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Research Article

To Assess the Knowledge and Extent of Compliance Regarding the Prevention of Foot Ulcers among the Patients with Diabetes Mellitus at Selected Settings in Chennai

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Abstract

Background: Diabetic foot ulcers (DFU) are a serious complication of diabetes that can lead to infections, hospital stays, and even amputations. Preventing these ulcers largely depends on how much patients know and how well they follow self-care practices. This study was carried out in selected outpatient departments of diabetic care centers in Chennai. The main goals were to assess patients' knowledge and compliance, see if there is a link between the two, and find out if factors such as age or education influence them.

Methods: A non-experimental descriptive study was conducted among 60 diabetic patients attending outpatient departments in selected health-care settings in Chennai. A non-probability convenience sampling technique was used. Data were collected using a semi-structured interview schedule consisting of demographic variables and questionnaires to assess knowledge and compliance regarding the prevention of DFU. Descriptive and inferential statistics were applied to analyze the data.

Results: Among the participants, 48.33% had moderate knowledge, 35% had inadequate knowledge, and only 16.67% had adequate knowledge regarding foot ulcer prevention. In terms of compliance, 51.67% exhibited moderate compliance with preventive measures, 43.33% had low compliance, and just 5% showed high compliance. A statistically significant positive correlation was found between knowledge and compliance ($r = 0.674$, $P < 0.001$), indicating that better knowledge was associated with better compliance.

Conclusion: The study concludes that diabetic patients' knowledge and compliance with preventive measures are key to reducing foot ulcer risk. Moderate levels observed highlight the need for structured education and ongoing support to improve self-care and diabetes outcomes.

Keywords: Compliance, diabetes mellitus, diabetic foot ulcers, foot care, knowledge, patient education

Introduction

Diabetes mellitus has evolved into a major global public health issue. The rising incidence of diabetes continues to impose significant burdens on individuals, families, and health-care systems, affecting national productivity and growth.[1]

As a group of metabolic disorders marked by elevated blood glucose levels (hyperglycemia), diabetes results from defects in insulin secretion, insulin action, or both, as defined by the American Nurses Association Expert Committee (2003).[2]

Among its many complications, diabetic foot ulcers (DFU) represent a particularly debilitating outcome, often leading to extended hospital stays, severe infections, and in some cases, limb amputations. Diabetic patients face a risk of lower extremity amputations that is 15–46 times higher than non-diabetics, underlining the critical importance of preventive

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care. The incidence of DFU is steadily rising due to the increasing prevalence of diabetes worldwide. It is estimated that around 15% of individuals with diabetes will experience a foot ulcer during their lifetime, and the risk increases with age and poor glycemic control.[3]

DFUs are defined as open sores or wounds that typically develop on the feet of individuals with diabetes, often due to poor blood circulation, nerve damage (neuropathy), or both. These ulcers are commonly located on pressure points such as the heel or the ball of the foot, and their severity can range from superficial wounds to deep, infected lesions.[3]

Foot ulcers are one of the most common complications associated with diabetes, affecting up to 25% of people with the disease at some point in their lives. Recurrence of foot ulcer is associated with risk factors including sex (more common in males), older age, duration of diabetes for more than 10 years, structural foot deformities, and associated systemic disorders.[4,5]

The prevention of DFU is a critical aspect of diabetes management. Early detection, proper footwear, daily foot care, and effective glycemic control are essential strategies to reduce the incidence and severity of foot ulcers, ultimately improving the quality of life for individuals with diabetes.[6,7] The presence of foot ulcers not only causes significant physical and emotional pain but also imposes a substantial economic burden on health-care systems due to the need for extended care, including wound management and, in some cases, surgical interventions.[8,9]

Aim of the study

The aim of this study is to assess the knowledge and extent of compliance regarding the prevention of foot ulcers among patients with diabetes mellitus at selected settings in Chennai.

Objectives

1. To assess the knowledge regarding the prevention of foot ulcers among patients with diabetes mellitus.
2. To assess the extent of compliance regarding the prevention of foot ulcers among patients with diabetes mellitus.
3. To examine the relationship between the knowledge and extent of compliance regarding the prevention of foot ulcers among patients with diabetes mellitus.
4. To associate the knowledge regarding the prevention of foot ulcers with selected demographic variables among patients with diabetes mellitus.
5. To associate the extent of compliance regarding the prevention of foot ulcers with selected demographic variables among patients with diabetes mellitus.

Materials and Methods

Study design and setting

This study adopted a non-experimental descriptive design to assess the knowledge and extent of compliance regarding the prevention of foot ulcers among patients with diabetes mellitus. The research was carried out across three different diabetic centers in Chennai. Data collection spanned a period from February 22, 2013, to April 29, 2013.[10,11]

A non-probability convenience sampling technique was employed to recruit participants. The study sample consisted of diabetic patients attending the outpatient departments of the selected centers who met the inclusion and exclusion criteria.[12]

Sample size and sampling method

A total of 60 diabetic patients were selected as the study sample. These participants were chosen using a non-probability convenience sampling technique.[13]

The inclusion criteria specified that participants had either type I or type II diabetes mellitus and were attending outpatient departments in selected diabetic centers in Chennai. Patients who already had DFU or were unwilling to participate were excluded from the study.

Data collection tool and technique

Data were collected using a semi-structured interview schedule administered directly by the researcher. The questionnaire focused on causes, symptoms, and preventive measures of DFU. The tool's validity was ensured through expert review, and the original English version was utilized in most cases. The instrument was developed in two parts:

- Section A: This part captured demographic information, including age, gender, educational status, occupation, family income, duration of illness, and prior receipt of foot care instructions.
- Section B: This section assessed patients' knowledge and compliance concerning preventive measures for DFU. The items in this section were based on literature and validated by subject experts. Most items were retained in their original English version.

Data management and analysis

Data collection was carried out by the investigator using face-to-face interviews.

Data were analyzed using both descriptive and inferential statistics. Frequency and percentage distributions were utilized to describe demographic variables and evaluate knowledge and compliance levels. Knowledge scores were categorized as: Adequate (≥75%), moderate (50–74%), and inadequate (<50%). Compliance scores were similarly categorized as: High (≥75%), moderate (50–74%), and low (<50%).[14]

Pearson's correlation coefficient was used to assess the relationship between knowledge and compliance scores. A Chi-square test was applied to examine associations between demographic variables and both knowledge and compliance scores. A significance level of $P < 0.05$ was considered statistically significant. All analyses were conducted using standard statistical software.

Ethical and cultural considerations

Ethical clearance was obtained from the Institutional Ethics Review Board. Formal permissions were secured from the administration of VHS Hospital, Chennai, and heads of the respective centers. The study upheld ethical standards, ensuring voluntary participation and informed consent, along with the right to withdraw at any stage.

Results

Section-I sociodemographic characteristics

The study involved 60 patients with diabetes mellitus attending outpatient departments at selected centers in Chennai. The demographic characteristics of the study participants are summarized in Table 1. The study included 60 participants, most participants were between the ages of 41–50 and 51–60 years, each group comprising 33.33% of the sample, followed by 21.67% aged 31–40 years, and 11.67% aged 61 and above while gender based distribution shows an equal distribution of males and females (50% each).

Regarding educational status, 30% had completed primary schooling, whereas 23.33% were non-literate. Secondary schooling was completed by 21.67%, and only a small proportion had higher secondary (10%) or collegiate education (15%).

Occupational status showed that half of the participants were employed, out of which 21.67% worked in private jobs, 3.37% held government positions, and 25% were self-employed. The remaining 50% of participants reported being unemployed.

In terms of socioeconomic status, the majority of participants (63.33%) reported a family monthly income of <10,000, followed by 21.67% earning 10,000–20,000, and 15% earning more than 20,000.

Regarding medical history, 46.67% reported a family history of diabetes mellitus. The duration of the participants' present illness varied, with the largest group (35%) having diabetes for 1–5 years. Other durations included 6–10 years (25%), 11–15 years (23.33%), 16–20 years (11.67%), and more than 20 years (5%).

Importantly, only 48.33% of the participants had received instruction on diabetic foot care from a health-care professional, whereas the remaining 51.67% had not [Table 1].

Knowledge regarding prevention of DFU

The analysis of participants' overall knowledge levels revealed that the majority exhibited a moderate understanding. Specifically, 48.33% of participants demonstrated a moderate level of knowledge, whereas 35% of participants were categorized as having inadequate knowledge. Only 16.67% of participants showed an adequate level of knowledge. These findings indicate a general need for improvement in knowledge levels among the studied population [Table 2].

Participants' knowledge regarding the causes and preventive measures of diabetic foot was assessed and is presented in Table 3.

Table 1. Sociodemographic characteristics (*n*=60)

Demographic variables	Frequency	Percentage
Age in years		
31–40	13	21.67
41–50	20	33.33
51–60	20	33.33
61 and above	7	11.67
Gender		
Male	30	50.00
Female	30	50.00
Educational status		
Non-literate	14	23.33
Primary schooling	18	30.00
Secondary schooling	13	21.67
Higher secondary schooling	6	10.00
Collegiate education	9	15.00
Occupational status		
Unemployed	30	50.00
Self employed	15	25
Government job	2	3.37
Private job	13	21.67
Family monthly income (in rupees)		
<10,000	38	63.33
10,000–20,000	13	21.67
More than 20,000	9	15.00
Family history of diabetes mellitus		
Yes	28	46.67
No	32	53.33
Duration of present illness in years		
1–5	21	35.00
6–10	15	25.00
11–15	14	23.33
16–20	7	11.67
More than 20	3	5.00
Received instruction on diabetic foot care (health care professional)		
Yes	29	48.33
No	31	51.67

Table 2: Overall knowledge level (*n*=60)

Category	Level	Frequency	Percentage
Overall knowledge level	Adequate	10	16.67
	Moderate	29	48.33
	Inadequate	21	35

Table 3: Differentiated knowledge regarding causes and prevention (*n*=60)

Category	Percentage		Frequency	
	Yes	No	Yes	No
Knowledge of causes				
Poor circulation	51.6	48.4	31	29
Dry foot	41.6	58.4	25	35
Poor sensation	53.3	46.7	32	28
Infection	40	60	24	36
Continuous pressure on extremities	46.6	53.4	28	32
Redness in the foot (warning sign)	53.3	46.7	32	28
Knowledge of preventive measures				
Normal blood sugar level maintenance	75	25	45	15
Diabetic foot care	68.3	31.7	41	19
Regular exercise	75	25	45	15
Regular foot pressure examination	31.6	68.4	19	38
Nail care	70	30	42	18
Comfortable footwear	61.6	38.4	37	23

With respect to knowledge of causes, 53.3% of respondents correctly identified poor sensation and redness in the foot as warning signs. Similarly, 51.6% recognized poor circulation as a contributing factor, whereas 46.6% acknowledged continuous pressure on the extremities. In contrast, awareness was lower for dry foot and infection, with only 41.6% and 40%, respectively, identifying them as potential causes.

In terms of preventive measures, the majority of participants were aware of key strategies. Notably, 75% correctly identified maintaining normal blood sugar levels and engaging in regular exercise as essential preventive actions. Knowledge was also relatively high regarding nail care (70%) and diabetic foot care (68.3%). However, awareness was comparatively lower for the importance of comfortable footwear (61.6%) and regular foot pressure examination (31.6%) as preventive practices.

These results indicate varying levels of awareness, with stronger understanding of general preventive measures but gaps in recognizing specific causes and more specialized prevention strategies [Table 3].

Extent of compliance with preventive measures

The participants' overall compliance with preventive practices related to diabetic foot care was assessed and is presented in Table 4. The findings indicate that the majority of participants (51.67%) demonstrated a moderate level of compliance. A considerable proportion (43.33%) showed low compliance, whereas only a small fraction (5%) exhibited high compliance with preventive practices. These results suggest that while some individuals are taking steps to prevent diabetic foot complications, there remains significant room for improvement in adherence to recommended practices [Table 4].

Participants' adherence to specific preventive practices related to diabetic foot care was thoroughly evaluated and is detailed in Table 5.

In the domain of blood sugar management, the majority of participants reported adherence to daily drug intake (81.6%) and regular blood sugar monitoring (61.6%). Slightly over half (55%) reported following a diabetic diet regularly.

Preventive practices for avoiding DFU were less commonly practiced. Only 36.6% cleansed their feet with lukewarm water, 35% underwent periodic foot examinations by professionals, and just 25% inspected their feet daily using a mirror.

For managing redness in the foot, a high proportion avoided wearing tight-fitting shoes (88.3%), whereas 56.6% sought medical assistance and applied appropriate ointments when needed.

In efforts to improve circulation, 83.3% performed regular foot exercises. However, only 43.3% practiced foot massage, and 23.3% elevated their feet to promote circulation.

Management of dry foot was suboptimal: 51.6% used recommended moisturizing lotions, whereas only 31.6%

Table 4: Patient overall compliance with preventive practices (*n*=60)

Category	Level	Frequency	Percentage
Overall compliance with preventive practices	Moderate	31	51.67
	Low	26	43.33
	High	3	5

Table 5: Differentiated patient compliance with preventive practices (*n*=60)

Category	Percentage		Frequency	
	Yes	No	Yes	No
Maintaining normal blood sugar level				
Daily intake of drugs	81.6	18.4	49	11
Regular monitoring of blood sugar	61.6	38.4	37	23
Regular intake of diabetic diet	55	45	33	27
Preventing diabetic foot ulcers				
Cleansing foot with lukewarm water	36.6	63.4	22	38
Periodical foot examination by professionals	35	65	21	39
Daily inspection of the foot with a mirror	25	75	15	45
Managing redness in the foot				
Avoid wearing tight-fitting shoes	88.3	11.7	53	7
Obtaining medical assistance	56.6	43.4	34	26
Application of oils/lotions/ointments	56.6	43.4	34	26
Improving circulation				
Regular foot exercises	83.3	16.7	50	10
Massaging the foot	43.3	56.7	26	34
Elevating the foot at 30 degrees	23.3	76.7	14	46
Managing dry foot				
Moistening the foot with recommended lotions	51.6	48.4	31	29
Soaking the foot in warm water	31.6	68.4	19	38
Avoiding walking barefoot outdoors	31.6	68.4	19	38
Managing poor sensation in the foot				
Daily inspection of the foot for cracks/injuries	60	40	36	24
Inspection of footwear for nails/thorns	45	55	27	33
Use of slippers indoors	18.3	81.7	11	49
Preventing infection				
Seeking medical assistance after injury	61.6	38.4	37	23
Drying areas between toes	45	55	27	33
Avoiding self-removal of corns/calluses	61.6	38.4	37	23
Maintaining normal foot pressure				
Avoiding high heel shoes	66.6	33.4	40	20
Maintaining normal body weight	65	35	39	21
Changing footwear regularly	60	40	36	24
Preventing circulatory impairment				
Avoiding tight-fitting shoes	81.6	18.4	49	11
Avoiding crossed legs	71.6	28.4	43	17
Avoiding prolonged standing	61.6	38.4	37	23
Changing footwear				
Selecting well-fitting shoes	86.6	13.4	52	8
Selecting well-cushioned slippers	68.3	31.7	41	19
Monitoring foot pressure	33.3	66.7	20	40
Exercise for prevention				
Brisk walking for 30 min daily	75	25	45	15
Flexion and extension of the foot	45	55	27	33
Jogging for 30 min daily	25	75	15	45
Nail care				
Keeping nails clean	81.6	18.4	49	11
Keeping nails straight and trimmed short	61.6	38.4	37	23
Soaking nails in warm water before cutting	38.3	61.7	23	37

soaked their feet in warm water or avoided walking barefoot outdoors.

Regarding poor sensation, 60% inspected their feet daily for injuries or cracks, whereas 45% checked footwear for foreign objects. However, only 18.3% reported using slippers indoors.

In the context of infection prevention, 61.6% sought medical help after injury and avoided self-removal of corns or calluses. Similarly, 45% dried areas between the toes after washing.

To maintain normal foot pressure, 66.6% avoided high-heeled shoes, 65% maintained normal body weight, and 60% regularly changed their footwear.

In the area of circulatory health, 81.6% avoided tight-fitting shoes, 71.6% refrained from crossing their legs, and 61.6% avoided prolonged standing.

Regarding footwear practices, 86.6% selected well-fitting shoes and 68.3% chose cushioned slippers, although only 33.3% monitored foot pressure.

As part of exercise-related prevention, 75% engaged in daily brisk walking, but fewer practiced foot flexion and extension exercises (45%) or jogging (25%).

Nail care practices were moderately followed, with 81.6% keeping nails clean and 61.6% keeping them straight and trimmed. However, only 38.3% soaked nails in warm water before cutting.

These findings highlight areas of both strength and deficiency in preventive foot care behaviors among participants, indicating the need for focused health education to address these gaps [Table 5].

Correlation between knowledge and compliance

The correlation coefficient between knowledge and compliance was $r = 0.674$ ($P < 0.001$), indicating a statistically significant, moderate positive correlation. This suggests that patients with better knowledge were more likely to comply with preventive practices. Cross-tabulation revealed that patients with adequate knowledge showed high compliance, whereas the majority of those with inadequate knowledge demonstrated low compliance [Table 6].

Association of knowledge with demographic variables

There is a statistically significant association between knowledge and the following demographic variables: Gender, educational status, and receiving prior instructions about diabetic foot care.

However, no significant associations were found between knowledge and age, occupational status, family monthly income, family history of diabetes mellitus, and duration of illness. These findings suggest that education level and patient education significantly impact knowledge of foot ulcer prevention.

Table 6: Relationship between knowledge and compliance

Variables	Mean	SD	"*r*" value
Knowledge	6.72	2.74	*R*=0.0647
Extent of compliance	19.72	4.97	*P*=0.000

Association of extent of compliance with demographic variables

The analysis showed that there was no statistically significant association between compliance and any of the following demographic variables such as age, gender, educational status, occupational status, family monthly income, family history of diabetes mellitus, duration of illness, and prior instructions received.

However, it was observed that none of the patients aged 61 years and above exhibited high compliance. Among the 26 patients with low compliance, 17 had not received instructions regarding diabetic foot care. While these findings did not reach statistical significance.

Discussion

This study was conducted to assess the knowledge and extent of compliance among patients with diabetes mellitus regarding the prevention of DFU in selected healthcare settings in Chennai. A total of 60 diabetic patients participated in the study. Data collection was carried out using a semi-structured interview schedule, focusing on knowledge and compliance related to preventive measures for DFU.

Sociodemographic characteristics

The demographic profile of study participants highlights key socioeconomic and educational factors influencing diabetic foot care knowledge and practices. Middle-aged adults formed the majority, aligning with the common onset of type 2 diabetes complications,[15] whereas elderly individuals were underrepresented, indicating possible outreach gaps. Equal gender representation improved generalizability, with gender showing a significant association with knowledge, supporting the need for gender-sensitive education.

Low educational levels among participants were linked to inadequate knowledge, suggesting the need for simplified, visually aided, and culturally relevant educational materials.[16] Though occupational status showed no direct correlation, its impact through income and health-care access remains relevant. Economic hardships were common and could impede compliance, underlining the value of subsidized care and free educational initiatives.

Family history of diabetes showed no direct impact on knowledge or compliance, but family-centered approaches could aid early intervention. Participants with shorter disease durations had better knowledge, possibly due to early education efforts, indicating a need for continuous education throughout the illness.

Alarmingly, most participants had not received diabetic foot care instruction; those who did had significantly better knowledge, reinforcing the critical role of structured

education.[17] Overall, the findings stress the need for practical, accessible, and context-sensitive interventions to improve diabetic foot care awareness and practices.

Knowledge on prevention of DFU

The maximum possible knowledge score was 12, which was converted into a percentage for classification into adequate (≥75), moderate (50–74), and inadequate (<50).

The study revealed a concerning knowledge deficit regarding the prevention of DFU, with only a small proportion of participants demonstrating adequate understanding. This aligns with findings by Desalu *et al.*,[18] who also reported that a limited number of diabetic patients possess sufficient knowledge related to foot care. These findings underscore the urgent need for focused health education programs to bridge the existing knowledge gap and minimize the risk of foot-related complications.

As mentioned, the study participants demonstrated a partial understanding of the causes and early warning signs of DFU. Many recognized poor circulation, neuropathy, and local trauma as contributing factors – findings consistent with previous research by Abbas *et al.* (2002).[19] However, understanding of additional causes, such as infection and continuous pressure on the extremities, was less comprehensive.

When examining knowledge of preventive measures, participants showed reasonable awareness of practices such as regular medication intake, blood sugar monitoring, and diabetic dietary adherence.

Despite a fair understanding of general foot care and nail hygiene, notable knowledge gaps existed in more specialized areas, such as foot pressure monitoring and appropriate footwear selection. This is consistent with findings from Vileikyte *et al.*,[20] who observed that patients often lack detailed knowledge of protective strategies that could help prevent foot injury and ulceration.

These results suggest that while general awareness of diabetic foot care is present among patients, specific aspects remain under-recognized. This highlights the need for targeted nursing interventions, with an emphasis on comprehensive patient education that covers all dimensions of diabetic foot prevention – particularly those less understood but critical for effective self-care.

Extent of compliance with preventive measures

The study revealed that most participants showed moderate compliance with diabetes management strategies, while a significant number had low adherence and only a few demonstrated high compliance. This aligns with prior studies highlighting generally low compliance among diabetic patients (Smith *et al.*, 2019; Johnson and Lee, 2020).[21] Compliance varied across self-care areas: most adhered well to medication, glucose monitoring, and diet – key factors in glycemic control – supporting findings from Williams *et al.* (2019) and Patel and Zhang (2021),[22] and consistent with the emphasis on tight glycemic control in earlier research (Johnson and Patel 2018).[23]

However, foot care compliance was notably lower. Few participants performed daily foot cleansing or regular inspections, though many avoided tight shoes and sought timely care for foot issues, echoing previous findings on inconsistent foot care.[8] While circulation-improving activities such as foot exercises were somewhat common, practices such as foot elevation and avoiding barefoot walking were less frequent, reflecting earlier research stressing comprehensive foot care.[9]

For reduced sensation, some engaged in inspections and footwear checks. In infection prevention, many avoided self-treating calluses and sought professional help – behaviors supported by Johnson and Patel[24] and Smith *et al.*[25] Preventive steps to reduce circulatory issues, such as avoiding tight shoes and standing long, were generally practiced, as was the selection of cushioned footwear.

Brisk walking was the preferred exercise, with less adherence to jogging or foot-specific exercises, mirroring Brown *et al.*[26] Nail care practices, such as cleaning, trimming, and soaking, were well maintained, consistent with Lee *et al.*[27] Overall, while adherence to basic care was adequate, more detailed foot care practices need reinforcement through targeted education.

Co-relationship between knowledge and compliance

A statistically significant positive correlation ($r = 0.674$, $P < 0.01$) was found between knowledge and extent of compliance shown in Table 6. Patients with higher knowledge levels were more likely to demonstrate better compliance. Specifically, among patients with adequate knowledge, 30 had high compliance. Conversely, 76 of those with inadequate knowledge showed low compliance.

These findings align with those of Abbas *et al*. (2002), who also reported that patients with better knowledge of diabetic foot care practices exhibited improved adherence to preventive measures. Similarly, a study by Desalu *et al.* found that patients with adequate foot care knowledge were significantly more likely to perform daily foot inspections and maintain proper hygiene.[18,19]

This finding supports the notion that improved knowledge positively influences health behaviors, emphasizing the importance of educational interventions to improve outcomes in diabetic foot care.

Association of knowledge with demographic variables

Knowledge levels showed significant associations with gender, educational status, and prior instruction about diabetic foot care ($P < 0.05$). No significant associations were found with age, occupation, family income, family history of diabetes, or duration of illness.

Older patients (aged 61 and above) showed lower knowledge levels, suggesting the need for ongoing education and reinforcement. All participants with adequate knowledge

had some level of formal education, and those who had received specific instructions on foot care performed better in knowledge assessments.

These findings align with previous studies indicating that education and targeted health instruction are key predictors of health literacy and preventive behavior among diabetic patients.[11]

Association of extent of compliance with demographic variables

In contrast, the extent of compliance did not show significant associations with any demographic variables. However, it was noted that older patients and those who had not received foot care instructions were more likely to have low compliance, although these trends did not reach statistical significance.

Conclusion

This study highlights a significant gap in both knowledge and compliance among diabetic patients regarding foot ulcer prevention. Only 16.67% had adequate knowledge, and just 5% demonstrated high compliance with preventive practices. A strong positive correlation between knowledge and compliance underscores the importance of patient education. To address this, health-care providers and stakeholders must implement structured, patient-centered interventions that empower individuals with diabetes to actively engage in foot care. Strengthening education and support systems is essential to reduce the incidence of DFU and improve patient outcomes.

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Conflicts of Interest

N/A.

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