

Management outcome of diabetic foot ulcers in a teaching hospital in Abuja, Nigeria

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Abstract:

Diabetes mellitus (DM) is a silent disease until the onset of complications, making it a leading cause of morbidity and mortality in sub Saharan Africa. The objective of this study was to describe the pattern of presentation and the outcome of management of patients with DM foot (DMF). Consecutive DM patients presenting with foot ulcers within a 2-year period were studied. Their demographic, clinical, and laboratory parameters were documented. One hundred and three patients entered the study; 49 (47.6%) were males and 54 (52.4%) were females, with a mean age of 54 (+13.0) years of age. The mean duration of DM, duration of ulcer, and mean BMI were 80.4 (93.2) months, 7.2 (7.5) weeks, and 27.0 (4.6) kg/m² respectively. Out of 87 patients with HbA1c, 47 (54%) had HbA1c above t (>7%). Eighty seven (84.5%) presented new to our institution and had no prior foot education. Neuropathic ulcers occurred in 70 (68%), neuro-ischaemic occurred in 11 (10.7%), and ischaemic occurred in 22 (21.4%). A spontaneous blister was the initiating factor in 50 (48.5%), and trauma of various types was the initiating factor in 53 (51.5%). Thirteen (12.6%) had amputation, 25 (24.3%) had serial debridement, 3 (2.9%) had skin graft, and 62 (60.2%) had dressing. Seventy-five (72.8%) were discharged home, 14 (13.6%) left against medical advice, and 9 (8.7%) died. Our patients had more neuropathic ulcers and a late presentation. The majority of the patients had no prior foot-care education. However, our amputation and mortality rates were lower than the figures in many centers in Nigeria.

Key words: Diabetic Foot Ulcer, Treatments, Epidemiology

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INTRODUCTION

The prevalence of diabetes mellitus (DM) worldwide is reaching epidemic proportions. According to the International Diabetes Federation (IDF), currently 382 million people are living with diabetes, of which 80% live in low- and middle-income countries. This figure will rise to 592 million by 2035.¹ A majority of the new cases will come from developing countries, with prevalence in Africa, likely to double within the next two decades.¹ In Nigeria diabetes is increasing, as is the case in many other developing countries with the prevalence ranging from 0.8% -10.3%.²⁻⁴

DM is a silent disease until the onset of complications.^{5,6} DM foot complications are responsible for much of the morbidity and mortality across the world, including in the African continent. It is responsible for more hospitalizations than any other complication of diabetes, and it takes the greatest toll.^{7,8} The

lifetime risk of a person with diabetes developing DMF ulcers is reported to be as high as 25%.⁹

Globally, diabetic foot lesions constitute a major medical and socio-economic burden, contributing to DM morbidity and mortality and also prolonged hospitalisation.¹⁰⁻¹² The prevalence of DMF ulcer was found to be between 1.0% and 4.1% in the United States and in the Netherlands 20.4%.^{13,14}

In Africa, the majority of foot lesions occur secondary to sensory loss as a consequence of diabetic peripheral neuropathy. These patients have therefore lost "the gift of pain" and are at risk of developing foot lesions as a consequence of insensitivity. This is followed by peripheral arterial disease and mixed pathology (presence of both neuropathy and peripheral arterial disease). Compounding the problem is the infection of the ulcers themselves which can progress to systemic infection and death.^{8-11,15}

In Nigeria, studies from some centers showed a prevalence between 8.3% and 19.1%,^{12,16-18} and DMF ulcer accounts for the majority of non-traumatic amputations performed in tertiary healthcare institutions.^{19,20}

Diabetes foot disease is a major medical, social, and economic problem that is seen in every continent and constitutes a major burden to the patient and the health care system. The aim of this study was to assess the management outcome of persons with DMF ulcers in a teaching hospital in Abuja, Nigeria.

METHODOLOGY

The study was carried at the University of Abuja Teaching Hospital Gwagwalada, Abuja, Nigeria. The teaching hospital is a 350 bed hospital, situated in the Federal Capital Territory (FCT) about 45 kilometres from the city center. The Ethics committee at the University of Abuja Teaching Hospital provided ethical clearance.

This was a descriptive cross sectional study involving 103 consenting diabetes patients with foot ulcers who were admitted into the medical wards within a two and half year period.

Information documented for each patient included age, gender, type of DM, duration of DM, duration of foot ulcer, mechanism of injury, type of ulcer, Wagner's grading, and blood pressure. Neuropathy was elicited by the use of monofilament wire, reflex hammer, and tuning fork while peripheral arterial disease was identified by palpation. Other

information documented included history of foot care education, blood glucose and HbA1c at presentation, mode of treatment, outcome, duration of hospital stay, and cost of treatment. Data was entered and analysed using the Statistical Package for Social Sciences IBM version 20.0.

RESULTS

During the study period 3,133 patients were admitted to the medical wards; 318 (10.2%) were diabetic patients, including 103 (32.2%) that were caused by diabetic foot ulcer or gangrene. There were more females 54 (52.4%) than males 49 (47.6%). Hypertension was present in 57 (55.3%) of the patients. Eighty-seven (84.5%) of the patients presented to our facility for the first time with a diabetic foot ulcer. The majority of the patients preferred pre-hospital treatment including home dressing, Chemist visit, or herbal treatment; hot water application occurred in 94 (92%) of the patients. Sixty-eight (66.6%) of the patients presented in Wagner grade 2 and 3, while as many as 32 (31.4%) had Wagner grade 4. Seventy (68%) of the ulcers were neuropathic, 21 (20.5%) were ischaemic, while 11 (10.7%) were neuro-ischaemic ulcers. Thirteen (12.7%) had both limbs affected with ulcer. The mean duration of hospital stay was 29.1 (17.2) days.

The mean age, duration of DM, and duration of foot ulcer of the subjects were 54.3 (13.0) years, 80.5 (93.1) months, and 7.2 (7.5) weeks respectively (**Table 1**).

Table 1. Clinical characteristics of patients with DMF ulcer.

Variable		Mean (SD)	Range	95% Confidence Interval
Age (Years)		54.32 (13.04)	21 – 90	51.7 – 56.9
Duration of DM (Months)		80.5 (93.1)	1 – 672	62 – 98.9
Duration of FU (Weeks)		7.16 (7.5)	1 – 52	5.6 – 8.6
BMI Kg/m ²		26.88 (4.6)	16 – 35.3	25.9 – 27.8
WC (cm)	Male	94.2	75 – 131	82.9 – 93.0
	Female	101.5	72 – 140	92.1 – 103.1
HbA1c (%)		7.44 (1.9)	3.2 – 14.4	7.01 – 7.8

DM:Diabetes Mellitus, FU:Foot Ulcer, BMI:Body Mass Index, WC:Waist Circumference, RBS:Random Blood Sugar
HbA1c:Glycated Hb

Foot ulcer started from spontaneous blisters in 50 (49%) of the patients; rat bite and interestingly antelope bite were responsible for ulcers in 3 (2.9%) (**Figure 1**).

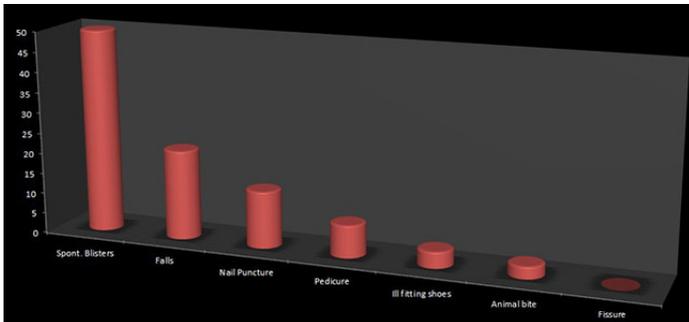


Figure 1. Type of initiating injuries for foot ulcer.

DEBRIDE: DEBRIDEMENT

Amputation was the treatment option for 13 (12.7%) of the patients, while 3 (2.9%) had skin graft (**Figure 2**).

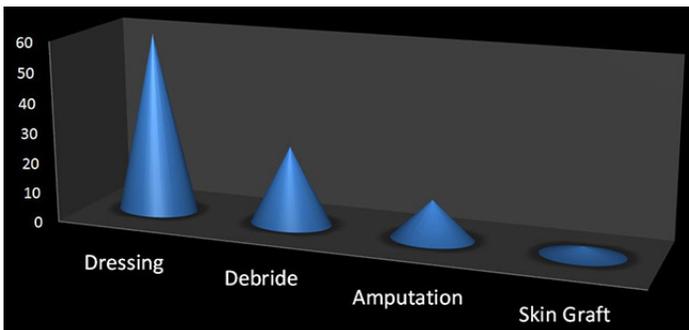


Figure 2. Various treatment options.

LAMA: LEFT AGAINST MEDICAL ADVICE

Nine (8.7%) of the patients died, while 14 (13.7%) left against medical advice (**Figure 3**).

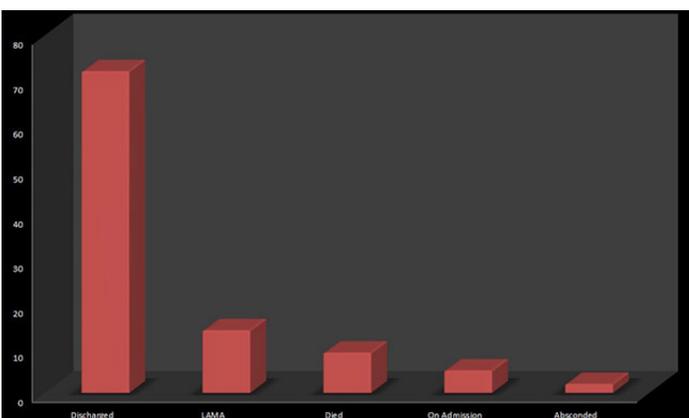


Figure 3. Mode of exit of the patients.

DISCUSSION

Diabetic foot ulcer remains a major complication of diabetes, occurring in 32.2% of all diabetic admissions in our center. In Nigeria, diabetic foot lesions are a major cause of morbidity and mortality among diabetics.^{12,18,21,22}

The mean age of affected patients is similar to many other studies.^{12,16-18} In this study we found a slight female preponderance, with 52.4% being females. Edo in Benin also found 55.7% of patients to be females.¹⁸ Whether this is related to health seeking behavior, or females are now more exposed to hazards than in the past, is not fully known. It is important to note that 84.7% of these patients presented to our facility for the first time with a foot ulcer, and they had not received prior foot care education. Presenting with a foot ulcer is a product of poor diabetes care. This goes to show that empowering the healthcare providers on quality diabetes care can be very valuable in reducing diabetes complications, including foot disease in our environment.

The most common initiating injuries were spontaneous blisters, falls, and nail puncture, similar to other reports in Nigeria.^{18, 23,24} We did not find tinea pedis or scald/burns as precipitating injuries in this group of patients, unlike the report of Edo in Benin. Two cases were precipitated by a rat bite; this has been reported previously by other authors,^{22, 24,25} but one patient had a bit from an antelope. We have not seen any other reported case due to this cause.

One very worrisome finding in this study is the delay in presentation at our health facility and the preference for other alternatives such as home dressing, herbal treatment, and chemist. The mean duration of foot ulcer before the patients presented to us was seven weeks. The delay in our setting is attributed to ignorance as regards to diabetes and foot complications. Poverty is another important reason for delay in presentation. In Nigeria, payment of medical bills is out of pocket, since we don't have strong social security system which could provide financial relief for patients.^{16-18,24,25} Sixty-six percent of the patients presented in Wagner grade 2 and 3, while 26.5% presented late in grade 4. Similar

findings were reported by Unachukwu et. al. in Port Harcourt and Ogbera et. al. in Lagos.^{16,17}

Diabetic patients often suffer from diabetic neuropathy due to several metabolic and neurovascular factors. This complication occurs in up to 58% of patients with long standing diabetes and occurs in more than 82% of patients with foot wounds.²⁶

Peripheral sensory neuropathy plays the central role in the development of foot ulcers, primarily by causing a loss of protective sensation. Importantly, most patients do not recognize the loss of protective sensation, underscoring the need for preventive efforts including regular screening and daily foot inspection.

Skin ulceration usually results from unperceived repetitive sheer-type trauma due to altered weight bearing (foot deformities and excess plantar pressure), ill-fitting shoes, or skin-penetrating trauma. Peripheral motor neuropathy can cause abnormal foot biomechanics and lead to distorted foot anatomy.^{8,27-29} In this study 68% of the patients had neuropathic ulcers. Other studies in Nigeria have documented that neuropathic ulcers are the most common ulcers in our patients presenting with foot ulcers.^{16-18,21-24}

Another risk factor for developing DFU and infection is limb ischemia. Peripheral arterial disease, typically affecting the major arteries between the knee and ankle, is twice as common in persons with diabetes as those without diabetes.^{11,29-31} Twenty percent of our patients in this study were found to have ischaemic ulcers.

In our patients the mean HbA1c was 7.4 (1.9%), range 3.2-14, with 55.3% having HbA1c above target (7%). It is well documented from research that poor glycaemic control, apart from delaying wound healing and promoting infection, is associated with lower limb amputation.^{18,32,33} The amputation rate in this study was 12.7%. The amputation rate is much lower compared to amputation rates from other centers in Nigeria, 42.6%-53.2%.^{12,16-18} Also, our mortality rate was 8.9% compared to the mortality rate of 53% found by Ogbera in Lagos in 2006.¹⁶ Management of DM foot ulcers in our center is

multidisciplinary involving the endocrinologist, the orthopaedic surgeon, the plastic surgeon, the diabetes educator/nurse, the orthoptist, and the dietician.

Early presentation of DMF ulcers coupled with aggressive wound care, control of infections, and adequate glycaemic control have been found to minimize the risk of lower extremity amputation. In extreme cases amputation is carried out when the ulcer is not healing well, is gangrenous, or becomes life-threatening to the patient.^{11,26,32-34}

In this study the mean duration of hospital stay was 29.1 (17.2) days, and the average cost of treatment about 197,000 naira (\$1,173), the highest being 235,000 naira (\$1,400). Similar findings have been documented by Ogbera et al in Lagos and Ngwogu et al in Abia.^{25,35} The high economic cost of successfully treating DMF ulcer places this care beyond the reach of an average Nigerian in the absence of an effective health insurance scheme. This high cost demonstrates the immense socio-economic burden of DMF ulcer, especially in the developing countries with very lean budget for health.

CONCLUSION

Early diabetes education and, very importantly, foot care education to persons suffering from diabetes is the easiest, least expensive, and most effective way of preventing foot ulcers, amputation, and death. Careful inspection of the diabetic foot on a regular basis and recognition of the most common risk factors for limb loss in our setting cannot be over emphasized

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