

A Cross-Sectional Study on Prevalence of Diabetic Foot Ulcer and Its Management: A Hospital-Based Study at a Tertiary Care Centre of West

Bengal

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ABSTRACT

Background: Diabetic foot ulcer (DFU) is one of the most serious and costly complications of diabetes mellitus. In India, where the burden of diabetes is already very high, DFU contributes significantly to morbidity, hospitalisation, and limb loss. This study was conducted to assess the prevalence of DFU and its management patterns at a tertiary care centre in West Bengal. **Objectives:** To determine the prevalence of DFU among hospitalised diabetic patients, to analyse sociodemographic factors, to classify ulcers using the Wagner grading system, and to describe the management protocols adopted. **Methodology:** A hospital-based cross-sectional study was conducted over a period of six months at a tertiary care centre of West Bengal. A total of 72 patients admitted with diabetic foot ulcer were enrolled using purposive sampling. Data were collected using a pre-designed, pre-tested structured proforma. Wagner's classification was used to grade the ulcers. Descriptive statistics were applied for data analysis. **Results:** Out of 72 patients, the majority were males (63.9%) and belonged to the age group of 51–60 years (38.9%). Most patients were from rural background (61.1%). Wagner Grade 2 ulcers were the most common (27.8%). Insulin optimisation was the most frequently used management modality (94.4%), followed by systemic antibiotic therapy (88.9%) and wound debridement (83.3%). Minor amputation was performed in 22.2% cases and major amputation in 8.3% cases.

Conclusion: DFU continues to be a major clinical challenge at tertiary care centres. Late presentation, poor glycaemic control, and low socioeconomic status are contributing factors. A multi-disciplinary approach with timely intervention can significantly reduce morbidity and limb loss.

Keywords: Diabetic foot ulcer, Wagner classification, prevalence, management, West Bengal, tertiary care

1. INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder of global public health importance. India currently stands as the diabetes capital of the world, with an estimated 101 million people living with diabetes as per the latest national data. Among the many complications of uncontrolled diabetes, diabetic foot ulcer (DFU) is one of the most devastating and disabling conditions[1].

A diabetic foot ulcer is defined as a full-thickness wound below the ankle in a diabetic patient. It arises due to a combination of peripheral neuropathy, peripheral arterial disease, foot deformities, repetitive trauma, and poor wound healing capacity — all worsened by persistent hyperglycaemia. Studies from India have reported that nearly 15–25% of all diabetic patients are at risk of developing a foot ulcer during their lifetime, and DFU accounts for approximately 15–20% of all diabetes-related hospital admissions[2].

The condition carries a grave prognosis if neglected. Without timely and appropriate intervention, DFU can progress to deep tissue infections, osteomyelitis, and gangrene, ultimately leading to amputation. It is estimated that every 30 seconds, a lower limb is lost somewhere in the world due to diabetes. The annual amputation rate among diabetic patients with foot ulcers is reported to be 10–30 times higher than in non-diabetic individuals[3].

In a state like West Bengal, where a significant proportion of the population relies on agricultural labour and has limited access to primary healthcare, the burden of DFU is expected to be disproportionately high. Hospital-based data from tertiary care centres provide important insights into the severity and management of this condition. However, hospital-based studies specific to West Bengal remain limited[4].

The present study was therefore undertaken to determine the prevalence of DFU among hospitalised diabetic patients at a tertiary care centre of West Bengal, to assess sociodemographic profiles, to classify the ulcers using Wagner's grading system, and to describe the management patterns adopted during the study period[5].

2. OBJECTIVES

2.1 Primary Objective

To determine the prevalence of diabetic foot ulcer among diabetic patients admitted to the surgery and medicine wards of the tertiary care centre.

2.2 Secondary Objectives

- (i) To assess the sociodemographic profile of patients with diabetic foot ulcer.
- (ii) To classify diabetic foot ulcers using Wagner's grading system.
- (iii) To describe the management modalities utilised during hospitalisation.
- (iv) To identify clinical and sociodemographic factors associated with severity of ulcers.

3. METHODOLOGY

3.1 Study Design

A hospital-based, cross-sectional, observational study was conducted.

3.2 Study Setting and Duration

The study was carried out at the Departments of General Surgery and Medicine of a tertiary care centre in West Bengal, India, over a period of six months (January 2024 to June 2024).

3.3 Sample Size Calculation

The sample size was calculated using the standard formula for estimating proportion in a crosssectional study: $n = Z^2 \times P \times Q / d^2$ Where:

n = required sample size

Z = 1.96 (standard normal deviate at 95% confidence level)

P = estimated prevalence of DFU among hospitalised diabetic patients = 25% (0.25) based on previous literature

Q = 1 – P = 0.75

d = allowable error (margin of error) = 10% = 0.10 $n = (1.96)^2 \times 0.25 \times 0.75 / (0.10)^2$ $n = 3.8416 \times 0.1875 / 0.01 = 72.03 \approx 72$

Hence, the final sample size was taken as 72 patients.

3.4 Sampling Method

Purposive (consecutive) sampling was employed. All patients who were diagnosed with type 2 diabetes mellitus and had a foot ulcer at the time of admission, and who fulfilled the inclusion criteria during the study period, were consecutively enrolled until the required sample size was achieved.

3.5 Inclusion Criteria

(i) Patients aged 18 years and above. (ii) Known cases of type 2 diabetes mellitus with foot ulcer. (iii) Patients admitted to the surgery or medicine ward. (iv) Patients who gave written informed consent.

3.6 Exclusion Criteria

(i) Patients with foot ulcers due to causes other than diabetes (e.g., venous ulcers, traumatic ulcers). (ii) Type 1 diabetes mellitus patients. (iii) Patients with incomplete records or unwilling to participate.

3.7 Data Collection Tool

Data were collected using a pre-designed, structured proforma that included sociodemographic information, clinical details, duration of diabetes, glycaemic status (HbA1c), ulcer characteristics, Wagner classification grade, and details of management received. Ulcer grading was done clinically using Wagner's Grading System (Grade 0 to Grade 5).

3.8 Statistical Analysis

Data were entered and analysed using Microsoft Excel and SPSS version 21. Descriptive statistics such as frequency, percentage, mean, and standard deviation were calculated. Results were presented in tabular form.

3.9 Ethical Consideration

The study was approved by the Institutional Ethics Committee. Written informed consent was obtained from all participants before enrolment. Confidentiality of patient data was strictly maintained throughout the study.

4. RESULTS

A total of 72 patients with diabetic foot ulcer were enrolled in this hospital-based cross-sectional study. The findings are presented below under various sub-headings along with tables.

4.1 Sociodemographic Profile

Table 1 below presents the detailed sociodemographic profile of all 72 study participants.

Table 1: Sociodemographic Profile of Patients with Diabetic Foot Ulcer (n=72)

S.No.	Variable	Category	Frequency (n=72)	Percentage (%)
1	Age Group (Years)	<40	6	8.3%
		41–50	14	19.4%
		51–60	28	38.9%
		61–70	18	25.0%
		>70	6	8.3%
2	Gender	Male	46	63.9%

		Female	26	36.1%	54
3	Religion	Hindu	52	72.2%	
		Muslim	14	19.4%	
		Others	6	8.3%	
4	Residence	Rural	44	61.1%	
		Urban	28	38.9%	
5	Education	Illiterate	20	27.8%	
		Primary	22	30.6%	
		Secondary	18	25.0%	
		Graduate & above	12	16.7%	
6	Occupation	Farmer/Labourer	30	41.7%	
		Housewife	20	27.8%	
		Business/Service	14	19.4%	
		Retired/Others	8	11.1%	
7	Monthly Income (INR)	<5,000	22	30.6%	
		5,001–10,000	28	38.9%	
		>10,000	22	30.6%	
8	Duration of Diabetes (Years)	<5	10	13.9%	
		5–10	28	38.9%	
		11–15	22	30.6%	
		>15	12	16.7%	

The mean age of the study participants was 56.4 ± 9.2 years. The majority of patients (38.9%) were in the age group of 51–60 years. Males constituted 63.9% of the study population. Most patients were Hindus (72.2%) and hailed from rural areas (61.1%), reflecting the agricultural and low-income background of the region. A considerable proportion (27.8%) was illiterate, and 58.5% had completed only primary or secondary level education. Farmers and daily-wage labourers constituted the largest occupational group (41.7%). In terms of income, 30.6% earned less than Rs. 5,000 per month, indicating significant socioeconomic vulnerability. Regarding duration of diabetes, 38.9% of patients had been living with diabetes for 5–10 years, and 16.7% had diabetes for more than 15 years, suggesting that longer disease duration is associated with

higher risk of foot ulceration.

55

4.2 Wagner Classification of Diabetic Foot Ulcers

Table 2: Distribution of Diabetic Foot Ulcers According to Wagner Grading (n=72)

Wagner Grade	Description	Frequency (n=72)	Percentage (%)
Grade 0	No open lesion, high-risk foot	8	11.1%
Grade 1	Superficial ulcer	18	25.0%
Grade 2	Deep ulcer to tendon/capsule	20	27.8%
Grade 3	Deep ulcer with osteomyelitis	14	19.4%
Grade 4	Partial foot gangrene	8	11.1%
Grade 5	Whole foot gangrene	4	5.6%

Wagner Grade 2 was the most common presentation (27.8%), followed by Grade 1 (25.0%) and Grade 3 (19.4%). Grades 4 and 5, representing partial and complete foot gangrene, were seen in 11.1% and 5.6% of patients respectively. Grade 0 (high-risk foot without open lesion) was recorded in 11.1% of cases. This distribution indicates that a significant number of patients presented at an advanced stage of the disease.

4.3 Management Modalities

Table 3: Management Modalities Used in Diabetic Foot Ulcer (n=72)

Management Modality	Frequency (n=72)	Percentage (%)
Wound debridement	60	83.3%
Antibiotic therapy (systemic)	64	88.9%
Insulin therapy optimisation	68	94.4%
Minor amputation	16	22.2%
Major amputation	6	8.3%
Offloading / pressure relief	52	72.2%
Vascular intervention	10	13.9%
Discharged / wound healed	42	58.3%

Insulin therapy optimisation was the cornerstone of management and was undertaken in 94.4% of patients. Systemic antibiotic therapy was instituted in 88.9% of cases, and wound debridement was performed in 83.3%. Offloading and pressure-relief measures were used in 72.2% of patients. Minor amputation (ray amputation or toe amputation) was performed in 22.2% and major amputation in 8.3% of cases. Vascular interventions such as angioplasty or bypass were required in 13.9% of patients with co-existing peripheral arterial disease. Wound healing and discharge were achieved in 58.3% of the patients.

4.4 Additional Key Findings

The mean HbA1c at admission was $10.8 \pm 1.6\%$, indicating very poor glycaemic control at the time of presentation. The mean duration of hospital stay was 18.4 ± 7.2 days. The most common site of ulceration was the plantar surface of the foot (51.4%), followed by the toe region (34.7%). Wound swab cultures showed *Staphylococcus aureus* and *Pseudomonas aeruginosa* as the most commonly isolated organisms.

5. DISCUSSION

The present hospital-based cross-sectional study was conducted on 72 patients with diabetic foot ulcer at a tertiary care centre in West Bengal. The findings revealed important sociodemographic, clinical, and management-related patterns that are relevant for public health planning and clinical practice[6].

The mean age of our study participants was 56.4 years, with the majority belonging to the 51–60 years age group. This is consistent with earlier Indian studies by Singh et al. (2013) and Pendsey (2010), who reported a similar age distribution, suggesting that middle-aged and older adults bear the maximum burden of DFU. Advancing age is associated with worsening neuropathy, reduced immunity, and longer duration of diabetes, all of which contribute to foot ulceration[7].

A higher proportion of males (63.9%) was observed in our study. This finding is in agreement with studies conducted by Shankhdhar et al. (2008) and Boulton et al. (2005), who reported male predominance in DFU. The higher prevalence in males may be attributed to greater physical activity, outdoor work, habit of walking barefoot, and delayed health-seeking behaviour among men in rural India[8].

A majority of patients (61.1%) were from rural areas, and a significant number were illiterate or had limited formal education. Low literacy levels are directly linked to poor knowledge of foot care practices, delayed recognition of ulcer severity, and late presentation to tertiary care facilities. These findings are in line with the observations of Abolfotouh et al. (2011), who emphasised the role of education in diabetic foot care[9].

Regarding Wagner classification, Grade 2 ulcers were the most common (27.8%), followed by Grade 1 (25.0%). The combined prevalence of Wagner Grades 3, 4, and 5 in our study was 36.1%, indicating that more than one-third of patients presented with advanced-stage disease. Late presentation is a recognised challenge in developing countries and is often attributable to inadequate primary care infrastructure, lack of awareness, and financial constraints. Similar findings were reported by Patel et al. (2012) and Jayasinghe et al. (2007).

In terms of management, insulin optimisation was the most universally applied intervention (94.4%), underlining the importance of achieving euglycaemia as the foundation of DFU management. Systemic antibiotics were administered in 88.9% of cases, reflecting the high 57 prevalence of secondary bacterial infection in these wounds. Wound debridement was performed in 83.3% of patients and offloading in 72.2%, both of which are standard components of wound care as recommended by the International Working Group on the Diabetic Foot (IWGDF)[10][11]. The amputation rate in the present study — minor amputation in 22.2% and major amputation in 8.3% — is comparable to findings from other Indian tertiary care hospital studies. Shastri et al. (2017) reported a minor amputation rate of 19.5% and a major amputation rate of 9.3% in a similar setting. High amputation rates in tertiary centres are partly explained by referral bias, as patients with severe or gangrenous ulcers are preferentially sent to higher-level facilities[12].

The mean HbA1c of 10.8% at admission highlights the critical issue of poor glycaemic control in these patients. Several studies, including the ADVANCE and UKPDS trials, have demonstrated that every 1% reduction in HbA1c significantly reduces microvascular and macrovascular complications of diabetes. The high HbA1c values in our study population suggest inadequate outpatient management and non-compliance with antidiabetic therapy, both of which require urgent attention.

A multidisciplinary team (MDT) approach, including diabetologist, surgeon, orthopaedic specialist, microbiologist, physiotherapist, and wound care nurse, was utilised in the management of most patients. Evidence consistently supports the MDT approach as the most effective strategy to reduce amputation rates and improve healing outcomes in DFU. The present findings emphasise the need for strengthening such MDT services in government tertiary care hospitals in West Bengal.

6. CONCLUSION

Diabetic foot ulcer is a significant and growing clinical burden at the tertiary care level in West Bengal. The present study demonstrated that patients most affected are middle-aged males from rural areas with poor literacy levels, low income, long duration of diabetes, and very poor glycaemic control. Advanced-stage ulcers at the time of presentation and high rates of minor amputation reflect delayed health-seeking behaviour and inadequate primary care.

Insulin optimisation, systemic antibiotics, wound debridement, and offloading remain the mainstay of management. A multidisciplinary, comprehensive, and patient-centred approach is essential to improve outcomes. Public health strategies should focus on strengthening community-level diabetes education, promoting regular foot examinations, ensuring early referral, and improving access to specialised wound care services. With timely diagnosis and appropriate management, a significant proportion of amputations and disability due to diabetic foot ulcer can be prevented.

7.DECLARATION

Conflict of Interest: The authors declare no conflict of interest.

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58

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