ORIGINAL ARTICLE

NORTH BENGAL MEDICAL COLLEGE JOURNAL [2024], VOL., 10, No. 2 : 22-28

Risk Factors of Foot Ulcer among Diabetic Patients in Sirajganj District of Bangladesh

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ARTICLE INFO

Article history:
Received: 07 November 2023
Accepted: 18 April 2024

Online:
www.nbmc.ac.bd

Keywords:
Risk factor, diabetic foot ulcer, peripheral neuropathy

ABSTRACT

Introduction: *Diabetes mellitus (DM) is a chronic metabolic disease characterized by elevated level of blood glucose, resulting from defect in insulin secretion, insulin action or both. Diabetic foot ulcer (DFU) is a major complication of DM. Aim of this study was to find out the risk factors of DFU among the diabetic patients.* ***Methods:*** *This cross-sectional study was carried out in the Department of Community Medicine, North Bengal Medical College, Sirajganj, Bangladesh during the period of September, 2020 to August, 2021.A total of 360 patients with diabetic foot ulcer were enrolled purposively from four selected hospitalsin sirajganj district of Bangladesh. Data was collected in pretested questionnaire from their self-reported statement, clinical findings and medical records.* ***Results:*** *Among the 360 patients with DFU, most of them were male (235, 65.28%) within 50–59 years of age group(100, 27.78%). Majority of the patients were farmer (179, 49.72%) and primary educated (116, 32.22%).Uncontrolled diabetes (335, 93.06%) was observed in maximum patients. Peripheral neuropathy, history of trauma and inadequate medication were major risk factors for the development of DFU. These risk factors are significantly associated with the DFU (p<0.00001).* ***Conclusion:*** *The development of DFU was highly correlated with uncontrolled diabetes, peripheral neuropathy, history of trauma and insufficient medication. Comprehensive health education to the diabetic patients should be ensured in all level of health care system for the prevention and better management of DFU.*

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INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by hyperglycemia due to an absolute or relative deficiency of insulin or cellular resistance to insulin.[1,2] In recent years, DM has become a fast-growing public health problem that affects both developed and developing countries.[1] According to the International Diabetes Federation (IDF), in 2010, there were 285 million diabetic patients globally; by 2030, that number is expected to increase to 438 million, with a

global prevalence rate of 5%–6%.[2,3] The World Health Organization (WHO) reported that, in 2012 more than 347 million people in the world suffer from DM.[2,4] Globally, Type 2 diabetes (T2D) is more prevalent and it is six and three times more common in South Asian and African people respectively. It is highly prevalent in Bangladesh like other developing countries.[3] According to the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR, B) in 2015, 7.1 million people had diabetes, 3.7 million cases were undiagnosed and about 129 000 deaths were attributed to the disease.[5] The prevalence of diabetes in Bangladesh ranges from 2.21% to 35%.[6,7]

Diabetic patients have an increased risk of developing peripheral arterial disease (PAD) and foot ulcers. About 15%–25% of patients with diabetes mellitus will develop diabetic foot ulcers (DFU) during their lifetimes.[3,8] Diabetic foot ulcers are the main cause of 85% of amputations in non-trauma patients due to extensive infection to gangrene.[3,9] Diabetic foot is defined as the presence of infection, ulceration and/or destruction of deep tissues associated with neurological abnormalities and various degrees of peripheral arterial disease (PAD) in the lower limb in diabeticpatients.[10] It is a significant cause of morbidity and prolonged hospital stay.[11]

Despite multiple researches being undertaken in Bangladesh, data on the risk factors of DFU are inadequate. So, this study was aimed to find out the relevant risk factors of foot ulcer among Diabetic patients in Sirajganj District of Bangladesh.

METHODS

This cross-sectional study was carried out in the Department of Community Medicine, North Bengal Medical College, Sirajganj, Bangladesh during the period of September, 2020 to August, 2021. A total of 360 diabetic patients with foot ulcer were enrolled purposively for this study from the Out Patients Department (OPD) of North Bengal Medical College Hospital, Shaheed M. Monsur Ali Medical College Hospital, General Hospital and Diabetic Foot Care Centre in Sirajganj District. Patients with acute illness, unwillingness to participate and mentally unstable were excluded. To meet the eligibility criteria, all subjects were screened for diabetic foot ulcer (DFU), based on their self-reported statement, their clinical history, foot examination and medical records review. Data was collected by face-to-face interview using a pretested questionnaire. The blood glucose levels (fasting and two hours after meal) and relevant information were collected from record books. Informed written consent was taken from the patients before data collection. Data were analyzed using the Statistical Package for Social Science (SPSS) V.20.The *p* value<0.05 was considered statistically significant.

RESULTS

Maximum (100, 27.78%) patients were within 50 to 59 years of age group followed by >60 years (Table I).

Table I: Age distribution of the patients (n-360)

Age (years)	Frequency	Percentage (%)	X^2	*p*-value
<30	28	7.78%		
30-39	59	16.39%	57.5347	<0.00001
40-49	85	23.61%		
50-59	100	27.78%		
≥60	88	24.44%		
Total	**360**	**100%**		

In this study, diabetic foot ulcer was common in male (235, 65.28%) than female (Figure 1).

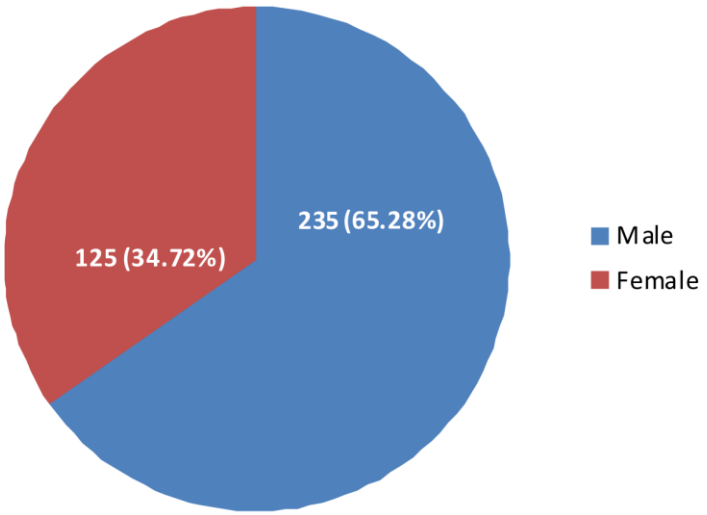

Figure 1: Distribution of the diabetic patients according to gender

Regarding educational status of the patients, majority (116, 32.22%) were primary educated (Table II).

Table II: Educational status of the patients (n-360)

Educational status	Frequency	Percentage (%)
Illiterate	71	19.72%
Primary	116	32.22%
Secondary	83	23.05%
Higher secondary	68	18.89%
Graduate and above	22	6.11%
Total	**360**	**100%**

Out of 360 patients, farmers were more sufferers with diabetic foot ulcer (Figure 2).

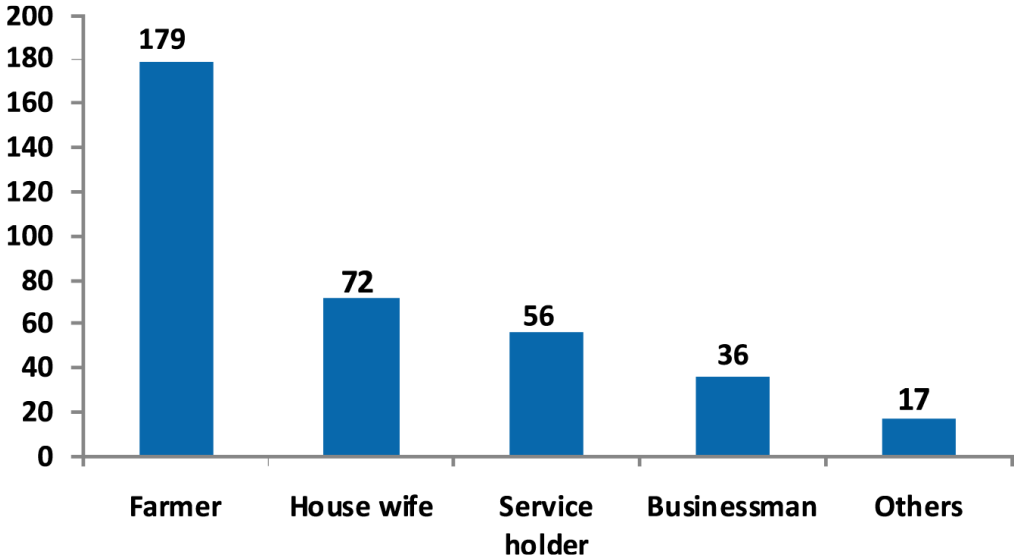

Figure 2: Distribution of the patients based on occupational status (n-360)

Uncontrolled diabetes is common (335, 93.06%) among the foot ulcer patients (Table III).

Table III: Glycemic status of the diabetic patients (n-360)

Glycemic status	Frequency	Percentage (%)	X^2	*p*-value
Uncontrolled	335	93.06%	533.8889	<0.00001
Controlled	25	6.94%		
Total	**360**	**100%**		

Peripheral neuropathy, history of trauma and inadequate medication are common risk factors of Diabetic foot ulcer (Table IV).

Table IV: Associated Risk factors of foot ulcer among diabetic patients

Associated Risk factor	Frequency	Percentage (%)	X^2	*p*-value
Peripheral neuropathy	192	53.33%		
History of trauma	143	39.72%		
Inadequate Medication	122	33.89%		
Hypertension (HTN)	64	17.78%	215.43	<0.00001
Diabetic retinopathy	30	8.33%		
Diabetic nephropathy	26	7.22%		
Heart diseases	11	3.05%		
CVD	09	2.5%		
CKD	05	1.9%		

*Multiple response

DISCUSSION

Diabetic foot disease is not uniform and can vary greatly among individuals. Factors such as genetics, lifestyle, access to healthcare, and environmental influences contribute to this heterogeneity. Understanding the prevalence, risk factors, and outcomes of diabetic foot disease in various communities is crucial for developing effective prevention and management strategies. Epidemiological studies provide valuable data for healthcare professionals and policymakers to address the disease effectively.

In this study, it was found that, maximum age of the patient was above 50 years which was associated with the development of Diabetic foot ulcer (DFU). Monami et al.[12] observed maximum patients were in between 51 to 74 years of age group and Kumar et al.[13] reported most of the patients were above 55 years of age. Akteret al.[4] (55 to 59 years) and Vibha et al.[14] (55 to 65 years) showed majority of the DFU patients were older. Diabetic foot ulcer is common in elderly patients due to peripheral neuropathy, poor glycemic control and trauma.

Diabetic foot ulcer was common in male (235, 65.28%) than female. Shahbazian et al.[15] showed that, male (269, 62.6%) was higher than female. Rossaneis et al.[16]also reported that majority were male (58.6%). Male are more prone to develop DFU due to multiple causes like peripheral vascular disease, tobacco intake, stress and trauma.

Regarding educational status, majority of the patients were primary educated (32.22%). Hussain et al.[17] showed that 69% patients were primary educated and below. Suwannaphant et al.[18] reported that most (38.3%) of the patients were illiterate. Diabetic foot ulcers was common (57.4%) in lower educational group (elementary school and/ illiterate) observed by Yenta et al.[19] Diabetic patients with low educational level are vulnerable to develop foot ulcer because of inadequate knowledge about healthy lifestyle, glycemic control and diabetic complication.

According to occupational status, diabetic foot ulcer was common in farmers (179, 49.72%). George et al.[20] found that, most frequently affected occupational category was farmers (46.29%). Farmers had higher exposure to bare feet, smoking, and foot injury from their daily activities which are responsible for the development of DFU.

Peripheral neuropathy (192, 53.33%) was the major risk factors of DFU. Parisi et al.[21] (33.7%)

and Kateel et al.[22] (35%) reported peripheral neuropathy was common risk factor of DFU. Similar studies also conducted by Al-Mahroos et al.[23] (36.6%) and Tabatabaei-Malazy et al.[24] (42%). Peripheral neuropathy causes sensory loss, inability to recognize trauma and infection which leads to ulceration.

History of trauma was present in 143 (39.72%) patients. This result was consistent with the other findings conducted by Yusuf et al.[25] (37.8%) and Woldemariam et al.[26] (31.6%). Puncture wounds, ill-fitting shoes and poor self-care practices are the causative factor of external trauma of DFU patients. These external trauma causes break down of skin tissue, which is responsible for infection and ulceration.

This study revealed, 122 (33.89%) patients take their medication inadequately. Ahmad et al.[27]and Jeffcoate et al.[28] reported taking of inadequate medication in 47.4% and 39.8% of patient respectively. Insufficient medication is a prevalent factor contributing to uncontrolled diabetes mellitus, ultimately leading to the occurrence of foot ulcerations in diabetic individual.

Hypertension was found in 64 (17.78%) patients. Kate let al.[22] and Jan et al.[29] reveled that 28.4% and 19% patients with hypertension respectively. Hypertension contributes to diabetic foot ulcers by impairing blood flow, exacerbating vascular damage, and increasing the risk of complications associated with diabetes.

CONCLUSION

Peripheral neuropathy, history of trauma and uncontrolled glycemic status were frequently associated with the development of Diabetic foot ulcer (DFU). Diabetic foot screening programme should be introduced in the healthcare system to detect the specific risk factors for the prevention of debilitating consequences of DFU.

Acknowledgements: Authos are grateful to the patients who participated in this study for their cordial cooperation.

Conflicts of interest: None.

REFERENCES

1. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care. 2004; 27(5): 1047-1053.
2. Ogurtsova K, Fernandes JD, Huang Y, Linnenkamp U, Guariguata L, Cho NH, et al. IDF Diabetes Atlas: Global estimates for the prevalence of diabetes for 2015 and 2040. Diabetes Res Clin Pract. 2017; 128: 40-50.
3. School of Health and Related Research (ScHARR), University of Sheffield. Clinical Guidelines for Type 2 Diabetes: Prevention and Management of Foot Problems [Internet]. Sheffield (UK): University of Sheffield; 2003. (NICE Clinical Guidelines, No. 10.) Available from: https://www.ncbi.nlm.nih.gov/books/NBK51709/
4. Akter S, Rahman MM, Abe SK, Sultana P. Prevalence of diabetes and prediabetes and their risk factors among Bangladeshi adults: a nationwide survey. Bull WHO. 2014; 92: 204-213A.
5. International centre for diarrhoeal disease research Bangladesh. Available: https://www.icddrb.org/news-and-events/press-corner/media-resources/non-communicable-diseases [Accessed 06 Sep 2019].Google Scholar
6. Sayeed MA, Banu A, Khan AR, Hussain MZ. Prevalence of diabetes and hypertension in a rural population of Bangladesh. Diabetes Care. 1995; 18(4): 555-558.doi:10.2337/diacare.18.4.555.
7. Saquib N, Khanam MA, Saquib J, Anand S, Chertow GM, Barry M, et al. High prevalence of type 2 diabetes among the urban middle class in Bangladesh. BMC Public Health. 2013; 13: 1-9.
8. Saquib N, Saquib J, Ahmed T, Khanam MA, Cullen MR. Cardiovascular diseases and type 2 diabetes in Bangladesh: a systematic review and meta-analysis of studies between 1995 and 2010. BMC Public Health. 2012; 12: 1-10.

9. Karthikesalingam A, Holt PJ, Moxey P, Jones KG, Thompson MM, Hinchliffe RJ. A systematic review of scoring systems for diabetic foot ulcers. Diabet Med. 2010; 27(5): 544-549.
10. Eleftheriadou I, Kokkinos A, Liatis S, Makrilakis K, Tentolouris N, Tentolouris A, et al.editors. Atlas of the diabetic foot. 2nd ed. Oxford, UK: John Wiley & Sons. 2019. P.1.
11. Snyder RJ, Hanft JR. Diabetic foot ulcers--effects on QOL, costs, and mortality and the role of standard wound care and advanced-care therapies. Ostomy Wound Manage. 2009; 55(11): 28-38.
12. Monami M, Vivarelli M, Desideri CM, Colombi C, Marchionni N, Mannucci E. Pulse pressure and prediction of incident foot ulcers in type 2 diabetes. Diabetes Care. 2009; 32(5): 897-899.
13. Kumar MS, Valame S. Risk of diabetic foot in diabetics with micro and macrovascular complications. J Evol Med Den Sci. 2014; 3(67): 14467-14478.
14. Vibha SP, Kulkarni MM, Kirthinath AB, Kamath A, Maiya GA. Community based study to assess the prevalence of diabetic foot syndrome and associated risk factors among people with diabetes mellitus.BMC Nedcor Discord. 2018; 18(1):1-9.
15. Shahbazian H, Yazdanpanah L, Latifi SM. Risk assessment of patients with diabetes for foot ulcers according to risk classification consensus of International Working Group on Diabetic Foot (IWGDF). Pak J Med Sci. 2013;29(3): 730-734.doi: http://dx.doi.org=/10.12669/pjms.293.343.
16. Rossaneis MA, Haddad MD, Mathias TA, Marcon SS. Differences in foot self-care and lifestyle between men and women with diabetes mellitus. Am J Nurs. 2016; 15(24): 1-8.doi:org/10.1590/1518-8345.1203.2761.
17. Hussain F, Shabbir M, Bunyad S, Arshad F, Kashif M, Siddique J. Diabetic Foot Ulcers: Prevalence and Associated Risk Factors Among Diabetic Patients: Diabetic Foot Ulcers. Pak J Health Sci. 2022; 3(5):86-90.doi: https://doi.org/10.54393/pjhs.v3i05.241.
18. Suwannaphant K, Laohasiriwong W, Puttanapong N, Saengsuwan J, Phajan T. Association between socioeconomic status and diabetes mellitus: the National Socioeconomics Survey, 2010 and 2012. J Clin Dig Res. 2017;11(7): LC18.
19. Yekta Z, Pourali R, Ghasemi-Rad M. Comparison of demographic and clinical characteristics influencing health-related quality of life in patients with diabetic foot ulcers and those without foot ulcers. Diabetes Metab Syndr Obes: Targets Ther.2011; (4): 393-399.doi:10.2147/DMSO.S27050.
20. George S, Thomas S, Cherian N, Peter N, Junior N. A prospective study on outcomes of diabetic foot ulcer patients with and without amputation. IJAR. 2016;2(9):767-770.
21. Parisi MC, Moura NA, Menezes FH, Gomes MB, Teixeira RM, De Oliveira JE, et al. Baseline characteristics and risk factors for ulcer, amputation and severe neuropathy in diabetic foot at risk: the BRAZUPA study. Diabetol Metab Syndr. 2016 ; 8:1-8.
22. Kateel R, Augustine AJ, Prabhu S, Ullal S, Pai M, Adhikari P. Clinical and microbiological profile of diabetic foot ulcer patients in a tertiary care hospital. Diabetes Metab Syndr: Clin Res Rev. 2018; 12(1): 27-30.
23. Al-Mahroos F, Al-Roomi K. Diabetic neuropathy, foot ulceration, peripheral vascular disease and potential risk factors among patients with diabetes in Bahrain: a nationwide primary care diabetes clinic-based study. Ann Saudi Med. 2007; 27(1): 25-31.
24. Tabatabaei-Malazy O, Mohajeri-Tehrani M, Madani S, Heshmat R, Larijani B. The prevalence of diabetic peripheral neuropathy and related factors. Iran J Public Health. 2011; 40(3): 55-62. PMID: 23113086; PMCID: PMC3481654.
25. Yusuf S, Okuwa M, Irwan M, Rassa S, Laitung B, Thalib A, et al. Prevalence and risk factor of diabetic foot ulcers in a regional hospital, eastern Indonesia. Open J Nurs. 2016; 6(1): 1-10.

26. Woldemariam GT, Atnafu NT, Radie YT, Wolde GT, Gebreagziabher TT, Gebrehiwot TG, et al. Determinants of diabetic foot ulcer among adult patients with diabetes attending the diabetic Clinic in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia: Unmatched case–control study. Diabetes Metab Syndr Obes. 2020:13: 3739-3747.
27. Ahmad W, Khan IA, Ghaffar S, Al-Swailmi FK, Khan I. Risk factors for diabetic foot ulcer. J Ayub Med Coll Abbott. 2013; 25(1-2) :16-18.
28. Jeffcoate WJ, Vileikyte L, Boyko EJ, Armstrong DG, Boulton AJ. Current challenges and opportunities in the prevention and management of diabetic foot ulcers. Diabetes Care. 2018; 41(4): 645-652.
29. Jan AW, Khan H, Ahmad IA, Khan M. Diabetic Foot Ulcer: Risk factors stratification in patients. A study of 150 patients. Professional Med J. 2016; 23(6): 693-698.