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Foot-care practices and diabetic foot ulcers among patients with type 2 diabetes

Roza Marlinda*, Rhona Sandra

Program Studi Ilmu Keperawatan, Universitas Syedza Saintika
Corresponding Author: Roza Marlinda. E-Mail: roza.marlinda@gmail.com

Abstract

Background: Diabetic foot ulcers are serious complications of type 2 diabetes and can lead to infection, hospitalization, amputation, and reduced quality of life. Consistent foot-care practices are an important component of diabetes self-management and may be associated with ulcer prevention.
Purpose: To examine the association between foot-care practices and diabetic foot ulcer status among patients with type 2 diabetes.
Method: This cross-sectional analytical study included 77 adults with type 2 diabetes attending the Surgical and Internal Medicine Outpatient Clinics of Dr. Rasidin Regional General Hospital, Padang, Indonesia. Participants were recruited through purposive sampling from April 17 to 26, 2026. Foot-care practices were assessed using the Foot Self-Care Behavior Questionnaire, and foot ulcer status was assessed by direct observation. The association was analyzed using the chi-square test.
Results: Of 77 participants, 48 (62.3%) had a diabetic foot ulcer. Among participants with ulcers, 33 (68.8%) were classified as having inadequate foot-care practices, whereas 15 (31.2%) had adequate foot-care practices. Foot-care practices were significantly associated with diabetic foot ulcer status ($p < 0.001$).
Conclusion: Foot-care practices were significantly associated with diabetic foot ulcer status among patients with type 2 diabetes. Because the study was cross-sectional, the findings indicate an association and do not establish causality.

Keywords: Diabetic Foot Ulcer; Foot Care; Self-Care; Type 2 Diabetes Mellitus.

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia and requires sustained self-management to reduce long-term complications. Contemporary standards emphasize regular assessment for neuropathy and foot-ulcer risk in people with diabetes (American Diabetes Association Professional Practice Committee for Diabetes, 2026). Diabetes-related foot ulcers are clinically important because they can lead to infection, hospitalization, amputation, recurrence, and substantial treatment burden (Armstrong, Boulton, & Bus, 2017; Schaper, van Netten, Apelqvist, Bus, Fitridge, Game, Monteiro-Soares, Senneville, & IWGDF Editorial Board, 2024).

Diabetic foot ulceration is multifactorial and is strongly influenced by peripheral neuropathy, peripheral arterial disease, prior ulceration, foot deformity, glycemic control, smoking, and other clinical factors (Rossboth, Lechleitner, & Oberaigner, 2021; Lin, Tian, Zhang, Zheng, & Liu, 2025). Indonesian evidence also shows that foot-care practices are clinically relevant in people with recurrent diabetic foot ulcers, alongside wound characteristics and infection severity (Amrullah, Pratama, Agustini, Khairillah, & Saun, 2024).

Foot care is an important component of diabetes self-management. Current international guidance recommends regular foot-risk screening, daily self-inspection, appropriate hygiene and skin care,

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suitable footwear, management of pre-ulcerative lesions, and timely professional review for people at risk (Bus, Sacco, Monteiro-Soares, Raspovic, Paton, Rasmussen, Lavery, & van Netten, 2024; van Netten, Raspovic, Lavery, Monteiro-Soares, Paton, Rasmussen, Sacco, & Bus, 2024). Reviews of diabetic foot self-care instruments and practices consistently identify inspection, washing and careful drying, skin care, and appropriate shoes and socks as core behaviors (Belchior, Nascimento, Sousa, Silveira, & Oliveira, 2023; He, Zhang, & Chen, 2022).

Evidence indicates that education can improve foot-care knowledge and self-care behavior, although evidence for preventing ulcers through education alone remains less certain (Goodall, Ellauzi, Tan, Onida, Davies, & Shalhoub, 2020; Crawford, Nicolson, Amanna, Martin, Gupta, Leese, Heggie, Chappell, & McIntosh, 2020). Indonesian research has identified practical barriers and facilitators to foot-care behavior, while intervention studies suggest that structured self- and family-management support can improve self-management and clinical outcomes (Sari, Yusuf, Haryanto, Sumeru, & Saryono, 2022; Subrata, Phuphaibul, Grey, Siripitayakunkit, & Piaseu, 2020). Caregiver involvement may further support preventive and wound-care behaviors (Suglo, Winkley, & Sturt, 2022). Local evidence from Dr. Rasidin Regional General Hospital is therefore important for planning practical foot-care education and screening.

RESEARCH METHOD

This analytical study used a cross-sectional design and was conducted at the Surgical Outpatient Clinic and Internal Medicine Outpatient Clinic of Dr. Rasidin Regional General Hospital, Padang, Indonesia. Data were collected from April 17 to 26, 2026. The source manuscript reported 1,044 diabetes-related visits from January to March 2026, with an average of 348 visits per month. A total of 77 participants were recruited using purposive sampling.

Participants were adults aged 18 years or older with type 2 diabetes who attended routine follow-up at the participating clinics and agreed to take part in the study.

Foot-care practices were measured using the Foot Self-Care Behavior Questionnaire and categorized as adequate or inadequate. Diabetic foot ulcer status was assessed by direct observation and classified as ulcer present or absent.

Categorical data were summarized using frequencies and percentages. The association between foot-care practices and diabetic foot ulcer status was assessed using the chi-square test, with statistical significance set at $p < 0.05$.

RESEARCH RESULTS

Table 1. Participant characteristics and study variables (N = 77)

Variable	Results, n (%)
Age, years, Mean ± SD (range)*	**46.17 ± 13.94 (20–73)**
<30 years	19/24.7
>30 years	58/75.3
Gender	
Male	41/53.2
Female	36/46.8
Highest educational level	
Elementary school	7/9.1
Junior high school	15/19.5
Senior high school	30/39.0
Higher education	25/32.5
Employment status	
Unemployed	22/28.6

Roza Marlinda*, Rhona Sandra

Program Studi Ilmu Keperawatan, Universitas Syedza Saintika
Corresponding Author: Roza Marlinda. Email: roza.marlinda@gmail.com

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Variable	Results, n (%)
Private-sector employee	45/58.3
Civil servant	10/13.0
Diabetes duration, years, Mean ± SD (range)	**3.56 ± 0.62 (3–5)**
3 years	39/50.6
4 years	33/42.9
5 years	5/6.5
Foot-care practices	
Inadequate	34/44.2
Adequate	43/55.8
Diabetic foot ulcer status	
Ulcer	48/62.3
No ulcer	29/37.7

Table 1 presents the distribution of participant characteristics and study variables. The mean age was 46.17 ± 13.94 years (range, 20–73 years), and most participants were older than 30 years (75.3%). More than half of the participants were male (53.2%) and employed in the private sector (58.3%), while senior high school was the most common educational level (39.0%).

The mean duration of diabetes was 3.56 ± 0.62 years (range, 3–5 years), with 3 years being the most frequent duration category (50.6%). Adequate foot-care practices were reported by 43 participants (55.8%), and 48 participants (62.3%) had a diabetic foot ulcer.

Table 2. Foot-care practices and diabetic foot ulcer status (N = 77)

Foot-care practices	Ulcer	No ulcer	Total	*p* value
Inadequate	33/68.8	1/3.4	34/44.2	< 0.001
Adequate	15/31.2	28/96.6	43/55.8	

Table 2 presents the distribution of foot-care practices according to diabetic foot ulcer status. Among participants with diabetic foot ulcers, 33 (68.8%) had inadequate foot-care practices and 15 (31.2%) had adequate foot-care practices. In contrast, among participants without diabetic foot ulcers, 28 (96.6%) had adequate foot-care practices, while only 1 (3.4%) had inadequate foot-care practices. The chi-square test showed a statistically significant association between foot-care practices and diabetic foot ulcer status ($p < 0.001$).

DISCUSSION

The principal finding was a statistically significant association between foot-care practices and diabetic foot ulcer status. Inadequate foot care was more common among participants with ulcers, whereas adequate foot care predominated among participants without ulcers. Because exposure and outcome were measured at the same time, the finding should be interpreted as an association rather than evidence that foot-care behavior directly caused or prevented ulcer formation.

This finding is consistent with the broader literature showing that preventive foot self-care is clinically important and that education can improve self-care behavior, although its direct effect on ulcer incidence is not always certain (Bus et al., 2024; Goodall et al., 2020; Crawford et al., 2020). Indonesian research also highlights barriers to regular foot care and supports structured self-management approaches (Sari et al., 2022; Subrata et al., 2020). Regular inspection and hygiene may help patients identify redness, callus, fissures,

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pressure areas, or minor trauma before they progress, while appropriate footwear and timely consultation can reduce avoidable mechanical injury.

The association is biologically and clinically plausible because many patients with diabetes have reduced protective sensation or impaired circulation. Minor trauma may therefore go unnoticed, particularly when daily inspection is inconsistent (Armstrong et al., 2017; Schaper et al., 2024). However, ulcer formation and recurrence are multifactorial. Glycemic control, duration of diabetes, peripheral neuropathy, peripheral arterial disease, foot deformity, smoking, prior ulceration, and other clinical factors may contribute and were not controlled for in the present bivariate analysis (Rossboth et al., 2021; Lin et al., 2025).

Several limitations should be considered. The cross-sectional design cannot establish temporal sequence and may be vulnerable to reverse causation because patients who already have ulcers may change their foot-care practices after receiving clinical advice. Purposive sampling at a single hospital limits generalizability. Foot-care practices were questionnaire-based and may be affected by recall or social-desirability bias. The foot-care questionnaire and ulcer-assessment procedures were not described in sufficient detail to permit full reproducibility. The analysis also did not adjust for important confounders such as glycemic control, diabetes duration, neuropathy, peripheral arterial disease, smoking, footwear, or previous ulcer history.

CONCLUSION

Foot-care practices were significantly associated with diabetic foot ulcer status among patients with type 2 diabetes at Dr. Rasidin Regional General Hospital, Padang. Inadequate foot-care practices were more common among participants with ulcers, while adequate practices predominated among those without ulcers. Because the study was cross-sectional, the findings demonstrate an association and should not be interpreted as evidence of causation.

SUGGESTION

Health professionals should reinforce practical foot-care education during routine diabetes visits, including daily foot inspection, hygiene, appropriate footwear, safe nail care, and early reporting of skin changes or injuries. These recommendations are consistent with current international foot-care guidance (American Diabetes Association Professional Practice Committee for Diabetes, 2026; Bus et al., 2024). Where appropriate, family or caregiver involvement may support sustained self-care behaviors (Suglo et al., 2022). Future studies should use larger multicenter samples, validated foot-care instruments, standardized ulcer assessment, and multivariable analyses that account for glycemic control, diabetes duration, neuropathy, peripheral arterial disease, footwear, smoking, and previous ulcer history. Prospective designs would help clarify whether foot-care practices precede subsequent ulcer development.

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Roza Marlinda*, Rhona Sandra

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Corresponding Author: Roza Marlinda. Email: roza.marlinda@gmail.com

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