Annals of Health Research
Volume 3, Issue No 2: 98 - 104
July- December 2017

ORIGINAL RESEARCH

Prevalence and pattern of Diabetic Foot Ulcers among adults with Diabetes mellitus in a secondary health care facility in Lagos, Nigeria

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Abstract

Introduction: The prevalence of diabetes mellitus with the attendant complications is increasing worldwide, contributing significantly to the health and socioeconomic burden of individuals, family and health care system.
Objective: To determine the prevalence and pattern of diabetic foot ulcers recorded among patients with diabetes at the General Hospital Marina, Lagos.
Methods: A descriptive cross-sectional study involving all the consecutively recruited attendees at the Out-patient Clinic was conducted between February and July 2014 using a semi-structured questionnaire.
Results: Six hundred and twenty adults were invited to the study out of which 8 declined, giving a response rate of 98.7%. The mean age of the participants, mostly females (78.9%), was 61.1±11.0 years. The subjects had lived with diabetes mellitus for more than 3years (76.3%) and had a mean blood glucose level of 136.4 ± 59.7mg/dl. Over two-thirds of them (79.6%) were receiving oral anti-diabetic drugs with a history of poor drug compliance in more than three-quarters (485; 79.2%). The prevalence of Diabetic Foot Ulcer was 17.3%; these presented as swelling (37; 34.9%), blisters (33; 31.1%), trauma (25; 23.6%) and burns (11; 10.4%). The prevalence was associated with female gender and age above 60 years (p = 0.0001 and p = 0.005 respectively). None of the other socio-demographic characteristics had significant association with the presence of diabetic foot ulcers.
Conclusion: This study revealed a high prevalence of diabetic foot ulcers, especially among the elderly females. Patient education on diabetes should include foot care as this may reduce its prevalence and burden.

Key words: Prevalence, Pattern, Diabetic foot ulcer, Secondary Health Care Facility, Nigeria

Introduction

Diabetes mellitus (DM) is the commonest endocrine disorder worldwide, Nigeria inclusive. Diagnosed by the presence of elevated blood glucose, the care of diabetes mellitus requires constant blood glucose monitoring, as poor control is linked to a number of serious long term complications of increasing global prevalence. [1, 2]

The International Diabetes Federation (IDF) estimated about 415 million people afflicted with DM in 2015, with a projected rise to 642 million by the year 2040. [3] In Africa, estimated 14.2 million people lived with DM in 2015 with a projected increase to 34.2 million by the year 2040. [3, 4] Nigeria has the greatest number of people living with DM (PLWD) in Africa, about 1.7 million, which is expected to increase to 4.8

by the year 2030, [3] with varying prevalence rates ranging between 0.65% in rural Mangu to 11.0% in urban Lagos. [5] Adequate control of blood glucose and other cardiovascular risk factors reduces the morbidity and mortality associated with DM, though the increased incidence of DM translates to increased incidence of late complications with major healthcare and economic challenges. [6-8]

Diabetic Foot Ulcer (DFU), commonly and widely defined by the Wagner classification system, which is based strictly on ulcer depth and description, is probably the most preventable late complication of DM and it is associated with significant morbidity and mortality. [9] DFU results mostly from the way healthcare providers care for the patients or the way the patients care for themselves. About 5-10% of DM patients are expected to have had past or present foot ulceration, which may result in annual incidence of amputations of 1-7%. [10] The ulcers result from a interplay of a number of factors, none of which, alone, is sufficient to cause ulceration: neuropathy, trauma, vascular disease and foot deformity. [11]

Previous studies on DFU in Nigeria, reported varying sex prevalence, but the condition is known to be common in lower socioeconomic group with a peak age in the sixth decade, which is an increase from a previously reported occurrence in the fifth decade of life. [12] In a study on mortality and relationship with demographic, clinical and laboratory features at presentation, a mean age of 56.1 ± 1.9 years, mean disease duration of 8.3 ± 1.1 years and in-hospital mortality rate of 40.3%, depending on ulcer grade and presence of anaemia and leucocytosis, were reported. [13] A similar study of diabetes-related admissions conducted in Lagos, Nigeria reported a prevalence rate of 11.7% for DFU. [14] Studying the pattern and classification of outcome of DFU cases managed at an Orthopaedic clinic of a tertiary care center, Musa proposed a new DFU grading system. [15] The burden of DM is enormous, in terms of direct cost of intensive monitoring of blood glucose control as well as managing cardiovascular, renal and neurological complications. The average cost for treating patients with DFU, including the cost of medications and surgery, account for about 46% of the total cost of diabetes care, with indirect cost due to absence from work from morbidity and mortality. [15,16]

The prevention, early diagnosis and prompt treatment of DM are associated with significant reduction in DFU morbidity and mortality. [17,18] Unless appreciated, severe DFU with life threatening limb gangrene will continue to result in increased morbidity and mortality necessitating major amputations and worsened mental state of affected individuals. [19, 20] Therefore, this study sought to determine the prevalence and pattern of DFU among PLWD from a secondary health care facility.

Methods

Study location and design

This is a descriptive cross-sectional hospital based study of foot ulcer among patients with diabetes attending the Outpatient Clinic of the General Hospital, Lagos. The hospital is located on the Lagos Island; established in 1893 as a military hospital for members of the British Armed Forces during the colonial rule in Nigeria and it later became the first General Hospital in Nigeria.

The subjects were recruited consecutively into the study between February and July 2014. A total of 620 PLWD was invited to participate in the study, but eight (8) declined participation, leaving 612 participants (response rate of 98.7%) whose data were analysed.

Ethical Considerations and Research Tools

The Health Research Ethics Committee (HREC) of the Olabisi Onabanjo University Teaching Hospital, (OOUTH), Sagamu approved the study and permission to conduct the study was also obtained through the Chief Medical Director of General Hospital Lagos. Written informed consent was also obtained from all the participants following detailed explanation of the study objectives and procedures.

Procedure

A semi-structured questionnaire containing open and close-ended questions was used to obtain data from the participants; the data included socio-demographic characteristics of the participants and pattern of foot ulcers in those with diabetic foot ulcers. The questionnaire was pre-tested among adults with diabetes mellitus attending the Out-patient Clinic of another secondary health facility at Surulere Lagos, after which it was revised with rephrasing or excision of ambiguous questions. The questionnaires were interviewer-administered and the administration was done by medical doctors with appreciable experiences in previous and similar research works and who were trained for this aspect of the study.

DFU was defined using the Wagner classification system while blood glucose assay was done by the enzymatic oxidation system described by Barham

and Trinder.[21] Completed questionnaires were retrieved immediately.

Data management and analysis

The data obtained were reviewed, organized and entered into a computer using the Statistical Package for the Social Sciences (SPSS) version 17.0. Continuous and categorical variables were identified; proportions and mean (±SD) values were compared using the Chi-Square test and Student's t-test, respectively, with the level of statistical significance set at $p < 0.05$.

Results

Socio-demographic Characteristics of study population

The 612 subjects enrolled into the study had a mean age of 61.1 ± 11.0 years, mostly females (483; 78.9%) and of the Yoruba ethnic group (538; 87.9%). Only 65 (10.6%) of the subjects attained tertiary level of education with secondary education and primary education as the highest qualification among 33.0% and 31.9% respectively. More than half of subjects (339; 55.4%) were semi-skilled workers, earned average monthly income ranging between N20,000.00 and N49,000.00 but 194 (31.7% were unemployed. The mean duration of the illness (Diabetes mellitus) among the study participants was 7.3 ± 6.2 years as shown in Table I.

Prevalence and Pattern of diabetic foot Ulcer and disease duration

The prevalence of foot ulcers among the subjects, (mostly Grade 2 Wagner), was 17.3% (106/612) with more than half of them diagnosed after 10 years of the onset of diabetes. Grade 1 and 2 foot ulcers comprised 31.1% and 68.9% respectively. DFU was commoner among the female subjects [90 vs 16 gender ratio 5.6:1]; with 69 (65.1%) aged 60 years and above and mostly, of the Yoruba ethnic group.

The remaining 506 (82.7%) without foot ulcers had lived with DM for about 3 years. About 13.1% of the participants with foot ulcers were not aware that they had Diabetes mellitus until the onset of the foot ulcers. The foot ulcers started as swellings in 37 (34.9%), as blisters in 33 (31.1%), were due to trauma in 25 (23.6%) and resulted from burn injury in only 11 (10.4%) cases. (Table II). Apart from age and ethnicity, no other socio-demographic characteristic was statistically associated with the presence of DFU [Table III].

Table I: Socio-demographic characteristics of the subjects

Characteristics		*Frequencies (n = 612)*	*Percentages*
Age Groups (Years)			
	30-39	22	3.6
	40-49	65	10.6
	50-59	156	25.5
	60-69	226	36.9
	70+	143	23.4
Gender			
	Male	129	21.1
	Female	483	78.9
Ethnicity			
	Yoruba	538	87.9
	Igbo	65	10.6
	Hausa	9	1.5
Occupation			
	Unemployed	194	31.7
	Civil servant	79	12.9
	Semi skilled	339	55.4
Monthly Income (Naira)			
	<10,000 150	24.5	
	10,000-19,000	151	24.7
	20,000-49,000	189	30.9
	50,000-99,000	94	15.4
	100,000+	28	4.6
Educational qualification			
	None formal	150	24.5
	Primary	195	31.9
	Secondary	202	33.0
	Tertiary	65	10.6

Subjects' attitude to Diabetes Care and Foot Ulcer management

Though a majority of the subjects (76.3%) had lived with DM for more than 3 years, they had a mean (± SD) fasting blood glucose level of 136.4 (±59.7) mg/dl. A large number (78.9%) complied with clinic attendance; almost all (92.8%) were on anti-diabetic medications with more than three-quarters (487; 79.6%) on oral anti-diabetic agents and 20.4% on Insulin. However, about 16.5% were compliant with drug treatment (Table IV). Only 30.5% of the subjects had foot education as part of diabetes management while 44% of those with foot ulcers presented late (after 3 weeks). Initial self- care, patronage of drug vendors from lack of funds for hospital management (44%) and fear of limb amputation (35%) were identified as some of the factors responsible for late presentation.

Table II: Prevalence and pattern of occurrence of Diabetic Foot Ulcer (DFU)

Characteristics		*Frequencies (n = 612)*	*Percentages*
Foot ulceration			
	Present	106	17.3
	Absent	506	82.7
Interval* (n = 106)			
	Undiagnosed DM**	14	13.2
	< 5 years	10	9.4
	6-10 years	20	18.9
	11-15 years	34	32.1
	> 15 years	28	26.4
Presentation of DFU (n = 106)			
	Swelling	37	34.9
	Blisters	33	31.1
	Traumatic	25	23.6
	Burns	11	10.4

KEY: * Interval between the diagnosis of Diabetes mellitus and occurrence of Foot Ulcers; **Diabetes mellitus

Discussion

This study on diabetes foot ulcer conducted at a secondary health facility in Nigeria is in the authors' opinion, one of the few available, as most reports are from tertiary care centers. [5, 13-15] The subjects in the present study comprised mostly females, and age in the sixth decade of life, which are at variance with previous reports of no sex predilection and age in the fifth decade for Type 2 Diabetes mellitus (T2DM). [3,4,13] This may be attributed to better health care-seeking behaviours of women and a higher tendency of women to attract emotional and financial supports from family and friends during illnesses. [17] The current trend of higher age incidence peaking at the sixth decade of life further lends supports the known fact that T2DM is a disease of the elderly. [3,12,15]

The subjects' socio-demographic characteristics on educational attainment (mostly secondary), occupation (mostly semi skilled and artisans) and low socioeconomic status are similar to previous reports classifying T2DM as a disease of the lower socioeconomic class. [3, 5, 22] These factors are known to influence health care-seeking behaviour and coping ability of PLWD. [17, 18] Though, the majority of the subjects had lived with DM for more than three years, the recorded mean fasting blood glucose of 136.4mg/dl depicts poor control similar to earlier reports of poor glycaemic control with the possible onset of long term complications of DM. [3, 6, 18, 19] Comprehensive diabetes education, including foot care has been shown to reduce morbidity and mortality associated with complications of DM. [6,17,22]

Although a large proportion of the subjects in the present study complied with clinic attendance, about half were not compliant with drug treatment, diabetes care, education, particularly on foot care, was inadequate while about a third were not aware of their DM status. These findings are similar to earlier reports of remarkable proportions of PLWD being non-compliant with medications, poorly educated about diabetes mellitus and not aware of the diagnosis. [3,22]

The 17.3% prevalence rate of DFU recorded in the present study was higher than reported prevalence rates which were mostly obtained from tertiary care centers. [5,12,15,23] This may suggest that a large proportion of the population with DM sought hospital care, but will default from referral for further care at the next level of health care. This attitude may be related to ignorance, poor understanding of the disease coupled with challenges of poor finances and fear of amputation. [23,24]

That about 13.1% of the subjects with foot ulcer in this study were not aware they had DM may also account for attendant late presentation, discharge against advice and subsequent readmission when the condition of the limb become life threatening. [12,13,15-16] It is noteworthy that, about a third of study subjects with foot ulcers reported their foot ulcers started as swellings and spontaneous blisters which are known early stages of DFU. The outcome of DFU is reported

to be dependent on DFU grade and is influenced by a combination of clinical and laboratory supports and the availability of multidisciplinary team of health care practitioners. [13,25]

Table III: Relationship of Diabetic Foot Ulcer and socio-demographic characteristics of subjects.

Characteristics		*FU Present (n= 106)*	*FU absent (n = 506)*	χ^2	*P-values*
		N (%)	N (%)		
Age Groups (Years)	40-49	13 (12.3)	74 (14.6)	10.609	0.031
	50-59	24 (22.6)	132 (26.1)		
	60-69	50 (47.2)	176 (34.8)		
	>70	19 (17.9)	124 (24.5)		
Gender					
	Female	90 (84.9)	393 (77.7)	2.760	0.097
	Male	16 (15.1)	113 (22.3)		
Ethnicity					
	Yoruba	86 (81.1)	452 (89.3)	10.765	0.005
	Igbo	20 (18.9)	45 (9.0)		
	Hausa	0 (0.0)	9 (1.7)		
Occupation					
	Unemployed	27 (25.5)	167 (33.0)	3.233	0.190
	Civil servant	61 (57.5)	278 (55.0)		
	Semi skilled	18 (17.0)	61 (12.0)		
Monthly Income (Naira)					
	<20,000 53	(50.0)	248 (49.0)	3.233	0.190
	20,000-49,000	34 (32.1)	155 (30.6)		
	50,000-99,900	19 (17.9)	75 (14.8)		
	>100,000	0 (0.0)	28 (5.5)		
Educational attainment					
	None formal	30 (28.3)	120 (23.7)	5.144	0.162
	Primary	28 (26.4)	167 (33.0)		
	Secondary	41 (8.7)	161 (31.8)		
	Tertiary	7 (6.6)	58 (11.5)		

FU Foot ulcers

Table IV: Details of Diabetes care and the attitude of subjects towards Diabetes Care

Characteristics		*Frequencies (n = 612)*	*Percentages*
Duration of Diabetic illness(Years)			
	0-5	145	23.4
	6-10	254	41.5
	11-15	213	34.8
	Mean duration	7.3 ± 6.2 years	
FBG* (mg/dl)			
	<125	336	54.9
	>135	276	45.1
	Mean FBG	136.4 ± 59.7 mg/dl	
Receiving anti-diabetic medication			
	Yes	568	92.8
	No	44	7.2
Type of anti-diabetic medication			
	Insulin	125	20.4
	OHA**	443	72.4
	Others	44	7.2
Compliance with insulin therapy			
	Regularly	35	28.0
	Frequently	70	56.0
	Occasionally	20	16.0
Compliance with clinic appointments			
	Comply most times	483	78.9
	Defaults occasionally	88	14.4
	Rarely complies	41	6.7

KEY: *FBG Fasting Blood Glucose

Whilst 30.5% of the subjects with foot ulcers had foot education prior to the development of foot ulcers, about half were not drug compliant. This may explain the development and occurrence of the foot ulcers in them. Comprehensive diabetes education inclusive of foot care and drug compliance reduces the morbidity and mortality associated with the complications of DM. [6,22,24] Awareness on regular foot education and examination, clinical staging and disease outcome are dependent on the level and type of practice, [12,15,16,24]

Conclusion

DFU remains a common complication of DM and a disease of the elderly patients with DM. There is a need for increasing public enlightenment and education on DM, with emphasis on foot care, clinic and drug compliance to reduce the burden of DM. That DFU has a predilection for females or may vary by ethnic group requires further collaborative studies.

Authors' Contributions: OO and AOE conceived and designed the study and participated in the collection, analysis and interpretation of the data. All the authors participated in the drafting of the manuscript and approved the final version of the manuscript.
Conflict of Interest: None
Funding: Self-funded.
Publication History: Submitted 03 - June 2017; Revised 13 - August 2017; Accepted 17-August 2017

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