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Prevalence Of Diabetic Foot Ulcer And Levels Of Foot Care Confidence Among Patients With Type 2 Diabetes Mellitus In Rural Area Of Thiruvallur District - A Cross-Sectional Analytical Study

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Abstract

Introduction
Diabetes mellitus, a severe chronic illness, is brought on by either insufficient or ineffective insulin synthesis, leaving the body with a persistent metabolic imbalance. A severe consequence of diabetes mellitus, diabetic foot ulceration is a significant cause of illness and mortality that leads to poor quality of life.
Methodology
Among 189 type 2 diabetes patients registered in the Non-Communicable Disease (NCD) clinic at the Rural Health Center in Thiruvallur , a cross-sectional analytical study was conducted. All the diabetic patients who visited the NCD clinic between November 2025 and March 2025 were recruited for the study. Consecutive sampling was done. Data was collected through a face-to-face interview with a structured questionnaire, including a Foot Care Confidence Scale developed by the Australasian Journal of Podiatric Medicine. Data was entered in (Microsoft) MS Excel and analyzed using IBM SPSS Statistics for Windows, Version 25.0. Statistical analysis was done to find an association between two categorical variables by chi-square test and for three categorical variables analysis of Variance (ANOVA) test was done.
Results
Our study shows that 51.9% of the patients are female, while 48.1% are male. Most patients (86.2%) are being treated at Saveetha Medical College and Hospital , Rural health center, indicating the significance of this clinic in managing Type 2 Diabetes mellitus. The prevalence of diabetic foot ulcers was 3.17 times higher in study participants aged >55 years compared to the other category (PR = 3.17 CI = 0.72-13.89).
Conclusion
It is essential to understand how participants fall across various risk categories to apply interventions and preventive measures appropriate for the individual risk levels. Healthcare professionals can better manage

patients with Type 2 Diabetes Mellitus overall foot care by focusing on targeted attempts to prevent diabetic foot ulcers.

Keywords - Type 2 Diabetes mellitus, Lifestyle modifications, Diabetic foot ulcer, Foot care confidence.

INTRODUCTION

Globally, diabetes prevalence has reached epidemic proportions. In 2024, an estimated 589 million adults aged 20–79 years were living with diabetes, representing a prevalence of 11.1%, and this number is projected to rise to 853 million by 2050. India is the most affected country worldwide, reporting 89.8 million cases with a 10.5% prevalence among adults. One of the most dangerous complications of diabetes is diabetic foot ulcer (DFU), which is associated with significant morbidity, mortality, diminished quality of life, high out-of-pocket expenses, and prolonged disability. [1]

Diabetes mellitus results from persistent metabolic imbalance leading to ineffective or insufficient insulin production. Diabetes currently affects approximately 589 million adults globally, or 10.5% of the adult population, with projections indicating an increase to 853 million by 2050, exceeding earlier projections of 643 million by 2030 and 628 million by 2045. According to the International Diabetes Federation, one limb is lost to diabetes somewhere in the world every 30 seconds [2].A nontraumatic lesion of the skin on the foot distal to the malleoli of a person with diabetes mellitus is known as a diabetic foot ulcer.

Globally, approximately 6.3% of individuals with diabetes develop active diabetic foot ulcers, with men affected more frequently than women. In Northern India, studies have reported that 70.1% of DFU cases occur in rural areas, with an overall prevalence of 14.3%. The lifetime risk of developing a diabetic foot ulcer among individuals with diabetes ranges from 19% to 34%. Among diabetes-related complications, DFUs represent the leading cause of hospitalization and impose a major economic burden, with treatment costs accounting for 20–33% of total diabetes-related healthcare expenditures [3].

Diabetes complications significantly affect patients' quality of life and increase healthcare burden globally. At Jimma Medical Center in Southwest Ethiopia, approximately 12.9% of diabetic patients had diabetic foot ulcers, while studies from Northwestern Ethiopia reported a prevalence of 13.6%. Global meta-analyses report a prevalence range of 4% to 10%, with an estimated pooled prevalence of around 6.3%. Major risk factors for DFU development include peripheral neuropathy, peripheral arterial disease, poor glycemic control, and longer duration of diabetes, while smoking, older age, and male gender are additional risk factors. [4]

One of the most serious complications of diabetic foot ulcers is infection, which can lead to severe consequences including lower limb amputation. Infected DFUs significantly increase the risk of amputation and often require surgical management. Chronic ulcers, pain, and immobility may also lead to psychological distress and depression, further complicating diabetes management. The economic burden of DFUs is substantial due to prolonged treatment, repeated hospitalizations, and specialized care requirements, particularly in the Asia-Pacific region. In low-resource settings such as rural South Africa and Ethiopia, limited access to appropriate footwear, inadequate patient education, and poor healthcare infrastructure further aggravate DFU complications. [5]

Delayed diagnosis, poor awareness, and limited healthcare access contribute to the rising incidence of diabetic foot ulcers. Evidence suggests that early detection and management of diabetic foot conditions can reduce ulcer development by 44% to 85%. Therefore, screening high-risk patients and improving patient confidence in foot self-care practices are crucial strategies to prevent diabetic foot ulcers and reduce associated morbidity. [6]

Materials and Methods

An institutional cross-sectional analytical study was conducted at the rural health center (RHC) of Saveetha Medical College and Hospital (SIMATS), Chennai. November 2025–March 2025, a period of four months,

was used for the investigation. All patients with type 2 diabetes who had enrolled in the NCD clinic, were willing to participate and provided their informed consent to participate were included as study subjects consecutively. Face-to-face interviews were used to gather data, and a structured questionnaire developed by the Australasian Journal of Podiatric Medicine included the Foot Care Confidence Scale [10–12]. All the participants were fully informed about the study in their language. This research eliminated those who did not provide their consent.

Sample Size Calculation

Based on the previous study, the prevalence of diabetic foot ulcers was 14.3% Shailesh K. Shahi et.al [2] with a 95% confidence interval, power of 80%, and absolute precision of 5%, the sample size was calculated to be 189 using Open Epi version 3.0.

A structured questionnaire was prepared after the selection of studies. Participants were selected based on inclusion and exclusion criteria. The questionnaire was administered to participants for 20 minutes and responses were assessed. The questionnaire comprised independent variables sociodemographic details, anthropometric parameters, addiction, comorbidities, duration of diabetes, treatment, diabetic control, and foot ulcer risk. The outcome variable was foot care confidence in people with diabetes using the Foot care confidence scale (Likert scale, Total of 12 questions with a maximum score of 60). The data collection tool used was the Foot Care Confidence Scale (FCCS) [10-12]. It consists of 12 parameters Each graded from strongly agree to strongly disagree a positive question Strongly agree = 5 points, for a negative question Strongly agree= 1-point, Maximum score=60, minimum score =12. Statistical analysis was done to find an association between two categorical variables by chi-square test and for three categorical variables analysis of Variance (ANOVA) test was done.

Operational Definition

History of Ever-Used Tobacco:

An "ever-used tobacco" individual is someone who has used any form of tobacco product, such as cigarettes, cigars, pipes, or smokeless tobacco (e.g., chewing tobacco, snuff), at least once in their lifetime, regardless of the frequency, duration, or intensity of use. [13]

History of Ever-Used Alcohol:

An "ever-used alcohol" individual is someone who has consumed an alcoholic beverage in any form (e.g., wine, beer, spirit) at least once in their lifetime, regardless of the amount, frequency, or pattern of consumption. [14]

History of Proxy Visit:

A "history of proxy visit" refers to an individual who has been represented by another person (a proxy) during a medical consultation, health assessment, or survey at least once in their lifetime. [15]

RESULTS

Table 1 shows the socio-demographic details of study participants attending the NCD Clinic. Among the study participants, more than half (63.5%) were aged above 55 years and (51.9%) were females. About 74.1% of the study participants were educated in the middle class. Based on the modified Kuppuswamy socio-economic status classification for 2023, more than half of them (67.7%) belonged below the middle class [16]. Among the study participants, the majority (90.5%) managed their control of diabetes with oral hypoglycaemic agents and (68.3%) study participants (68.3%) had a history of other comorbid conditions.

Table 1: Socio-demographic distribution of Type 2 Diabetes mellitus patients (N=189)

Sl. No	Variable	Category	Frequency, n (%)
1	Age group (in years)	<55	69 (36.5)
		>55	120 (63.5)
2	Gender	Male	91 (48.1)
		Female	98 (51.9)
3	Educational status	Up to middle class	140 (74.1)
		Above middle class	49 (25.9)
4	Socioeconomic class*	Middle and above middle-class	61 (32.3)
		Below middle class	128 (67.7)
5	Duration of diabetes (years)	< 5	93 (49.2)
		>5	96 (50.8)
6	Control of diabetes	Oral Hypoglycemic Agents	171(90.5%)
		Insulin	18(9.5%)
7	History of other comorbidity	No	60 (31.7)
		Yes	129 (68.3)

*Socioeconomic status based on the modified Brahm Govind (BG) Prasad scale, 2025

Table 2 shows the family and personal history of Type 2 Diabetes Mellitus (T2DM) patients. Among the study participants, the majority (92.6%) had fewer than one primary caregiver. Majority of the study participants had never used tobacco (84.7%) or alcohol (82.5%). More than half of the study participants (59.8%) do not have a history of proxy visits. Majority of the study participants (91.0%) have no past history of foot ulcers.

Table 2: Distribution of family and personal history of Type 2 Diabetes mellitus (N=189)

SL No	Variable	Category	Frequency, n (%)
1	Number of primary caregivers	< 1	175 (92.6)
		>1	14 (7.4)
2	History of ever-used tobacco	No	160 (84.7)

		Yes	29 (15.3)
3	History of ever-used alcohol	No	156 (82.5)
		Yes	33 (17.5)
4	History of proxy visit	No	113 (59.8)
		Yes	76 (40.2)
5	Past history of foot ulcer	No	172 (91.0)
		Yes	17 (9.0)

Figure 1 categorizes the participants based on their risk of developing diabetic foot ulcers [17]. Among the study participants, a majority (75.7%) fall into the low-risk category, indicating a lower likelihood of developing foot ulcers. On the other hand, 17.5% of participants are classified as moderate risk, suggesting a slightly higher risk level for foot ulcer development. About 6.9% of the study population had high-risk and active ulcers.

Fig 1. Risk categorization of Diabetic Foot Ulcer (N=189)

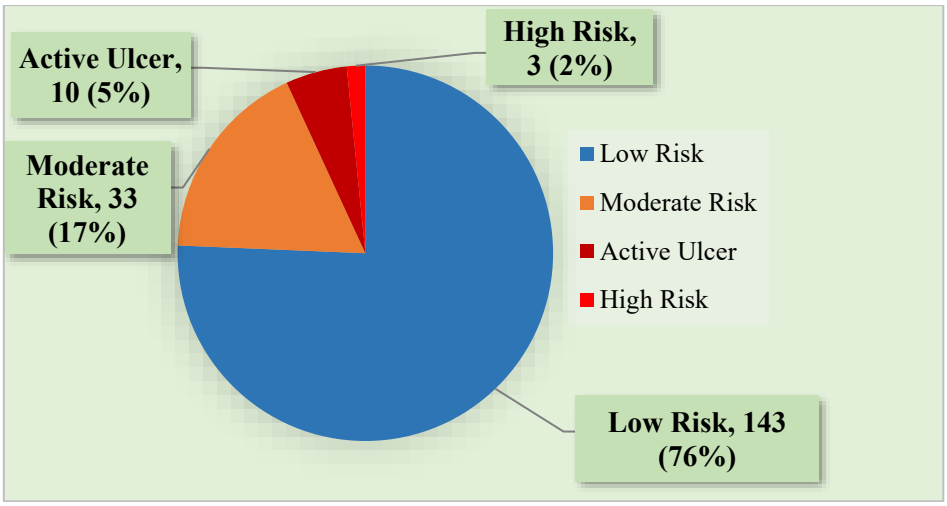

Table 3 shows the association of foot care confidence among Type 2 Diabetes Mellitus (T2DM) patients at the NCD Clinic. The mean score as per the Foot Care Confidence Scale = 45.65 (SD 5.42). This study's findings showed that low-risk patients had the highest confidence, with an average score of 46.7 (5.1). In contrast, those at moderate risk and those with diabetic foot ulcers had lower confidence levels, with average scores of 43.5 (5.0) and 39.0 (2.9), respectively.

Table 3 Association of Foot Care Confidence among the study participants (N=189)

Sl No	Risk category	Mean (SD)	95% CI	P value
1	Low risk	46.7 (5.1)	(45.88-47.58)	**<0.001***
2	Moderate risk	43.5 (5.0)	(41.76-45.32)	

3	Diabetic foot ulcer	39.0 (2.9)	(37.30-40.84)	

***p value <0.05 is significant, (one-way ANOVA test)**

Table 4 shows the factors associated with diabetic foot ulcers among the study participants. The prevalence of DFU was 3.17 times higher in study participants aged >55 years compared to the other category (PR = 3.17 CI = 0.72-13.89). The prevalence of foot ulcers was 2.2 times higher in alcohol users compared to non-alcohol users (PR = 2.2 CI = 0.74-6.83). The prevalence of OHA use among study participants was 4.7 times higher than those with insulin use, (PR = 4.7 CI = 2.01-11.13) and this difference was statistically significant. Study participants with a history of diabetic ulcers were 53.2 times more prevalent in diabetic foot ulcers than the other category, (PR = 53.2 CI = 13.29-213.8) and this difference was statistically significant.

Table 4: Factors associated with diabetic foot ulcer among the study participants (N=189)

Sl No	Category	**No Diabetic foot ulcer n = 176 (%)	**Diabetic foot ulcer n = 13 (%)	Prevalence ratio (PR)	P value
1	**Age group (in years)**				
	<55	67 (97.1)	2 (2.9)	3.17 (0.72-13.89)	0.101
	>55	109 (90.8)	11 (9.2)		
2	**Gender**				
	Female	92 (93.87)	6 (6.13)	0.8 (0.28 - 2.28)	0.671
	Male	84 (92.3)	7 (7.7)		
3	**History of ever-used tobacco**				
	No	149 (93.13)	11 (6.87)	1 (0.21 - 4.74)	0.191
	Yes	27 (93.1)	2 (6.9)		
4	**History of ever-used alcohol**				
	No	147 (94.23)	9 (5.77)	2.25 (0.74 - 6.83)	0.201
	Yes	29 (87.9)	4 (12.1)		
5	**Duration of diabetes (in years)**				
	< 5	88 (95.7)	8 (4.3)	0.4 (0.14-1.43)	0.764
	>5	85 (90.6)	9 (9.4)		
6	**Type of control of diabetes**				
	Insulin	12 (66.7)	6 (33.3)	4.75 (2.01-11.13)	**<0.001***
	OHA	164 (95.9)	7 (4.1)		
7	**Past history of foot ulcer**				
	Yes	6 (35.3)	11 (64.7)	53.2 (13.29-213.8)	**<0.001***
	No	170 (98.8)	2 (1.2)		
8	**History of proxy visit**				
	No	106 (93.8)	7 (89.26)	0.9 (0.90-1.06)	0.651
	Yes	70 (92.1)	6 (7.9)		

***p value <0.05 is significant, (Chi-square test)**

DISCUSSION

In our study, females comprised 51.9% of participants, with more than half (63.5%) aged over 55 years. This demographic distribution aligns with recent Indian trends in type 2 diabetes mellitus (T2DM), where prevalence increases markedly with advancing age and peaks in older adults. According to the International Diabetes Federation (IDF) Diabetes Atlas 2025, diabetes prevalence rises substantially after the age of 50 years, with particularly high rates observed in the 70–74-year age group. Although males tend to show slightly higher prevalence rates overall, females represent approximately 48–52% of the diabetic population and frequently demonstrate higher healthcare-seeking behavior, which may explain their greater representation in clinic-based studies. [1,2,5] Older adults are also at increased risk of developing diabetic foot ulcers (DFU) due to longer duration of diabetes, progressive peripheral neuropathy, and peripheral arterial disease (PAD), factors strongly associated with foot complications.[15,19]

In the present study, 67.7% of participants belonged to socioeconomic class III and below, based on the updated BG Prasad socioeconomic classification, and most participants had educational attainment up to middle school level. These findings are consistent with patterns observed in several Indian diabetes cohorts where lower socioeconomic status (SES) is associated with a higher burden of diabetic complications. Limited access to healthcare services, lower health literacy, and reduced awareness of preventive foot care practices contribute to poor glycemic control and increased risk of complications such as neuropathy and DFU.[13,15,23] Socioeconomic disparities continue to influence diabetes outcomes, particularly in developing countries where resource constraints limit early screening and self-management practices.

The majority of study participants (90.5%) managed their diabetes using oral hypoglycemic agents (OHAs), while 68.3% reported associated comorbidities such as hypertension, dyslipidemia, and cardiovascular disease. Similar findings have been reported globally, where 70–80% of individuals with T2DM present with at least one comorbidity, significantly increasing the risk of diabetic complications.[1,15] These comorbid conditions contribute to the development of DFU through mechanisms such as vascular endothelial dysfunction, accelerated atherosclerosis, and impaired tissue perfusion. Hypertension and dyslipidemia in particular are known to exacerbate peripheral arterial disease and neuropathy, thereby increasing susceptibility to ulcer formation.[15,27]

Diabetic Foot Ulcer Risk

The present study observed that 75.7% of participants were categorized as low risk, 17.5% as moderate risk, and 6.8% as high risk or having active DFU. This proportion of moderate-to-high risk individuals is somewhat lower than that reported in several international studies. For instance, Nyamu et al. reported that approximately 45% of diabetic patients in Nairobi were classified as moderate-to-high risk, largely due to high prevalence of neuropathy and poor glycemic control. Similarly, global epidemiological reviews estimate that 15–25% of diabetic patients in community settings fall into moderate-to-high DFU risk categories.[9,27] The relatively favorable distribution observed in the current study may be attributed to improved screening and follow-up services available through non-communicable disease (NCD) clinics and primary healthcare facilities, although continued monitoring remains essential to prevent progression to ulceration.

Foot Care Confidence and Diabetes Management

Participants in the current study demonstrated high levels of confidence in foot self-care practices, particularly in daily foot inspection (mean score 47.2/60) and protective behaviours such as appropriate footwear use (mean score 45.8/60). Previous studies have shown that self-efficacy plays a crucial role in adherence to preventive behaviours among individuals with diabetes. Pourhaji et al. demonstrated a significant positive association between self-efficacy and foot care compliance ($r = 0.62$), with improved adherence leading to a 35% reduction in ulcer development over one year. [20] Similarly, Perrin et al. reported that individuals with higher confidence in foot care practices were more likely to perform regular foot inspections and preventive measures, thereby reducing the risk of complications.[21] These findings support

the importance of strengthening patient education and behavioural interventions within diabetes care programs.

Foot Care Confidence and Knowledge

The high confidence scores observed in the present study are comparable with findings from Chiwanga et al., who reported that diabetic patients with adequate knowledge and self-care awareness were significantly less likely to develop foot ulcers.[25] Similarly, Desalu et al. demonstrated that improved patient knowledge regarding foot care practices was associated with reduced incidence of diabetic foot complications.[26] These studies emphasize the importance of integrating structured patient education programs and routine foot examinations into primary healthcare services, particularly in low-resource settings where preventive care can substantially reduce the burden of diabetic complications.

Relationship Between Risk Factors and Confidence

In the present study, it was observed that foot care self-confidence was inversely related to DFU risk. The low risk group had higher scores of confidences (mean 46.7 ± 5.1) than the moderate risk (39.2 ± 6.4) and high risk/DFU groups (32.1 ± 7.2). This pattern implies that people who have more confidence in their self-care are more likely to have ulcer risk-reduction preventive behaviours. Previous studies have also identified the importance of psychosocial factors in diabetes management; for example, one study found that higher self-efficacy and social support were associated with better adherence to diabetes self-care and better glycemic control.[20,24] The effectiveness of family support and community-based education programs to enhance foot care practices among people with diabetes has also been demonstrated. [24]

DFU Risk Factors

The analysis further highlighted that individuals who were treated exclusively with oral hypoglycaemic agents had approximately 4.7 times higher prevalence of DFU than those who were on insulin therapy (PR = 4.7; 95% CI: 2.01–11.13; $p < 0.01$). This association can be attributed to delayed treatment intensification and extended duration of poor glucose control among the patients who were exclusively on oral medications. Similarly, another study has reported that higher rates of vascular complications are associated with poorly controlled diabetes.[15,27] In addition, a history of diabetic foot ulcer emerged as a strong predictor of recurrence; the findings are consistent with the North-West Diabetes Foot Care Study, were 52% of the total patients showed recurrent ulcers in long-term follow-ups.[28] Persistent neuropathy, structural foot deformities, and impaired tissue healing are attributed to the recurrence. In addition, many other comorbidities including hypertension and cardiovascular disease have been shown to account for a significant percentage of the risk of DFU, underscoring the need to address systemic risk factors comprehensively.[15]

Strengths of the Study

The major strength of the study is the use of a well-structured questionnaire, which deals with a wide range of variables such as sociodemographic factors, comorbidities, and foot care confidence. The reliability of the assessment of foot care confidence among the participants is reinforced by adopting the Foot Care Confidence Scale, a validated tool. This has ensured that the data collected will be consistent and can be comparable with other studies.

Limitations of the Study

Establishing a causal link between the appearance of DFUs and risk factors is limited by the study design. The study was conducted at a single centre; hence, the findings cannot be generalised. To examine the changes in foot care confidence and DFU risk over time, longitudinal studies are required. Interventions, such as foot care education or foot care clinics, could be explored to assess the efficacy of these strategies in increasing confidence in diabetic foot care and reducing the prevalence of DFUs in the population. There

is a need for further research to investigate how psychological factors (e.g. diabetes-related distress or depression) affect foot care confidence and practices.

Conclusion

The study findings indicate that a history of foot ulcers and usage of oral hypoglycaemic drugs for diabetes therapy could be important risk factors for the development of diabetic foot ulcers. The overall positive Foot Care Confidence profile of the study participants confirmed their motivation to engage in key foot care behaviours. The study findings also highlighted the importance of promoting patient engagement in supporting their foot health and self-care practices and preventing any potential consequences of DFF. Healthcare practitioners also hold an important role in identifying the person at higher risk, so that the prevention measures can be developed and implemented to prevent DFUs and improve overall foot health

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