



Prevalence and Factors Associated with Diabetic Foot Ulcer among Adult Patients Attending Diabetic Clinic at Nyeri Level 5 Hospital

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Summary

BACKGROUND

Diabetic foot ulcer is a leading cause of amputation among diabetic patients and a major burden to patients, care-givers and health care providers. Diabetic foot ulcers significantly contribute to morbidity and disability of patients with diabetes mellitus. As a consequence, diabetic patients with foot ulcers require frequent and long-term hospitalization. The purpose of this study was to determine the prevalence of and factors associated with diabetic foot ulcers among adult patients attending diabetic clinic at Nyeri level 5 hospital.

MATERIALS AND METHODS

A cross-sectional study was conducted to determine the prevalence of diabetic foot ulcer and its associated factors. The study was conducted at the diabetic clinic in Nyeri Level 5 Hospital. Systematic sampling was used in the identification of participants. A total of 387 diabetic patients participated in the study. A structured questionnaire and key informant guide were used in data collection. Quantitative data was entered into MS Excel spreadsheets and exported to SPSS version 24.0. Both descriptive and inferential statistics were done to establish the factors associated with diabetic foot ulcers among diabetic patients.

RESULTS

The prevalence rate of diabetic foot ulcers was 9.04%. Individual level factors associated with developing diabetic foot ulcer include marital status [(OR=1.825, 95% CI=1.825-1.092, P<0.05)] and occupation [(OR=1.720, 95% CI =2.123-3.213, P<0.05)]. Facility level factors found to influence occurrence of diabetic foot included availability of diabetic medication in the hospital, [(OR=.1.493, 95% CI =1.111-2.006, P<0.05)] distance travelled to get diabetic treatment, [(OR=.2.982, 95% CI =1.226-7.254, P<0.05)] and satisfaction with healthcare provider services [(OR=3.638, 95% CI=2.347-5.779)].



CONCLUSION

The study showed that at least one in ten diabetic patients attending Nyeri level five hospital has a foot ulcer. Factors found to have been associated with diabetic foot ulcer were marital status, occupation, availability of diabetic medicine in hospital, distance from home to hospital and satisfaction with health care service providers.

Keywords: Diabetes, Diabetic Foot Ulcer

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Introduction

Globally, there has been a rapid rise in the burden of diabetic foot diseases which has contributed to these conditions being categorized among the most rapidly rising public health concerns (1,2). This condition is also considered to be one of the conditions which are associated with a poor quality of life among diabetic patients especially in the socio economic perspective (3). According the WHO there are at least 250 million people in the world who are living with diabetes, with these numbers expected to increase to 380 million by 2025. An estimation of 15-25% has also been captured in relation to the number of individuals who will have foot ulcers in the course of their lifetime. On an annual basis, 9.1-26.1 million individuals living with diabetes in the world develop foot ulcers in the world (4,5).

The prevalence of diabetic foot ulcer, is however, varied. Among countries with the highest prevalence is Belgium 16.6% followed by Canada with 14.6%, USA and North America with 13% while Asia, Europe and Africa had a prevalence of only 5.5%, 5.1% and 7.2% respectively (6).

There are a number of factors linked to the prevalence of the condition including an individual's level of interaction with the environment, more importantly, the metabolic characteristics (7). Other factors which have

been found to be correlated with the occurrence of diabetic foot ulcers among diabetic patients include walking barefoot or wearing inappropriate footwear, illiteracy, faith in alternative system of medicine, and lack of training of primary care physicians in the treatment of the diabetic foot ulcers (8,9).

Other studies have also captured a significant relationship between the occurrence of diabetic foot disease with the age and gender of the diabetic patients (8,9) a relationship which was not found in two studies conducted in India which focused on these two sexes (10,11).

Similar studies also point to the fact that diabetic patients in rural areas are more likely to suffer from diabetic foot ulcers compared to patients in urban areas (11,12). A study conducted in North India which captured 216 patients revealed that 70.1% patients in rural areas suffered from diabetic foot ulcers compared to 29.9% patients from urban areas who suffered from the condition. Additionally, the development of diabetic foot ulcers includes period of exposure to diabetes mellitus (12), smoking/tobacco chewing (11) and previous history of foot ulcer (9,13,14).

A majority of studies on diabetic foot ulcers have mainly been conducted in high and middle-income regions like the USA and Canada (6), UK (13), and India (11). Few studies on this condition have been conducted in Africa, a majority of which have been conducted



in urban areas thus the statistics do not offer a clear depiction of the situation. Similarly, very few studies have been conducted in Kenya and as such no prevalence and correlated factors have been investigated. Additionally, no study has established both the prevalence and factors associated with diabetic foot ulcers in Kenya, Nyeri County.

Materials and Methods

This was a descriptive cross-sectional study. The study was conducted at the diabetic clinic situated within Nyeri Level 5 Hospital. Nyeri Level 5 Hospital was selected purposively because of its status as the only referral hospital in the region and its location. The study population was diabetic patients attending Nyeri Level 5 hospital diabetic clinic. The diabetic clinic attends to an average of 100 diabetic patients every week.

Systematic sampling was used in the identification of participants. The sample size was calculated using the Cochran 1963 formula. A total of 385 respondents were recruited in the study.

A structured questionnaire and key informant guide were used in the data collection. Quantitative data was entered in MS Excel spreadsheets and then exported into SPSS version 24.0. Descriptive statistics was calculated and compared. Inferential statistics through the use of regression (Univariate and multivariate) was conducted in order to determine the relationship between the variables in the study. The level of statistical significance was set at $P < 0.05$.

Ethical clearance and approval were obtained from University of Eastern Africa, Baraton University ethics and research committee before conducting the study. Permission was also obtained from the National Commission for Science, Technology

and Innovation (NACOSTI) and the County Director of Health Services, as well as Hospital administrator the Training and ethics committee of Nyeri Level 5 Hospital in Kenya. The researcher upheld other research ethical principles including administration of informed consent and keeping all research participants anonymous.

Results

Socio-Demographic Characteristics

The tables representing summaries of the socio demographic characteristics (Table 1) and other study findings are presented in the appendix.

Prevalence of Diabetic Foot Ulcer

The prevalence of diabetic foot disease was 9.04%.

Individual Level Factors Associated with the Diabetic Foot Ulcer

Individual level factors associated with developing diabetic ulcer foot include marital status [(OR=1.825, 95% C=1.825-1.092, $P < 0.05$)] and occupation [(OR=1,720, 95%CI =2.123-3.213, $P < 0.05$)]. Table 2 presents a summary of the data.

Facility Level factors associated with the development of diabetic foot ulcer

Facility level factors found to influence occurrence of diabetic foot included availability of diabetic medication in the hospital, [(OR=.1.493, 95%CI =1.111-2.006, $P < 0.05$)] distance



travelled to get diabetic treatment, [(OR=2.982, 95%CI =1.226-7.254, P<0.05)] and satisfaction with healthcare provider services [(OR=3.638, 95% C=2.347-5.779)]. Table 3 presents a summary of the data.

Discussion

Prevalence of Diabetic Foot Ulcer

The prevalence of diabetic foot ulcer among diabetic patients attending Nyeri level five hospital was 9.04%. There are variations in relation to the prevalence of diabetic foot ulcer among affected individuals in various countries in the world. One study conducted in North America captured a prevalence level of 13 % for the condition which was higher than the prevalence of 5.5% captured in countries in Asia, Europe and Africa. A high prevalence of the conditions was also noted to be associated with the male gender, individuals with type II diabetes, individuals who smoked and those with a small body mass index (6).

Another study conducted in Tanzania also revealed in a sample population of 404 patients, 15% had foot ulcers with factors like lack of formal education, diabetes duration and receiving advice on foot care being significantly correlated with its occurrence (15). A similar study conducted in Iran revealed a prevalence of 6.4% which was attributed to factors such as, the level of education 10g monofilament sensation, body mass index (BMI), patients age, glycemic controls and smoking to be all linked to the prevalence of the condition (16).

A prevalence level of 13.6% for diabetic foot ulcer was reported in a study conducted in Ethiopia, prevalence linked to factors like rural residency, overweight and obesity, poor foot self-care practices and neuropathy (17).

Individual Level Factors Associated with the Development of Diabetic Foot Ulcer

The study revealed that factors like marital status, and occupation, were associated with the occurrence of diabetic foot ulcer. In relation to a study conducted by Tesfamichael *et al*, a significant relationship was found between the occupation of the patients, residence, lifestyle, poor foot self-care practices and neuropathy to be linked with the occurrence of diabetes (17).

Another study also found a significant relationship between the development of diabetic foot ulcer and factors like occupation of the patients, no special foot care and wearing inappropriate shoes (18). Similarly, Kumhar *et al* found out that the development of the diabetic foot ulcer was associated with socio economic status, poor level of knowledge on footwear and foot care, religious customs (e.g. walking barefoot and walking on fire) were all linked with the occurrence of diabetic foot ulcer (10).

Other factors which are have been found to be associated with the occurrence of the condition included the occurrence of neuropathy and the age of the patient (19). However, a similar study found a significant relationship between the occurrence of diabetic foot ulcer, gender, level of education and duration of treatment of diabetes treatment (20). Another study conducted in Nigeria revealed that the continued occurrence of diabetic foot ulcers was significantly correlated to gender and socioeconomic status (redundancy) (21).



In Brazil, the study revealed that factors like gender, level of formal education and previous history of foot ulcers were significantly associated with the occurrence of diabetic foot ulcers among the patients (22).

Facility Level Factors Associated with the Development of Diabetic Foot Ulcer

The findings from this study revealed that availability of diabetes medication in the hospital, distance travelled to get diabetic treatment, and satisfaction with healthcare provider services were associated with the occurrence of foot ulcer. A study conducted in the UK captured factors like the provision of health education and the accessibility of health services to be linked with the occurrence of diabetic foot ulcers among individuals affected with diabetes (23). Another study also found a significant relationship between the accessibility of health facilities, health-related costs and the quality of care (24).

Studies also note that the burden of diabetic foot ulcers was linked with poor delivery of health care, the geographical location of the patient especially in relation to the proximity to the health facility and health-related costs of delivering this care. Proper management of the feet, provision of medication, foot hygiene and provision of therapeutic footwear is critical in the prevention of occurrence of diabetic foot ulcer (25,26).

A review of 30 controlled studies indicated the occurrence of diabetic foot ulcers to associated with proximity to the health facility, the quality of professional care, patient education, quality of treatment and the provision of therapeutic foot care which would also be

critical in limiting the level of reoccurrence of the condition (27).

Treatment of diabetes is associated with significant clinical and economic burden and outcomes. The best prospects for limiting these effects would include increasing the accessibility of the hospital especially, through reduction of costs and the implementation of coordinated care.

Conclusion

A prevalence level of 9.04% was found for diabetic foot ulcers among diabetic patients. The study showed that at least one in ten diabetic patients attending in Nyeri level five hospital had foot ulcer. Factors found to have been associated with diabetic foot ulcer were marital status, occupation, availability of diabetic medicine in hospital, distance from home to hospital and satisfaction with health care service providers.

Competing interests

The author declares no competing interests.

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Appendix

Table 1: Socio-Demographic Characteristics of the Study Participants

Characteristics	Frequency (n=387)	Percentage
Gender		
Male	184	47.55
Female	203	52.45
Marital status		
Married	259	66.67
Separated	4	1.03
Single	56	14.47
Widowed	68	17.83
Level of education		
No formal education	61	15.76
Primary	169	43.67
Secondary	130	33.59
Tertiary	27	6.98
Religion		
Atheist	3	0.78
Christian	381	98.45
Muslim	3	0.77
Place of residence		
Rural	319	82.43
Urban	68	17.57
Current occupation		
Agriculture	250	64.60
Business	71	18.35
Unemployed	37	9.56
Manual Labour	9	2.33
Office work	7	1.81
Student	13	3.36
Average monthly income		
<10,000 Ksh	305	78.81
10,000-20,000 Ksh	51	13.18
20,000-30,000 Ksh	20	5.17
30,000-50,000 Ksh	5	1.29
>50,000	6	1.55



Table 2: Individual Level Related Factors -Influencing occurrence of Diabetic Foot Ulcer

Variable	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Marital status	.564	.253	4.977	1	.028*	1.825	1.092	2.921
Respondents occupation	-.865	.258	11.245	1	.001*	1,720	2.123	3.213

Table 3: Facility Level Related Factors -Influencing Occurrence of Diabetic Foot Ulcer

Variable	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Availability of Diabetic Medication in hospital	.401	.151	7.075	1	.008	1.493	1.111	2.006
Distance to hospital	1.093	.454	5.802	1	.016	2.982	1.226	7.254
Satisfaction with Health care services provided	1.304	.230	32.145	1	.000	3.683	2.347	5.779
Constant	-3.347	.589	32.339	1	.000	.035		