

Clinical profile of diabetic foot ulcers at the Jos University Teaching Hospital

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Abstract

Background: Diabetes mellitus (DM) continues to be a growing health problem worldwide, and diabetic foot complications is one of the most common causes of non-traumatic foot amputation and hospital admission among patients with DM. The objective of the study was to determine the clinical profile of patients with Diabetic foot ulcers in Jos University Teaching Hospital.

Methods: This was a cross sectional study that evaluated adult patients with DM who presented with foot ulcerations to the Jos University Teaching Hospital over a 6 month period. The patients' socio-demographic characteristics, clinical presentation, grade of ulcer and comorbidities were noted.

Results: Sixty-three patients with Diabetic foot ulcers were studied with a mean age of 57.43±13.76 years (Ranged 39-86 years) and a male: female ratio of 1.26 to 1. The median duration of DM history was 10 (Inter Quartile range IQR 3-14) years (range 1 - 40 years) before manifesting with foot ulcers. The duration of the ulcers ranged between 2 to 16 weeks with a

median of 8 (IQR of 4-8) weeks. The mean glycosylated haemoglobin was 10.74±14.7%. Majority had Neuro-ischaemic ulcers 19(30.9%). The commonest predisposing factor for DM foot ulcer was wearing of ill-fitting shoes in 16(24.5%) patients, while in 28 (44.40%) there was no identifiable predisposing factor.

Conclusion: The study found that diabetic foot ulcer commonly affected middle age individuals with a slightly higher preponderance among men. Most had Neuro-ischaemic ulcers, poor glycaemic control and wearing of ill-fitting shoes a commonly observed predisposing factor.

Key words: Clinical Profile, Diabetic Foot Ulcer, Jos University Teaching Hospital.

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Introduction

Diabetes Mellitus (DM) is a metabolic condition characterized by chronic hyperglycemia due to relative or absolute absence of insulin. Diabetic foot ulcers (DFU) is a direct complication of DM and is a major health problem worldwide.¹⁻³ In Nigeria, the prevalence of DM and attendant complications which includes DFU has been increasing at an alarming rate.⁴⁻⁷ DFU is the most common complication of DM presenting for surgical management.^{8,9}

Diabetic foot ulcers in most cases is due to underlying neuropathy or ischemia either in isolation or a combination of both with or without associated infection. The loss of protective sensitivity precipitated by the neuropathy and ischemia coupled with trauma or excessive pressure on deformed feet would result in skin ulceration and exposure of the deep tissue to bacterial colonization and multiplication.^{10,11} Infections in DM are facilitated by immunological deficits (especially in neutrophils) complicating DFU in most instances.¹¹

Various classifications schemes have been used to grade DFUs, but it is important to note that a classification needs to be simple enough to be clinically useful in enhancing improved clinical outcomes, and yet precise enough to be useful.^{12,13} The commonly used classification systems in DFU are the University of Texas (UT) and the Meggitt-Wagner classification.^{14,15} They are easy to use among health care providers, and also provide a guide to planning treatment strategies. DFU is commonly staged using the Meggitt-Wagner classification.¹⁶⁻¹⁸

Despite the notable prevalence of DFU in this setting, there has been a paucity of data regarding predisposing factors and the clinical profile of the foot ulcers. It is important to recognize these factors in this group of patients to enable an informed management plan.^{6, 19, 20} The objective of the study therefore was to describe the clinical profile of foot ulcers among diabetic patients at the Jos University Teaching Hospital.

Materials and Methods

This cross-sectional study was carried out in the Jos University Teaching Hospital. A 500 bed capacity hospital located in Jos, the Plateau State capital, Nigeria. It serves as a referral centre for most of the states in the North-Central area of Nigeria even extending up to the North-Eastern region of the country.

Setting: The study was carried out among out-patients and in-patients presenting with diabetic foot ulcers to the

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surgical outpatient clinic, medical outpatient clinic and the accident and emergency unit of the hospital over a 6 month period from July to December 2018. Management of diabetic foot ulcer at the Jos University Teaching Hospital is primarily done by the Orthopaedic unit which subsequently invites the plastic and endocrine units depending on the grade of the ulcer and also due to the need for a multi-disciplinary approach to the management of DFU.

Inclusion criteria- Adult patients over 18 years of age presenting with diabetic foot ulcers that consented to take part in the study were recruited consecutively from the afore mentioned units.

Exclusion Criteria- patients under 18years of age, those who did not give consent to participate in the study and Patients with graded I Wagner classification Foot syndrome (no ulceration).

Procedure: For each of the recruited patient, detailed demographics including the age, gender, marital status, area of usual residence and level of formal education were obtained. The possible causes or associated factors as well as the duration of DFU, history of diabetes including duration of disease (estimated from years of diagnosis) and mode of treatment was recorded. The comorbid conditions and social history were also noted.

Physical examinations were carried out by the residents in the orthopedic unit and confirmed by unit consultants. Height and weight were measured without shoes and with light clothing on. The body mass index was calculated as $BMI = \text{weight (kg)} / \text{Height in Kg/M}^2$. The blood pressure was measured with adult cuff using the standard technique. An average of two readings at 5 minutes interval was used for final records. Both feet were examined and the site, state and stage of ulcers was documented. The lesions were staged according to the Wagner classification.¹⁶

Peripheral neuropathy was assessed by determining the presence or absence of vibration sense using a 128 Hz tuning fork over the medial and lateral malleoli. The pressure sensation (monofilament testing) was done using 10g monofilament. The modality was to test various sites on the sole of the feet and findings noted as present or absent. Examination of the deep tendon was done by examining the Achilles tendon reflex which was tested using a standard patella hammer and technique. This was graded as either present (normal), detectable only after enhancement or absent. The neurological disability scoring system (NDS) was used to determine the severity of neuropathy present and classified as normal, mild moderate or severe neuropathy.²¹

Peripheral vascular disease: The dorsalis pedis and posterior tibial artery pulses were palpated with patient in the supine position and this was graded as normal, impaired or absent. Blanching on elevation, dependence rubor and delayed capillary refill was also noted. Doppler ultrasonography was done to determine patency of the vessels.²²

The type of lesion was determined and classified as neuropathic, ischemic or neuroischaemic. Foot ulcers were categorized as ischemic when peripheral disease was present but disability score was less than or equal to 2, neuropathic when neurological disability scoring system was greater or equal to 3 but no obvious peripheral vascular disease. Neuro-ischemic was said to be present when both the neurological disability scoring system and peripheral vascular disease were present.²³

The fasting blood glucose and glycated hemoglobin were determined from venous blood using appropriate methods and recorded.²⁴⁻²⁶

Data analysis

Data was collected using an interviewer administered questionnaire and data collection form. The data were collated and entered into Microsoft Excel spread sheet and subsequently exported into Statistical Package for the Social Sciences version 20.0.

Statistical analysis

The demographics obtained which included the age, sex, address and occupation were summarized and displayed using descriptive statistics. Continuous variables were presented with means \pm standard deviations if found to be normally distributed or as median with interquartile ranges when not normally distributed. The qualitative data aspect of the clinical profile was presented as percentages and frequency table.

Ethical Approval: Approval for the study was obtained from the health research ethics committee of the Jos University Teaching Hospital. Participation in the study was voluntary with written informed consent obtained from all participants and the information obtained from the study was treated as confidential.

Results

Sixty-three patients, males (57%) participated in the study with a mean age of 57.4 ± 13.8 years (range 39-86 years). The educational level of the patients are stated in table 1 with most of the patients having only primary level of education (42.9%) and majority of the patients were business persons. (Table 1.)

Table 1: Demographic characteristics of the patients with diabetic foot ulcer

Characteristics	Frequency (%) n= 63
Sex	
Male	36 (57.1)
Female	27 (42.9)
Age group (years)	
≤ 50	18 (28.6)
51-60	21 (33.3)
61-70	15 (23.8)
≥ 71	9 (14.3)
Mean age	57.4±13.7 years
Occupation	
Business	30 (47.6)
Housewife	12 (19.1)
Farmer	12 (19.1)
Civil Servant	9 (14.3)
Educational Level	
None	18 (28.6)
Primary	27 (42.9)
Secondary	9 (14.3)
Tertiary	9 (14.3)

The median duration of DM history was 10 years (IQR-11years) with a range between 1 year to 40 years before manifesting with foot ulcers, while the duration of the ulcers ranged between 2 to 16 weeks with a median of 8 (IQR - 4weeks) weeks prior to presentation. The commonest predisposing factor of DM foot was wearing of ill-fitting shoes which was noted in 16(24.5%) of the patients while in 28 (44.4 %) there was no identifiable predisposing factor (Table 2)

The mean body mass index of the patients was 26.1±2.9Kg/M². Nine (14.3%) of the patients had a normal body mass index, 42 (66.7%) were overweight and 12(19.1%) being obese. The commonest comorbidity in the patients studied was hypertension which was present in 18(28.6 %) of the patients, while 6(9.5%) had a co-existing nephropathy.

The Wagner stage of the ulcers studied are as shown in table 2 with stage III being the most prevalent stage of the ulcers which account for 36 (57.1%). The dimension of the ulcers measured after debridement ranged from 8 to 150cm², median of 60cm², (IQR 92cm²). The ulcers were located predominately in the hind foot and fore foot with the distribution shown in table 2.

The neurological disability scoring system was used to access for the presence of neuropathy which was

found to be present in 30 (47.6%) of the patients with 15% being mild, 45% moderate and 10% having severe neuropathy. Peripheral vascular disease was found to be present in 40% of the patients.

The fasting blood sugar done for the patient at presentation was 12.1±2.9mmol/l while the mean glycosylated haemoglobin was 10.7±14.7%. Forty two of the patients were on oral glucose lowering agents as shown in Table 2.

Table 2: Clinical profiles of Diabetic Foot Ulcers in DM patients at the Jos University Teaching Hospital, Jos.

Characteristics	Frequency (%) n=63
Duration of DM History	10(IQR 3-14)years
Median duration	Body Mass Index
Normal	9(14.2)
Overweight	42 (66.7)
Obese	12(19.1)
Suspected predisposing causes	
Nail cutting	2 (3.6)
Thermal injuries	2 (3.6)
Penetrating wound	5 (7.7)
Blunt trauma	6(8.7)
Ill-fitting shoes	15 (24.5)
Others (self-inflicted trauma, accidents, walking barefoot, etc)	5(7.7)
Undefined (no identifiable predisposing factor found)	28 (44.4)
Wagner Staging	
II	9 (14.3)
III	36 (57.1)
IV	15 (23.8)
V	3 (4.8)
Size of the Ulcer	
≤ 60cm ²	36 (57.1)
≥ 61cm ²	27 (42.9)
Location of the Ulcer	
Fore foot	23 (36.5)
Mid foot	10 (16.9)
Hind foot	30 (47.6)
Type of Ulcer	
Neuropathic	30 (47.5)
Ischaemic	11 (17.5)
Neuroischaemic	19 (30.2)
Unclassified	3 (4.8)

Table 2. contd

Characteristics	Frequency (%) n=63
Grading of Neuropathy using the NDS	
Neuropathy Absent	18 (28.6)
Mild	9 (14.3)
Moderate	30 (47.6)
Severe	6 (9.5)
Medication	
Oral glucose lowering agents only	42 (66.7)
Insulin only	16 (25.4)
Combination of insulin and oral glucose lowering agents	5 (7.9)
Laboratory investigation	
Fasting blood sugar	12.1±2.9mmol/dl
Glycosylated haemoglobin	10.74±14.7%.

Discussions

This study has shown the clinical profile of patients presenting with diabetic foot ulcers at the Jos University Teaching Hospital. It showed that DFU was commoner in males and in persons slightly older than 50 years of age. Majority of the patients had Wagner stage III and neuropathic ulcers with no identifiable cause and poor glycemic control most often overweight or obese. The above findings are similar to other findings.^{22, 27} Males tend to be exposed to more physically demanding work which may predispose them to trauma.^{4, 5, 22, 28} It is also notable that a greater proportion of the patients had no formal education, this could have contributed to insufficient attention to foot care in DM and the development of DFU. Previous studies have also highlighted the importance of patient education in DM care.^{29,30}

The mean age of the patients was similar to other studies and most of the patients presented with type II DM which tends to be predominant for this age group. This is similar to the studies done in Kenyatta hospital and also that of the Seattle study.²² The comparable mean age across studies may be explained by the time dependent risk factors which is present in all diabetic patients regardless of the environment.³¹

The mean duration of DM in the study was 10 years and that of the duration of foot ulcers was comparable to other studies.^{5,22} This development of DFU though multifactorial, can occur as a chronic complication of the disease process.

In this study, patients with stage III ulcer had the highest proportion, reflecting the probable health seeking behavior of patients in this setting where there is

a tendency to undertake self-care at the earlier stages of the ulcer.³² It is observed that some patients in our environment present when they have impaired quality of life or present in a diabetic emergency. Some may have however presented to lower levels of health care rather than a tertiary center. It is advised that patients with any grade of DFU be referred to an orthopedic unit at the earliest sign for review to enable ample examination and possible prevention of adverse morbidity.

The location of the ulcers were majorly on the dorsum of the foot which can be explained by the use of inappropriate shoes and going around unshod especially when engaging in physical activity. Again, the highest identifiable predisposing factor noted was wearing of ill or tight fitting shoes. This exerts maximum pressure on the hind foot and may explain the presence of most of the ulcers occurring in hind foot. This was slightly different to another study where most patients had ulcers on the fore foot.³³ Although the ulcers located on the plantar surface tend to be more extensive due to reduced padding and less resilient nature of the skin on the dorsum of the foot. This results in early exposure of the tendons and poses surgical challenges when skin cover is required.

The relatively large sizes of the ulcers found in this study also has grave implications on the management and cost considerations in managing the DFU as larger ulcers require extensive debridement which may result in a longer hospital stay or amputations.^{29,34} Early identification of ulcer location and size by specialized units, preventive strategies involving proper foot care and wearing of appropriate foot wears can mitigate the burden.³⁵

This study also identified neuropathic and neuro-ischaemic types of ulcer being the commonest in the study population. This was similar to what obtained in another study³³ and again reflects the morbidity that DM impacts on the patients. It was difficult to identify predisposing factors leading to the DFU in some patients, but again this might be a reflection of the neuro-ischemic changes being experienced prior to injury. This study performed detailed clinical examinations to evaluate both neuropathy and peripheral vascular disease. However, with the patient load in routine DM clinics, these assessments may not be regularly achievable in a resource challenged setting, it is suggested that all patients with DM get an annual or biannual detailed foot evaluation to reduce this burden.¹⁷⁻²⁸

Glycemic control was observed to be generally poor in all the patients. This may have been a contributory as well as a complicating factor in this subset of patients as glycemic control is difficult to achieve in the presence of infection which accompanies most DFUs.³⁵

We believe that a cross-sectional survey is best suited for this particular research as it provides an insight into the possible factors that may predispose a T2DM patient

into developing DFU. Other study designs like a cohort / case-control would be better in preventing the development of identified risk factors and trying to improve the QOL of those who have DFU. We do agree that duration could have been longer to increase the sample size. However, with the findings obtained from this study, the need for a detailed evaluation method has been identified. This will also serve as a basis for future research into preventing DFUs.

Conclusion

The findings from this study showed that grade III ulcer, (large ulcers >60cm²), mostly involving the hind foot largely following the use of ill-fitting shoes and neuro-ischemic complications are the common presentations of DFU in this setting. Proper education for foot care and a more frequent detailed evaluation of DM may mitigate morbidities and mortality associated with this condition.

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