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## Diabetic Foot Ulceration in a Secondary Health Facility

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### Authors' contributions

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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### ABSTRACT

**Aims:** To determine the prevalence, pattern and presentation of the diabetic foot ulcer.

**Background:** A diabetic foot ulcer is a major complication in diabetes mellitus and probably the major component of diabetic foot. It occurs in 15% of all patients with diabetes and precedes 84% of all lower leg amputations.

Poverty, low economic status and ignorance have resulted in this devastating disease. It may worsen in the next decade.

There are multiple risk factors that predispose an individual to DM foot ulcer; they include age, gender(male), type of DM, glycaemic (HbA1c) or FBG level, duration of DM (>10yrs) occupational status particular habits of self-foot care and infection.

**Patients and Methods:** This consists of 69 diabetic patients; male and female included done between the months of January 2019 to March 2019.

A demographic data questionnaire and social history were obtained. Overnight fasting serum glucose was obtained. Serum glucose was determined by enzymatic glucose oxidase method.

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Data obtained were subjected to Stata Version 11 Software to determine the graphical representation, mean, standard deviation of the analysis.

**Results:** Thirty-Five 35 were male and 34 were female had type 2 diabetes. Forty-Three 43 patients had foot ulcer, 21 patients had gangrene and 5 had infection. The number of patients with peak glucose values 10 mmol/L and least glucose at 20-25 mmol/L. Those of duration 4-6 years were the most affected the age group most affected is between 40-59 yrs.

**Discussion and Conclusion:** Risk factors for foot ulceration discovered among a host other factors identified in this study, were the infection, low socioeconomic status, improper footwear, poor glycaemic control, structural foot deformity and untreated gangrene.

The role of poor glycaemic control in the genesis of diabetic complications cannot be overemphasized as the mean FPG was noted to be considerably higher in patients with foot ulceration As part of a comprehensive foot care programme, education on foot care should be directed at patients, family members and healthcare providers.

Not less than 85% of all diabetic foot-related problems are preventable. This can be achieved through a combination of good care of foot, provided by an inter-professional diabetes care team, and appropriate education for people with diabetes.

*Keywords: Diabetic foot ulcer; diabetes mellitus; diabetic patients; glycaemic control.*

## 1. INTRODUCTION

Diabetic mellitus T2DM is a group of metabolic diseases characterized by elevated blood glucose level (hyperglycemia) resulting in defects of insulin secretion, in insulin action or both. Diabetic mellitus is not a pathogenic entity but a group of different metabolic disorders. The prevalent T2DM is worldwide and increasing [1-3].

It has been conservatively estimated T2DM will approximately double by 2030 at which time 355 million people will have diabetes.

A diabetic foot ulcer is a major complication of diabetes mellitus, and probably the major component of diabetic foot. it occurs in 15% of all patients with diabetes and precedes 84% of all lower leg amputations.

Urbanization and adoption of western lifestyles have led to the prevalence of diabetes with its attendant complications are increasing in Nigeria. Poverty, low economic status and ignorance have resulted in this devastating disease. It may worsen in the next decade.

There are multiple risk factors that predispose an individual to DM foot ulcer; they include age, gender(male), type of DM, glycaemic (HbA1c) or FBG level, duration of DM (>10yrs) occupational status particular habits of self-foot care and infection. One of the major complications of T2DM is diabetic foot ulcer and occurs in 15% of all patients with T2DM. It precedes 84% of all lower leg amputation [4,5].

The pathogenesis of diabetic foot ulceration is a complex interplay of a number of elements including peripheral neuropathy, structural deformities, elevated plantar pressures, limited joint mobility, vascular disease, and various extrinsic sources of trauma such as ill-fitting shoes show wear or foreign objects in shoes [5-7].

A study done in Calabar Nigeria revealed that diabetes foot gangrene accounted for 58% of all major limb amputations [8].

Another work in Port Harcourt gives a 19.1% among patients with hand-foot ulcers and 51% with left lower limbs ulcers [9].

In India, approximately 40,000 legs are being amputated annually due to DM2 with 75% being neuropathic complication [10].

The prevalence and remedy of this challenge are not documented in this setting. The aim of this study is to determine the prevalence, pattern and presentation of this challenge in this study.

## 2. PATIENTS AND METHODS

### 2.1 Study Design and Settings

This is a cross-sectional retrospective interventional study diabetic patients attending plateau specialist hospital (PSSH) in their surgical outpatient department and surgical wards referrals come from neighbouring general hospitals and various PCH's.

### 2.2 Study Population

This consists of 69 diabetic patients; male and female included from done between the months of January 2019 to March 2019.

Patients with leg ulcer without T<sub>2</sub> DM were excluded. Amputees due to trauma of RTA or other causes were also be excluded.

### 2.3 Data Collections and Analysis

A demographic data questionnaire and social history were obtained. Overnight fasting serum glucose was be obtained. Serum glucose was determined by enzymatic glucose oxidase method.

For every 1% HbA1c, there is a 2mmol/L change in FBG. The goal is to achieve an HbA1c as close to normal as possible without significant hypoglycemia. In most normal individuals, the target HbA1c should be 5-7%, preprandial capillary plasma glucose 4.4-7.2 mmol/L and peak postprandial capillary plasma glucose <10.0 mmol/L (WHO).

### 2.4 Statistics

Data obtained were subjected to Stata Version 11 Software to determine the graphical representation, mean, standard deviation of the analysis.

## 3. RESULTS

Of the 69 diabetic patients with past or present ulceration studied, 35 were male and 34 were female had type 2 diabetes. Table 1 shows demographic characteristics with age range of 19years and 50.7% males and 45% female. Table 2 shows those that had foot ulceration when seen were 43. Forty-Three 43 patients had foot ulcer, 21 patients had gangrene and 5 had infection.

**Table 1. Socio-demographic characteristics of the patients (n=62)**

Age group (years)	Number of patients (%)
20 – 39	1.61
40 – 59	69.35
60 – 79	29.03
<b>Sex</b>	
Male	50.7
Female	45.0

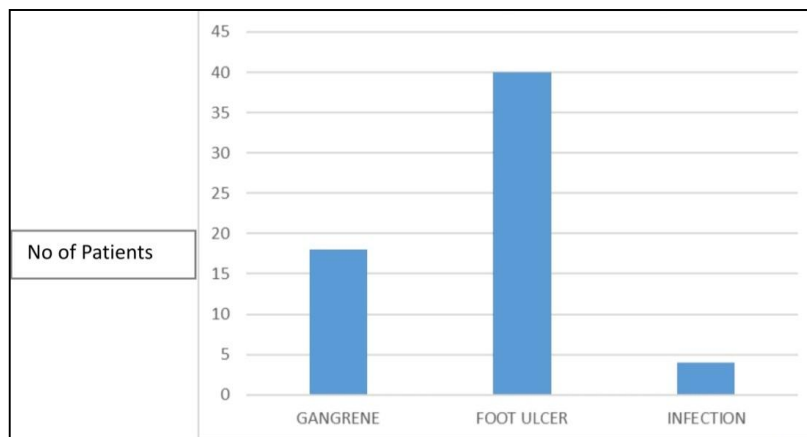
Table 2 clearly depicts the pattern of presentation of the disease with gangrene (30.43%), foot ulcer (62.32%) and infection (7.25%).

Fig. 1 illustrates the pattern graphically and Fig. 2 shows various glucose range and the number of patients with peak values 10 mmol/L and least at 20-25 mmol/L.

This is the most important risk factor in addition to the age and gender examined.

Table 3 depicts the percentage of patients at a duration most affected. Those of duration 4-6years are the most affected. Those from 7years and above might have progressed to amputation of r worst of all death.

1. Glycaemic control was classified using the mean fasting plasma glucose (FPG) over a period of 3-6 months [8]. Good control was an FPG<6.6 mmol/l, fair control an FPG of 6.7-7.7 mmol/l.
2. Duration of diabetes was described as short if it was between 0 and 5 years, medium if it was 6-10 years, and of long duration if greater than 10 years.



**Fig. 1. Graphical representation of the pattern of disease with highest affectation is the foot ulcer**

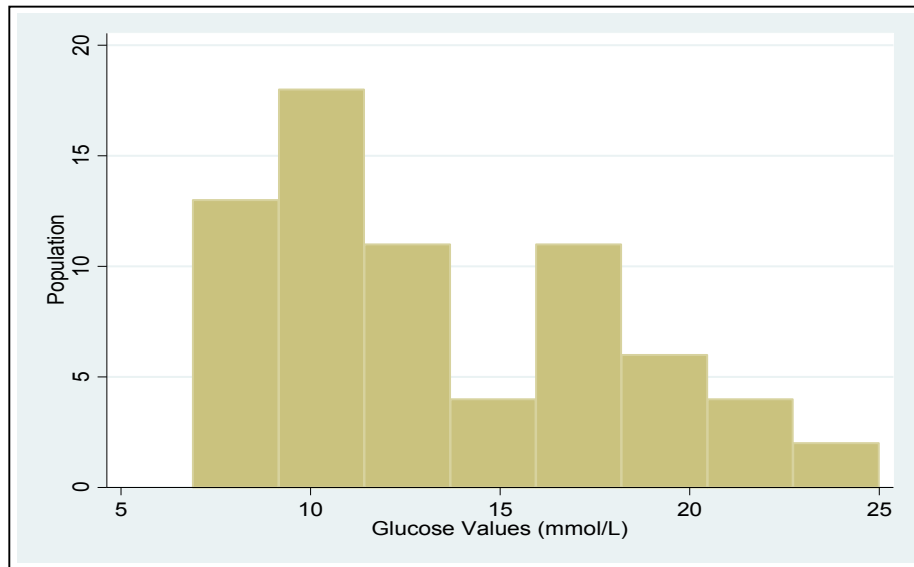


Fig. 2. Shows various glucose range and the number of patients

Table 2. Clinical presentation of patients

	Gangrene	Foot ulcer	Infection
Population	21	43	5
% Population	30.43%	62.32%	7.25%

Table 3. Duration of DM

Duration (year)	No of patients (%)
1-3	14.5
4-6	46.4
7-10	24.64
11-14	14.5
>15	0

#### 4. DISCUSSION

The risk factors for foot ulceration discovered among a host other factors identified in this study, were the infection, low socioeconomic status, improper footwear, poor glycaemic control, structural foot deformity and untreated gangrene.

In this study, those of male sex is greater than 61 years of age were found to have an increased risk for foot ulceration – the odds ratio estimate of these factors being high. Similar findings have been documented by others [4,11].

The role of poor glycaemic control in the genesis of diabetic complications cannot be overemphasized as the mean FPG was noted to be considerably higher in patients with foot

ulceration. Various studies have shown similar findings [4,11,12,13].

The long duration of diabetes, which has been inconsistently reported as a risk factor for diabetic foot ulcers [11] was not found to be a significant risk factor in our study. Fourteen point five (14.5%) per cent of foot ulcer patients in this study had diabetes diagnosed only when presenting with foot lesions. These corroborate the general observation that the diagnosis of diabetes is sometimes made with accompanying complications. Other factors that were poorly related to foot ulcer risk from our study were smoking, low socio-educational status and walking unshod. Abnormal footwear obviously also contributes. Chronic infection, which in the setting of uncontrolled hyperglycaemia continues unabated and causes a chronic diabetic foot ulcer which may go on to amputation.

The triad of neuropathy, ischaemia and infection; resulting from chronic hyperuricaemia and contributing to the pathophysiology of the diabetic foot has consistently been emphasized.

Hyperuricaemia plays an important role in the initiation of diabetic foot ulcers, in its recurrence,

chronicity and worsening of diabetic foot ulcers and eventually contributing to amputations. It has been documented recently that careful glucose control can significantly decrease the complications of diabetes [14], maintain near-normal glucose levels and those patients who have been successful in achieving euglycaemia definitely have better outcomes.

In a study, it was reported for the first time that patients whose HbA1c increased during their study (n=101), 20.7% of all wounds and 21% of dermal substitute-managed wounds (n=105) healed: whereas, in patients whose HbA1c levels remained stable or decreased, 26.3% of all wounds and 47% of dermal substitute-managed wounds healed (p<0.05).

However, in a majority of diabetic patients, for a variety of reasons, good blood glucose control is not easily obtained. Therefore, the management of diabetic complications still remains a major area of focus. Well-controlled diabetes is also reported to decrease the prevalence of diabetes-specific cutaneous disorders associated with chronic hyperglycaemia [7].

Late presentation to the hospital may result from ignorance of diabetes (13.1% of our patients with foot ulcer were previously undiagnosed of diabetes) and its complications, self-care at home, patronage of chemist/pharmacist, lack funds for hospital management and fear of limb amputation if they came to the hospital. There is also shortage of time for Diabetes care specialists in our practice locale. Most patients will seek treatment from health care providers with little or no training in managing diabetic foot ulcers. Delays in referring patients to diabetes care specialists also contribute late presentation.

The study also documented a high level of poor short-term diabetes control (casual blood glucose <6.1 mmol/L) and our patients at the point of entry with about (60%) of them having casual blood glucose above 13.8 mmol/L.

## 5. CONCLUSION AND RECOMMENDATION

Authors concluded that many risk factors for foot ulceration are potentially preventable. As part of a comprehensive foot care programme, education on foot care should be directed at patients, family members and healthcare providers.

Not less than 85% of all diabetic foot-related problems are preventable. This can be achieved through a combination of good care of foot, provided by an inter-professional diabetes care team, and appropriate education for people with diabetes. Successful diagnosis and treatment of patients with chronic wounds involve holistic care and a team approach.

## CONSENT

As per international standard, patient's written and informed consent has been collected and preserved by the author(s).

## ETHICAL APPROVAL

As per international standard written ethical approval has been collected and preserved by the author(s).

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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