

## The Diabetes Foot Ulceration Burden: A Look at 10 Years In-Hospital Treatment Outcome in a Nigerian Teaching Hospital in the Commercial City of Aba

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### Abstract

Diabetic foot ulcerations (DFU) are, often, indications for admissions in the medical wards. Published literature on outcome of DFU admissions in Aba, South east Nigeria is scanty. The objective of this study, therefore, is to determine the treatment outcome of DFU managed in the medical wards of the Department of Internal Medicine, Abia State University Teaching Hospital (ABSUTH), Aba, South East, Nigeria. This was a 10-year retrospective descriptive study in which data about diabetic patients admitted for foot ulcers was extracted from the Admission/Discharge registers in the male and female medical wards of ABSUTH, Aba from May 1, 2007 to April 30, 2017. Relevant data obtained were analyzed using Statistical Package for Social Sciences (SPSS) version 20.0 software. A total of 1220 subjects were admitted because of DM related complications of which 220 (18.03%) were admitted on account of diabetic foot ulcers, made up of 130 (59%) males and 90 (41%) females. Mortality among the diabetic admissions with foot ulcers was 20% and the mean duration of hospitalization was  $25.04 \pm 23.10$  days with most deaths occurring within the first week of hospitalization. The burden of diabetic foot ulcerations in Aba is significant. Mortality from DFU is high with a long and variable duration of hospitalization. Strengthening of the diabetes care services and supports is recommended to prevent diabetic foot ulcers and achieve favorable outcome.

**Keywords:** Aba; Diabetes Mellitus; Foot Ulcers; Medical Wards; Outcome; Nigerian Teaching Hospital

### Introduction

Diabetes mellitus (DM) is on the increase [1], more so, in sub Saharan Africa [2] due to ageing of the population, improving survival of people living with diabetes, obesity, increased urbanization and westernization, dietary changes and physical inactivity. In year 2010, diabetes mellitus was projected by the World Health Organization (WHO) to afflict 438 million people world-wide by 2025 but, by 2019, six years before the projected date, 463 million people in the world were already living with diabetes [3]. By 2045, International Diabetes Foundation (IDF) projection is that 700 million people in the world will be living with diabetes [4]. In conformity with this trend of increasing burden of diabetes among the Sub Saharan Africans, chronic diabetic complications including foot ulcers in persons living with diabetes have been on the increase too.

Prevalence of foot ulcerations in persons living with diabetes worldwide [5] is estimated at 6.3% but in Africa, the prevalence of DFU [6] is higher at 7.2%. It is documented that persons living with diabetes have a 25% chance of developing DFU in their lifetime [7-9] thereby accounting for a majority of all non-traumatic amputations [10]. In Nigeria, the prevalence of DFU in persons living with diabetes ranges from 11 to 32% [11,12] with amputation rates of 12 - 53% [13] and mortality rates ranging from 8.7 - 40%, making it the second commonest cause of diabetes-related deaths in the medical wards after hyperglycaemic emergencies [14,15]. In Nigerian tertiary hospitals based studies [16-18], DFU was a major cause of medical admissions, morbidity and mortality.

Risk factors for diabetic foot ulceration include longer duration of DM, poor glycaemic control, nerve damage (peripheral neuropathy), peripheral vascular compromise, inappropriate foot wear and poor foot care, foot deformity, previous foot ulceration or amputation, male sex, smoking, dyslipidemia, farming or fishing jobs [19,21]. Diabetes foot ulcers heal slowly leading to prolonged wound care and increased length of hospital stay or may be non-healing requiring lower limb amputations. Length of hospital stay for diabetic in-patients in Aba [17] and Port Harcourt [18], all in Nigeria, was longest for those admitted on account of diabetic foot ulcerations. In their multi-centre evaluation of diabetic foot ulcer in Nigeria (MEDFUN) study, the median duration of hospital stay for the patients admitted for DFU was 53 days [16].

In the commercial city of Aba, South East Nigeria, there is a dearth of published studies on the treatment outcome of diabetic foot ulcerations in the medical wards of ABSUTH, Aba, Southeast Nigeria. This study, therefore, set out to bridge that gap in knowledge; to generate data that will be used by health policy makers, healthcare managers, clinicians and government in planning and allocation of health services and resources.

### Subjects and Methods

#### Study setting/location

This study was carried out in the male and female medical wards of the Department of Internal Medicine, Abia State University Teaching Hospital (ABSUTH), Aba. Aba is a commercial city in the Southeastern region of Nigeria known for her industrial, mercantile and craft-work activities. The hospital is the only tertiary health facility in Aba and gets referrals from all the primary and secondary health facilities in Aba and the neighboring states. The medical wards (male and female) have 52 beds with 2 isolation wards. Medical in-patients come from the emergency department, medical out-patients clinic, Anti-retroviral Therapy (ART) clinic, transfers from the other specialties of the hospital such as the obstetrics/gynaecology or surgical wards. The Department of Internal Medicine, ABSUTH, Aba has the major sub-specialties in Medicine (Cardiology, Endocrinology, Nephrology, Gastroenterology, Infectious Disease unit and Pulmonology), each headed by a consultant in the subspecialty and assisted by medical residents and interns. The medical wards have other support staffs such as the nursing unit, medical records, pharmacy section and the cleaners.

#### Study design

This was a retrospective descriptive study carried out on records of all patients admitted with a diagnosis of diabetic foot ulceration with or without gangrene into the medical wards. The study covered a period of ten years between May 1, 2007 and April 30, 2017. Using the Nurse's Inpatient Admissions/Discharge Registers in the male and female medical wards, nurses report books, Death certificates and in some cases, case notes of some patients from the Medical Records Department of the hospital, the patients admitted with diabetic foot ulcer in the medical wards were recruited. All the diagnoses were based on the final diagnoses made by the supervising consultants. A diabetic foot ulcer in this study was, as per the International Working Group on the Diabetic Foot (IWGDF) definition, "a full thickness wound through the dermis of skin in the area distal to the ankle joint in a patient living with diabetes" [21]. Duration of hospital stay of 1 day refers to patients in whom the outcome of admission occurred within 24 hours of admission in the medical wards.

#### Inclusion criteria

All patients admitted into the medical wards with a diagnosis of diabetic foot ulcer from age 18 and above were included in the study. Patients with repeat visits within the study period were counted as two or more depending on their number of visits. Diabetic patients admitted to the medical wards because of ulcers in their hands were, also, included in the study.

**Exclusion criteria**

Patients whose data were incomplete or missing were excluded from the study. Patients previously admitted in the surgical or orthopaedic wards and had limb amputations there, even because of DFU before being transferred to the medical wards were, also, excluded from the study because their length of hospital stay before the transfer were not captured in the data sources.

**Data collection**

Data collected from each patient’s record included - age, gender, definitive diagnosis, duration of hospital stay and outcome during admission. In this study, the outcome measures were improved and discharged home, died, discharged against medical advice (DAMA) or transferred to another specialty outside the medical wards or to another health facility. Amputation as a treatment option or outcome was not captured as an outcome measure.

**Ethical consideration**

Ethical approval was obtained from the Institution’s Health Research Ethics Committee before commencing the study.

**Data analysis**

The Statistical Package for Social Sciences (SPSS Inc. Chicago IL. USA) version 20.0 software was used for data analysis. For continuous variables such as the ages of the study subjects and duration of hospital stay, mean values and standard deviations (SD) were calculated and the means compared using two samples t-test. Categorical variables such as gender, diagnosis and treatment outcome were summarized using proportions expressed in percentages. The categorical variables were compared using the non-parametric test, chi square test. The level of statistical significance was set at  $p < 0.05$ .

**Results**

A total of 6587 admissions were recorded in the medical wards within the study period of which 1220 (18.5%) were admitted because of DM related complications. Out of this 1220 diabetic admissions, 220 (18.03%) were admitted on account of diabetic foot ulcers, made up of 130 (59%) males and 90 (41%) females with a ratio of 1.44:1. The age range was 25 - 92 years with a mean age of  $56.34 \pm 12.29$ ; male  $56.58 \pm 12.14$  years and female  $55.99 \pm 12.57$  years. The differences in the mean ages of the male and female participants were not statistically significant ( $t = 0.35, p = 0.73$ ). Middle aged subjects (40 - 59 years) and the elderly population (60 years and above) were the predominant age groups admitted in the medical wards of ABSUTH on account of DFU (Table 1).

Age categories in years	Frequency (n = 220) (%)
< 20	Nil
20 - 39	12 (5.5)
40 - 59	121 (55)
60 and above	87 (39.5)
<b>Gender</b>	
Male	130 (59)
Female	90 (41)

**Table 1:** Frequency of diabetic foot ulceration admissions stratified by age groups and gender in ABSUTH.

The overall mortality was 20% and majority of the DFU admissions (66.4%) improved and were discharged home (Table 2). Most of the deaths (56.8%) occurred among the middle aged patients (Table 3). Of the patients that were discharged against medical advice, a greater number of them were females despite that the study population was predominantly males (Table 2). The mean duration of hospitalization for the subjects was 25.04 ± 23.10 days with a range of 1 - 122 days and most deaths, 25 (56.8%) and DAMA, 9 (36%) occurred within the first seven days of hospitalization (Table 4).

Outcome	Male	Female	Total (%)
Discharged home	94	52	146 (66.4)
Died	24	20	44 (20)
DAMA	9	16	25 (11.4)
Referred	3	2	5 (2.2)
Total	130	90	( $\chi^2 = 7.58, p = 0.06$ )

**Table 2:** Treatment outcome of DFU in ABSUTH, Aba.

Age group	Home	Died	DAMA	Referred	Total (%)
20 - 39 years	8	3 (6.8%)	1	0	12 (5.5)
40 - 59 years	80	25 (56.8%)	13	3	121 (55)
60 years and more	58	16 (36.4%)	11	2	87 (39.5)
Total	146	44 (100%)	25	5	220 (100)

**Table 3:** Treatment outcome of DFU stratified by age groups in ABSUTH, Aba.

Day of hospitalization	Died (n = 44)	DAMA (n = 25)	Referred
Day 1	8	4	1
Day 2	5	0	0
Day 3	4	2	0
Day 4	2	0	0
Day 5	1	0	0
Day 6	4	0	0
Day 7	3	3	0
	Total = 25 (56.8%)	Total = 9 (36%)	

**Table 4:** Duration of hospital stay in relation to outcome of treatment.

## Discussion

The main findings of this study were that DFU contributed significantly to diabetic admissions in the medical wards with the middle aged group being the predominant population admitted for DFU while an overall considerable mortality was noted. Again, DFU was associated with long duration of hospital stay with majority of deaths and DAMA occurring within the first week of hospitalization.

In the index study, DFUs accounted for 18.03% of all diabetes related hospital admissions within the study period and this is greater than the 16% and 14% noted in Lagos [23] and Port harcourt [18] respectively but less than the 24.9% reported in the MEDFUN [16]

study. It is important to note that DM related complications in the MEDFUN study was 13.8% of all in-hospital admissions which was less than the 18.5% noted in the index study. The contribution of DFUs to diabetes related hospitalizations in other Nigerian cities [18,23] and some other African countries [24,25] is equally high. The implication of this huge burden of DFU in these studies is the socioeconomic losses incurred by the patients, their caregivers and the nation while the condition is being managed. The patients are, also, subjected to mental, physical and psycho-social trauma as a result of DFUs. In contrast to our findings, DFU burden in the developed countries is low [26,27], as low as 2.05% of DM related hospital admissions.

More males living with diabetes than females were hospitalized for DFUs over the study period. This is similar to findings in the MEDFUN study and in some other Middle East countries [28-30]. The explanation why DFU with or without gangrene was seen more among the males in the present study is not clear but may have to do with the male gender's roles as the breadwinner of the family despite their diabetes status. Again, men are more exposed to trauma in their day-to-day activities while women are more self-caring than men. Hospitalization duration was long with patients that had DFU with or without gangrene for the obvious reasons that some of them needed wound debridement and even limb amputation which were associated with prolonged period of wound care. The implication of this prolonged duration of hospital stay for patients with DFU with or without gangrene is loss of man-hour in hospitals, poverty, lack of resources for future diabetes care and premature death.

Young people and the middle aged persons combined at 60.5% were the predominant age group afflicted by DFU in this study and this is comparable to the 73.8% noted in the MEDFUN study. These findings are similar to other Nigerian studies [12,13,31] where the people in the working class group were affected most by DFU. Findings in these local studies contrast sharply with the situations in USA and Middle East countries [32-35] where DFUs were most common in the elderly population. The middle aged persons in every nation drive the economic wheel of the nation such that the socioeconomic consequences of this illness in Nigeria and other low income countries are enormous. Cost implications of DFUs are counted in huge dollar costs of treatment, man-hour loss in hospitals for both patients and caregivers, socio-psychological and emotional trauma of the illness.

Mortality from diabetic foot ulcerations is high in this study at 20% which is comparable to the 20.5% and 8.7 to 40% noted respectively in the MEDFUN [16] and other Nigerian hospital based studies [23]. Mortality in our study, however, is higher than the 6.7% noted in Port harcourt [18], Nigeria where 81.7% improved and were discharged home following conservative and surgical management. In the index study, 66.4% improved and were discharged home. Amputation as a treatment option was not documented in our study even though results of studies on amputation in Nigeria over a 15 year period has shown a 12.3% amputation rate due to diabetic gangrene in the 4<sup>th</sup> place after trauma, complications of traditional bone setting and malignant tumors at 34%, 23% and 14.5% respectively [36]. In Port harcourt [18], Nigeria, 11.6% of the patients treated for DFUs were discharged against medical advice (DAMA) either because they could not afford further hospital treatment or because they rejected amputation option prescribed for them. This is similar to the 11.4% DAMA rate noted in the index study.

Finally, it is important to note that majority of the deaths (56.8%) and DAMA (36%) in this study occurred within the first week of hospitalization in the medical wards. This result may suggest serious shortcomings in the nursing and medical care which are crucial to a favorable outcome. It is possible that most of those deaths were secondary to associated medical and other comorbid conditions such as sepsis, hyperglycaemic emergencies, foot gangrene, severe anaemia and end-stage renal diseases (ESRD). Reasons for the high DAMA rate (11.4%) in this study are not clear especially coming within the first week of hospitalization. Late presentation to the diabetes care team with a subsequent prescription of amputation soon after hospitalization may have been the reason for the early request of DAMA in the index study.

## **Conclusion/Recommendations**

This study has shown that diabetic foot ulceration is a major cause of diabetes related hospital admissions with considerable mortality and DAMA especially in the acute phase of a vastly prolonged hospitalization. Again, the burden of DFU was more on the active working class group than the geriatric population. It is recommended that with effective self-monitoring of blood glucose (SMBG) practices, improvement in general health education programmes and diabetes self-management education (DSME), strengthening of the diabetes care services and supports, DFUs can be prevented. Prevention of DFU is more cost effective than the multidisciplinary care services needed to achieve a favorable outcome with DFU

## **Limitations**

A major limitation of this study was its inability to show the proportion of the patients afflicted with DFU who had limb amputations. Data on amputation was not documented in the data sources used in this retrospective study. Limb amputation was an important outcome measure documented in most of the studies on DFUs as it has been shown by IDF that a lower limb is being amputated every 30 seconds globally because of diabetes [37] and that DM is the commonest non-traumatic cause of limb amputations in the world [22].

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