

Knowledge of Risk Factors for Foot Ulceration among Patients with Diabetes Mellitus Attending a Tertiary Health Facility in Nigeria

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Abstract

Objective: Diabetic foot ulcer (DFU) is a relatively common complication of diabetes mellitus and constitutes a major cause of mortality. This study aimed to assess the knowledge of risk factors for foot ulceration among patients with diabetes in a tertiary health facility in South Western Nigeria.

Materials and Methods: This cross-sectional study was initiated with participation of 100 diabetic patients. Diabetic patients were attending the medical outpatient clinic of the University College Hospital, Ibadan. A structured and validated questionnaire was administered and data was analyzed using SPSS 22. Association between sociodemographic characteristics and knowledge of risk factors for foot ulceration was evaluated by chi-square test.

Results: Most of respondents were female (66%). The mean age of the patients was 58.77 (± 11.8) years and 51% of patients did not know that it is possible to develop foot ulcer without feeling pain and 30% did not know that features suggestive of neuropathy could be associated with development of foot ulcer. 75% did not know that surgical vascular repair could play any role in the healing of a diabetic foot ulcer. 11% of patients were walking barefooted at home and as much as 63% of respondents did not know that poor long-term glycemic control could be a risk factor for the development of diabetic foot ulcers.

Conclusion: The knowledge of the patients attending the diabetes clinic of a tertiary hospital in south-western Nigeria on foot care is generally poor. Education in this direction is very paramount to correct this defect.

Keywords: Diabetes mellitus, Diabetic foot ulcer, Knowledge

Introduction

Diabetes mellitus (DM) is a heterogeneous disease that has continued to generate global health concerns due to its multisystemic effects reflected in its potential complications, with attendant increased morbidity and mortality (1,2). According to reports by the International Diabetes Federation, there are 463 million

people currently living with DM worldwide which is expected to increase to 700 million within the next 25 years (1). Africa is projected to have the highest percentage rise in DM prevalence over this period. More than half of the people also have undiagnosed diabetes which is more disturbing, considering the numerous challenges facing the region (1). Diabetic Foot is a foot affected by ulceration (involving the ankle distally) associated with neuropathy and/or peripheral arterial disease of the lower limb in a patient with diabetes (3,4). Diabetic foot ulcer (DFU) is a breach in the skin epithelium's continuity involving its full thickness or beyond, distal to the ankle joints, in a person living with DM (5). DFU is a product of chronic complications of diabetes that constitute one of the main reasons for hospital admissions in patients with DM, resulting in increased morbidity, mortality and reduced quality of life (1,2,4,6,7). Approximately 85% of lower-limb amputations in individuals with diabetes are preceded by a foot ulcer and the lifetime incidence of having foot ulcers could be up to 25% (8). In Nigeria, DFU constitutes a high burden, with a prevalence of 11%-32% among hospitalized patients with DM (5).

There are known risk factors that predispose to foot ulceration in patients with DM and studies have shown that patients with DM have inadequate knowledge of foot care. Therefore, adequate knowledge of these risk factors could help in the prevention of the development of DFU as knowledge empowers (8,9). Some of the predisposing factors include peripheral neuropathy, peripheral arterial disease, poor glycemic control, and inappropriate foot wear practices (3,6).

The study's aim was to assess the knowledge of patients with DM attending a tertiary health center regarding the risk factors for foot ulceration. The objectives were to evaluate the knowledge of neuropathy as a risk factor for DFU and to find out if patients are aware of the role of arterial disease in the development of foot ulceration. In addition, the study desired to confirm the poor knowledge about

glycemic control leading to foot ulceration and lack of knowledge about foot wear practice plays a role as a risk factor for DFU.

Materials and Methods

Study location and design

This is a cross-sectional study that was carried out in the Medical Outpatient Clinic of the Endocrine Unit of the University College Hospital (UCH), Ibadan. UCH is a main tertiary hospital that serves the Ibadan environs and the country at large and it is also a referral center in the Southwest geopolitical zone of Nigeria. UCH was established in the year 1957 in Ibadan, the seat of the first university in Nigeria.

However, a total of 100 individuals with DM attending the medical outpatient clinic of UCH, Ibadan, were consecutively recruited, after obtaining informed consent.

Procedure

A structured questionnaire was used to obtain data from the study participants. The questionnaire is validated and reliable as it was developed in tune with the recommendations of the American Diabetes Association, American College of Foot and Ankle Surgeons and Diabetes UK and was previously used in other studies (10,11). An experienced translator and the principal researcher ensured translation of the questionnaire into the local (Yoruba) language for those participants that do not understand English. The questionnaire contains questions on socio-demographic characteristics and sections on knowledge of the subjects as regards risk factors for foot ulceration. Questionnaires were interviewer-administered and carried out by resident doctors who have a good understanding of the items being tested. The questions were answered with a 'YES' or 'NO' response from the participants.

Data analysis

Data obtained were reviewed and analyzed using the Statistical Package for Social Sciences (SPSS) version 22. Continuous

variables were expressed as mean \pm SD; categorical variables were represented as proportions. Comparison of means was done using T-test for continuous data and chi-square test for categorical data. Statistical significance was set at P -value $<$ 0.05.

Ethical considerations

Ethical approval for this study was obtained from the Joint University of Ibadan/UCH Institutional Review Board (IRB) (UI/EC/21/0030).

Results

100 patients with DM took part in the study. Out of this number, 66 (66%) of respondents were females. The mean age of the patients was 58.77 ± 11.8 years.

51% of patients did not know that it is possible to develop foot ulcer without feeling pain and 30% did not know that features suggestive of neuropathy could be associated with development of foot ulcer (Figure 1). 49% of respondents did not know that smoking encourages development of peripheral arterial

disease, which is a risk factor for foot ulceration and 75% did not know that surgical vascular repair plays any role in healing of diabetic foot ulcer (Table 1).

In addition, 59% of patients attending our diabetes clinic did not know their optimal fasting glucose target and as much as 63% did not know that poor long-term glycemic control could be a risk factor for development of diabetic foot ulcer. 11% of the patients agreed that they could walk barefooted at home without posing any risk to their foot and same proportion did not know that footwear has any impact on development of foot ulcers.

Furthermore, a quarter of the patients did not know that visual impairment could be a risk factor for the occurrence of foot ulceration and 27% did not know that diabetes affecting the kidneys could also be a risk factor for foot ulceration. 61% of respondents did not know that DFU could be recurrent, and 21% did not know that use of sharp objects like razor to cut nails by themselves is not a good foot care practice.

There was no significant association between

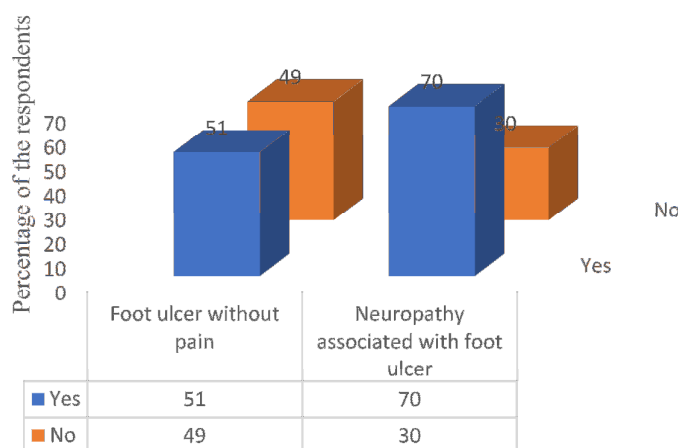


Figure 1. Knowledge of respondents on neuropathy as a risk for diabetic foot ulcer.

Table 1. Knowledge of respondents on peripheral arterial disease as a predisposition to foot ulcer

Question	Frequency (%)	
	YES	NO
Smoking is a risk for arterial disease	51 (51)	49 (49)
Surgical vascular repair improves foot ulcer healing	25 (25)	75 (75)

educational status and knowledge of neuropathy as a risk factor for DFU among our patients (P -value= 0.745). Also, there was no significant association between annual income and knowledge of neuropathy in the respondents (P -value= 0.531).

Discussion

In our study, about half of the respondents would expect pain to occur before development of DFU and approximately a third of them were unaware that features of neuropathy such as paraesthesia and numbness could constitute risk factors for DFU. This goes to corroborate the fact that many patients with DM may have sensory neuropathy with accompanying loss of protective sensation and may sustain an injury to the foot even without the patient knowing at that time (12,13). Cigarette smoking has been recognized as a risk factor for DFU through its damaging effects on peripheral arteries (3) and it is disturbing that about half of the patients in this study are unaware of its negative impact on the vascular integrity. This is however lower than what was reported by Desalu et al., where 75% of diabetes patients did not know smoking affects vascular supply to the feet and could lead to subsequent ulceration (14).

Poor knowledge of glycaemic targets in terms of fasting blood glucose and HbA1c was seen in over half of the patients (59% and 63% respectively). This is higher than what was recorded by Hasnain et al. in Pakistan, where 22% of the study subjects were unaware of blood glucose target and its importance in prevention of diabetes foot complication (15). In addition, about a quarter of our patients are unaware that good eye sight is important in prevention of development of foot ulcer. It appears such finding may not be limited to patients with DM as another Nigerian study by Buloala et al. reported that virtually all healthcare practitioners (non-doctors) that participated in a study on knowledge of diabetes foot care did not know that poor vision is a risk factor for foot ulceration (16). Poor glycaemic control and visual impairment

are notable risk factors for development of foot ulceration (17) and both the patients with DM and the healthcare provider should be knowledgeable about this.

About one-tenth (11%) of the patients thought walking barefooted at home does not pose a risk to the foot. This is notable, though found to be lower than what was reported by Taksande et al (14.5%), Ekore et al. (27.4%), Desalu et al. (38.6%) and Khamseh et al. (62%) (14,18-20). This may be a reflection of the beliefs of members of the local communities attending our clinic, which might have gradually improved over time, hence the lower proportion compared to other studies. Furthermore, 11% of our patients did not know that foot wear has any impact on the development of foot ulcers, as against findings from a similar study in India by Teli et al., where over 90% of their patients are unaware of the importance of appropriateness of foot wear to prevent foot ulceration (21).

Diabetic kidney disease is a risk factor for DFU (3). Less than a third (27%) of our patients did not know that diabetes affecting the kidneys could be associated with foot ulceration. This is however lower than what was reported by Buloala et al., where over 95% of respondents had no knowledge of diabetic nephropathy as a risk factor for development of foot ulcer (16). Also, a previous foot ulcer is a risk factor for the development of another foot ulcer in the future (3,17). This point is essential as more than half (61%) of our patients believed that someone could not have a recurrent foot ulcer, close to findings from another study where about three-quarters of participants were unaware of likelihood of developing a foot ulcer following a previous ulcer (16).

About one-fifth (21%) of our patients are not aware that using sharp instruments like a razor blade to cut nails is an inappropriate foot care practice. This is unexpectedly high as less than this (10%) was reported in a study in India (21) but a higher percentage (38.6%) of diabetes patients in another Nigerian study (14) used sharp instruments to cut their nails. It

is possible that our patients do not recognize the type of instrument used in cutting their nails is important and that using sharp instruments like razor blades might lead to inadvertent injury and subsequent foot ulceration.

No significant association was found between educational status and neuropathy knowledge as a risk factor for the development of DFU among the respondents. This contrasts findings from the study by Desalu et al. in Ilorin and an Iranian study by Pourkazemi et al. which revealed educational status was significantly associated with knowledge of foot care (14,22). This may indicate that the knowledge of foot care in our patients is generally poor regardless of their level of education. Also, there was no significant association between patient's income and knowledge of neuropathy as a risk factor for DFU among our patients similar to findings by Hasnain and Sheikh in Pakistan (13). This means that financial buoyancy or the reverse does not influence knowledge of neuropathy in our patients.

Strengths and limitation

This study is an eye-opener to everyone involved in the multidisciplinary care of patients with DFU. It serves as a fulcrum to improve existing educational programs on the preventive management of foot ulceration in persons with DM. As with some other studies, a limitation is that this is a hospital-based study and similar research carried out in the larger community might yield a more robust outcome.

References

1. International Diabetes Federation. IDF Diabetes Atlas. 9th ed. International Diabetes Federation, Brussels, Belgium, 2019. <http://www.diabetesatlas.org>. Accessed Dec. 30, 2020.
2. Anumah FO, Mshelia-Reng R, Abubakar A, Sough T, Asudo F, Jamda MA, et al. Management outcome of diabetic foot ulcers in a teaching hospital in Abuja, Nigeria. *The Journal of Diabetic Foot Complications*. 2017;9(1):15–20.
3. Alexiadou K, Doupis J. Management of diabetic foot ulcers. *Diabetes Therapy*. 2012;3(1):4.
4. Tuttolomondo A, Maida C, Pinto A. Diabetic foot syndrome: Immune-inflammatory features as possible cardiovascular markers in diabetes. *World journal of orthopedics*. 2015;6(1):62-76.
5. Ugwu E, Adeleye O, Gezawa I, Okpe I, Enamino M, Ezeani I. Burden of diabetic foot ulcer in Nigeria: current evidence from the multicenter

Conclusions

Knowing risk factors for foot ulceration among our patients is suboptimal and education in this direction is paramount to correct this. Empowering patients through proper knowledge can go a long way to prevent foot ulceration as some of the risk factors for foot ulceration are preventable and education on foot care has been identified as a crucial element in the prevention of foot ulceration (9). Both the health educators and the attending physicians have crucial roles to play in this regard. This educational intervention may also need to be carried out in the community and through various media to create awareness on appropriate knowledge, attitude and practices that are germane to avoid foot ulceration and complications that may follow, thus reducing the burden of foot disease. Further studies can be carried out in the future to ascertain the effects and outcome of intervention that may be embarked upon as a result of this study.

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Conflict of Interest

None.

- evaluation of diabetic foot ulcer in Nigeria. *World journal of Diabetes*. 2019;10(3):200-211.
6. Syafril S. Pathophysiology diabetic foot ulcer. *InIOP Conference Series: Earth and Environmental Science*. IOP Publishing .2018 ; 125(1):012161.
 7. Ogbera AO, Fasanmade O, Ohwovoriole AE, Adediran O. An assessment of the disease burden of foot ulcers in patients with diabetes mellitus attending a teaching hospital in Lagos, Nigeria. *The international journal of lower extremity wounds*. 2006;5(4):244-9.
 8. Ibrahim A. IDF Clinical Practice Recommendation on the Diabetic Foot: A guide for healthcare professionals. *Diabetes research and clinical practice*. 2017;127:285-7.
 9. Raimi TH, Fasanmade OA. Precipitating factors for diabetes foot ulcer in a nigerian tertiary hospital. *European Journal of Biology and Medical Science Research*. 2018;6(2):21-8.
 10. Al-Hariri MT, Al-Enazi AS, Alshammari DM, Bahamdan AS, Al-Khtani SM, Al-Abdulwahab AA. Descriptive study on the knowledge, attitudes and practices regarding the diabetic foot. *Journal of Taibah University medical sciences*. 2017;12(6):492-6.
 11. American Diabetes Association. Foot care in patients with diabetes mellitus. *Diabetes care*. 1998;21(Supplement 1):S54-5.
 12. Mishra SC, Chhatbar KC, Kashikar A, Mehndiratta A. Diabetic foot. *Bmj*. 2017;359:j5064.
 13. Ikem RT, Ikem IC. Screening and identifying diabetic patients at risk of foot ulceration: use of the Semes-Weinstein monofilament. *Mera Diabetes International*. 2009:15-7.
 14. Desalu OO, Salawu FK, Jimoh AK, Adekoya AO, Busari OA, Olokoba AB. Diabetic foot care: self reported knowledge and practice among patients attending three tertiary hospital in Nigeria. *Ghana medical journal*. 2011;45(2):60-65.
 15. Hasnain S, Sheikh NH. Knowledge and practices regarding foot care in diabetic patients visiting diabetic clinic in Jinnah Hospital, Lahore. *JPMA. The journal of the Pakistan Medical Association*. 2009;59(10):687.
 16. Buluala LW, John ME. Knowledge of diabetic foot care among nursing practitioners in rivers state, Nigeria. *Texila International Journal of Nursing*. 2018;4(2).
 17. Edo AE, Edo GO, Ezeani IU. Risk factors, ulcer grade and management outcome of diabetic foot ulcers in a Tropical Tertiary Care Hospital. *Nigerian medical journal: journal of the Nigeria Medical Association*. 2013;54(1):59-63.
 18. Ekore RI, Ajayi IO, Arije A, Ekore JO. Knowledge of and attitude to foot care amongst Type 2 diabetes patients attending a university-based primary care clinic in Nigeria. *African journal of primary health care and family medicine*. 2010;2(1):1-3.
 19. Taksande BA, Thote M, Jajoo UN. Knowledge, attitude, and practice of foot care in patients with diabetes at central rural India. *Journal of family medicine and primary care*. 2017;6(2):284.
 20. Khamseh ME, Vatankhah N, Baradaran HR. Knowledge and practice of foot care in Iranian people with type 2 diabetes. *International wound journal*. 2007;4(4):298-302.
 21. Teli GO, Ponnappa B. A study on knowledge, attitudes, and practices for the prevention of diabetic foot in rural tertiary care teaching hospital. *International Journal of Pharmacy and Pharmaceutical Sciences*. 2017;9:138-142.
 22. Pourkazemi A, Ghanbari A, Khojamli M, Balo H, Hemmati H, Jafaryparvar Z, et al. Diabetic foot care: knowledge and practice. *BMC endocrine disorders*. 2020;20(1):1-8.