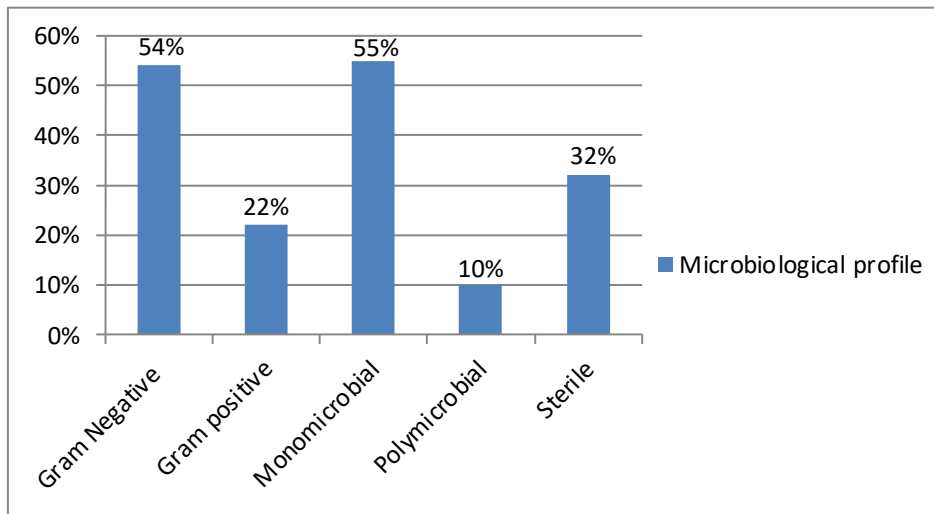


Figure 2: Microbial profile of DFU among study participants

In total, most patients had moderate DFI ($n = 140$). Mild DFI was present in 120 patients and severe DFI was present in 40 patients. Ulcers healing in 1st, 2nd & 3rd month had significantly associated with the severity of the DFIs. Minor and major Amputation of foot were significantly higher in severe DFI cases [Table:3].

Table 3: Association of severity of DFU with clinical outcome

Outcome	Severity of DFI			P value
	Mild (n=120)	Moderate (n=140)	Severe (n=40)	
Ulcer healing at 1 st Month	49.2%	28.6%	25%	<0.05
Ulcer healing at 2 nd Month	80%	64.3%	52.5%	
Ulcer healing at 3 rd Month	95%	82.2%	70%	
Minor amputation	15%	51.4%	47.5%	<0.05
Major amputation	0	10%	25%	
Readmission at 1 st month	2.5%	17.8%	20%	<0.05
Readmission 2 nd month	1.6%	5.7%	17.5%	
Readmission at 3 rd month	0	3.5%	12.5%	
Mortality	0	4.2%	10%	

DISCUSSION

Diabetic foot lesions are one of the most common causes of hospitalizations and caused by number of socio-cultural practices in India like barefoot walking, inadequate facilities for diabetic care, low level of education, and poor socioeconomic conditions.

In our study majority of the DFU participants were 45-60 year age group, similar finding observed by Vijay V, et al [10] and Reiber GE, et al [11]. It may be because that Diabetes Mellitus type II is classically seen in elderly patients. Current report found males are more commonly affected by diabetic foot ulcers than females, consistent results seen by many other studies: Bund et al [12], Ramakant P, et al [13] and Bansal E, et al [14]. The males high risk of developing diabetic foot infections because of increased prevalence of neuropathy, less joint mobility, and higher foot pressure.

Some authors reported the risk of diabetic foot infections were more in lower socio-economic groups peoples, because of precarious hygiene conditions, lack of education on nature of illness and lack of care, our observation correlates with these authors [15-16].

In our report, infection was present invariably in nearly 65% of patients and Gram-negative bacteria were the most commonly isolated from DFI, in agreement with the A Gupta1, et al [17] and Seth A, et al [18].

Type 2 DM was present in 95.3% of the study subjects; this was concordance with the Aliyu R, ET AL [19].

High percentage of insulin was also correlated with heavy weight as 58.4% of the populations were either obese or overweight. Similar high BMI were also noticed in a earlier study done by Janmohammadi N, et al [20] among subjects who developed DFU.

In our results the common predisposing factors associated with DFU were older age, lower socio-economic class, longer duration of DM, poor glycemic control, presence of peripheral neuropathy and peripheral arterial disease (PAD), our finding were comparable with the many other researchers also: Yin K, et al [21], Pedras, et al [22] and Idumagbodi A et al [23].

The current finding demonstrate that participants who had uncontrolled blood sugar having lesser success rate in treating DFU. Thus degree of glycemic control not only acts as a major risk factor for developing DFU but also plays a major role for its treatment success rate, our findings correlate with the Prakash V, et al [24] and Abdissa D, et al [25].

Fife et al, [26] demonstrate that ulcer size, wound age (duration in days), and number of concurrent wounds of any etiology please a crucial role for the wound healing of the patients.

The resent study observed that ulcer healing rates, increased risk of amputation, readmission and mortality rates were significantly higher in severe DFU patients, constant findings seen in other studies like: Wukich et al [27] and Nagaraju et al [28].

CONCLUSION

We have concluded that diabetic foot ulcers are more common among middle-aged males. Poor glycemic control, longer duration of diabetes and peripheral neuropathy were the common predisposing factors of DFUs. There was a predominance of monomicrobial growth and Gram negative organisms. Delayed ulcer healing, amputations (major and minor), hospital readmissions and mortality were significantly increased with increasing severity of DFI.

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