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Foot Care Practices and Wound Occurrence Among Patients with Type 2 Diabetes Mellitus

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ABSTRACT

Background: Foot wounds are an important complication among people with type 2 diabetes mellitus and may be associated with inadequate daily foot-care practices. Aim: This study examined the relationship between foot care and wound occurrence among patients with type 2 diabetes mellitus at RSUD dr. Rasidin, Padang, in 2025. Methods: An analytic cross-sectional study was conducted at the Surgical and Internal Medicine Outpatient Clinics from 17 to 26 April 2025. The study population was reported as 348 patients per month, and 77 respondents were selected using purposive sampling. Data were collected using a questionnaire and analysed using univariate statistics and the Chi-square test. Results: The Chapter IV frequency tables reported wounds in 48 of 77 respondents (62.3%) and inadequate foot care in 43 of 77 respondents (55.8%). The cross-tabulation reported a statistically significant association between foot-care category and wound occurrence (Pearson χ^2=31.263; $p<0.001$). However, the frequency tables and cross-tabulation contain inconsistent category totals, which require verification against the original dataset. Conclusion: The reported analysis suggests an association between foot-care practices and wound occurrence. The underlying frequency discrepancies should be resolved before journal submission.

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder characterized by hyperglycemia resulting from impaired insulin secretion, insulin action, or both. Type 2 diabetes mellitus is the most common form and requires long-term self-management to reduce the risk of acute and chronic complications. The International Diabetes Federation estimated that 536.6 million adults were living with diabetes worldwide in 2021, with a projected increase to 783.2 million by 2045. Indonesia was estimated to have approximately 19.5 million adults with diabetes in 2021, emphasizing the growing need for accessible and sustained complication-prevention strategies. These epidemiological trends underline the importance of preventing lower-extremity complications through integrated diabetes care (1,2,25).

Diabetic foot wounds are clinically important because peripheral neuropathy, peripheral arterial disease, infection, structural deformity, and repetitive mechanical stress can interact to produce tissue damage. Sensory loss may prevent patients from recognizing minor trauma, while impaired perfusion can compromise tissue repair and increase the risk of infection. Foot ulceration is associated with substantial treatment demands, reduced mobility and quality of life, and an increased risk of lower-limb amputation. Prevention therefore requires systematic risk identification, clinical surveillance, and sustained participation in daily foot care (3-7,19).

Foot care is an essential component of diabetes self-management. Recommended practices include washing and carefully drying the feet, inspecting the soles and dorsum for skin changes, checking the nails, trimming nails straight across, selecting well-fitting footwear and suitable socks, checking footwear before use, applying moisturiser to dry skin while avoiding the interdigital spaces, and seeking assistance when a problem cannot be managed safely. These behaviours support early recognition of pre-ulcerative changes and reduce avoidable trauma. Current international guidance

emphasizes structured education, repeated reinforcement, appropriate footwear, and professional foot assessment according to individual risk (5,6,8-10).

Evidence from clinical guidance and empirical studies supports the importance of foot-care behaviour as one element of diabetic foot-ulcer prevention. Indonesian studies have documented gaps in foot-care behaviour and identified knowledge, motivation, family support, financial circumstances, and health-service factors as relevant influences. A recent review also highlights that education and skills training are central to foot self-management, although interventions do not consistently measure long-term foot-health outcomes (11-14). Nevertheless, findings from different settings cannot be assumed to apply directly to patients attending the surgical and internal medicine outpatient clinics of RSUD dr. Rasidin. Local evidence remains useful for tailoring nursing assessment and prevention strategies.

The study is conceptually consistent with a self-care perspective: daily foot-care activities are patient-performed behaviours that may help prevent or identify early tissue injury. In this study, foot-care practice is the independent variable and wound occurrence is the dependent variable. The analysis tests whether these two observed variables are associated; because the design is cross-sectional, it cannot establish temporal sequence or prove that foot-care behaviour caused or prevented a wound.

Nursing relevance is practical. If inadequate foot care is associated with wound occurrence, nurses can strengthen individualized education, demonstrate daily inspection and safe nail care, discuss appropriate footwear, and provide take-home materials such as posters or leaflets. Education should be reinforced through demonstration, teach-back, and follow-up rather than relying on information delivery alone. It should complement, rather than replace, clinical foot examination and timely referral when abnormalities are found (8,11,15,16).

The aim of this study was to determine the relationship between foot-care practices and wound occurrence among patients with type 2 diabetes mellitus at RSUD dr. Rasidin, Padang City, in 2025. Specifically, the study described wound occurrence and foot-care practices and examined their statistical association.

METHOD

Study design and setting. This was an analytic quantitative study using a cross-sectional design. Foot-care practice and wound occurrence were assessed at the same point in the study period. Data collection took place from 17 to 26 April 2025 at the Surgical and Internal Medicine Outpatient Clinics of RSUD dr. Rasidin, Padang City, Indonesia.

Population and sample. The source thesis states that 1,044 patients with diabetes mellitus attended the relevant clinics during January–March 2025, corresponding to an average of 348 visits per month. The study population is therefore described in the thesis as 348 patients per month. A total of 77 respondents were recruited using purposive sampling, with the sample size calculated using Slovin's formula. The inclusion criteria were patients with type 2 diabetes mellitus attending the two outpatient clinics, willing to participate, and able to read and write. Patients who declined or withdrew were excluded.

Data collection and instruments. Primary data were obtained directly from respondents using a questionnaire. The foot-care questionnaire contained 12 items with four response options: never, rarely, often, and always. Items covered washing and drying the feet, inspecting the skin and nails, trimming nails, selecting and checking footwear, using soft socks, applying moisturizer, keeping the feet warm, and performing foot exercises. The source attributes the questionnaire content to the American Diabetes Association. The source thesis does not provide a complete instrument

validation report, reliability coefficient, or documentation of permission for adaptation; these details should be supplied by the authors if available.

Wound occurrence was recorded as a binary category (wound / no wound). The source describes questionnaire-based collection for both variables. The detailed clinical definition and verification procedure used to classify a wound are not fully specified in the manuscript source and should be clarified before submission.

Ethical considerations. The study reports that informed consent was obtained before data collection and that anonymity, confidentiality, privacy, and fair treatment were maintained. A formal research ethics committee name, approval number, and approval date are not stated in the material reviewed. These details must be added if ethical approval was obtained; they must not be inferred from institutional permission or informed consent alone.

Data processing and analysis. Data were checked, coded, entered, cleaned, and tabulated. Univariate analysis was used to describe the frequency distribution of wound occurrence and foot-care practices. Bivariate analysis used the Chi-square test to assess the association between foot-care category and wound occurrence, with a significance threshold of $p<0.05$. The statistic output reproduced in the thesis reports Pearson Chi-square=31.263, df=1, $p<0.001$, with no expected cell count below five (minimum expected count 12.48). The source does not identify the software version.

Bias and study limitations in method. Purposive sampling limits generalizability beyond the participating outpatient population. Questionnaire responses may be affected by recall or social-desirability bias. The cross-sectional design cannot determine whether foot-care practices preceded wound development. The source does not describe blinding or independent clinical adjudication of wound status.

RESULTS AND DISCUSSION

Respondent characteristics and univariate findings

The wound-frequency table lists 48 respondents (62.3%) with wounds and 29 (37.7%) without wounds. The foot-care frequency table lists 43 respondents (55.8%) with inadequate foot care and 34 (44.2%) with good foot care. These values are reproduced as presented in the main results chapter; a discrepancy with the detailed SPSS output and cross-tabulation is documented in the author verification note at the end of this file.

Variable	Category	n	%
Wound occurrence	Wound	48	62.3
	No wound	29	37.7
	Total	77	100.0
Foot-care practice	Inadequate	43	55.8
	Good	34	44.2
	Total	77	100.0

Table 1. Frequency distributions reported (n=77).

Association between foot care and wound occurrence

The cross-tabulation in the table below shows that 33 respondents with wounds were labelled as not performing foot care well, compared with 15 respondents with wounds in the category labelled as performing foot care well. Among respondents without wounds, the corresponding counts were

1 and 28. The crosstab output reports the same cell counts and a Pearson Chi-square statistic of 31.263 (df=1; p<0.001).

Foot-care category (as labelled in cross-tabulation)	Wound n (%)	No wound n (%)	Total n (%)
Not good	33 (68.8)	1 (3.4)	34 (44.2)
Good	15 (31.2)	28 (96.6)	43 (55.8)
Total	48 (100.0)	29 (100.0)	77 (100.0)

Table 2. Cross-tabulation of foot-care category and wound occurrence. Percentages within each outcome column are reproduced from the thesis.

Note: Pearson Chi-square=31.263; df=1; p<0.001. The table's row totals (34 and 43) do not match the univariate foot-care frequencies in Table 1 (43 and 34). The SPSS frequency output in the appendix also reports wound occurrence as 43/34 and foot-care practice as 46/31. The source values are therefore internally inconsistent and must be checked against the raw data before final submission.

Discussion

The main inferential result reported in the SPSS output indicates a statistically significant association between foot-care category and wound occurrence among the 77 respondents (Pearson χ^2=31.263; p<0.001). The cross-tabulation suggests that wound occurrence was more common in the category labelled as inadequate foot care, while the no-wound group was concentrated in the category labelled as good foot care. This pattern is compatible with the prevention rationale that regular inspection, hygiene, safe nail care, and suitable footwear may help patients recognize early abnormalities and avoid preventable injury. However, the descriptive frequency table and cross-tabulation reverse the totals assigned to the foot-care categories, and the appendix reportedly contains further discrepancies. The association should therefore be interpreted as the result reported by the available output, not as a definitive estimate until the raw dataset and coding have been reconciled.

The present pattern is broadly consistent with the clinical rationale and published evidence supporting foot self-management as part of ulcer prevention. International guidance recommends daily foot inspection, washing and careful drying, emollient use for dry skin, straight-across nail trimming, avoidance of barefoot walking, and footwear that fits the shape of the foot. These measures are intended to reduce exposure to trauma and improve the likelihood that early lesions will be identified and assessed promptly (5,6,8). Indonesian research similarly describes suboptimal foot-care behaviour among people with diabetes and identifies the need for specific education on hygiene, inspection, footwear selection, and injury prevention (12,13).

From a nursing perspective, the findings support integrating structured foot-care education into outpatient diabetes care. Education can include demonstration of daily inspection, cleaning and drying between the toes, safe nail trimming, moisturizing dry skin while avoiding application between the toes, checking the inside of footwear, and choosing footwear that fits appropriately. Nurses can use teach-back to confirm understanding and ask patients to demonstrate the steps. Written materials may reinforce information after the clinic visit, but they should be combined with practical coaching and repeated reminders. Behaviour-change evidence suggests that education should address capability, motivation, and opportunities to perform self-care, rather than focusing only on knowledge transfer (11,14,15).

The study contributes local evidence from a hospital outpatient setting in Padang. It highlights foot care as a practical topic for nursing assessment and education rather than focusing exclusively on glycaemic management. A routine foot-care checklist could help nurses document whether patients inspect their feet, identify skin changes, use suitable footwear, and know when to seek clinical

attention. A comprehensive clinical assessment should also consider loss of protective sensation, peripheral pulses, deformity, callus, previous ulceration or amputation, and other indicators of elevated risk. Current recommendations support at least annual comprehensive foot evaluation for all people with diabetes, with more frequent review for those at increased risk (7-9). Patients with open wounds, signs of infection, ischaemia, unexplained swelling, or increasing redness or warmth require prompt clinical assessment and referral; self-care education alone is not a substitute for wound management (9,16,17).

Several limitations should be considered. First, the cross-sectional design identifies association but cannot establish causality or the temporal order between foot-care practices and wound occurrence. Second, purposive sampling at one hospital limits external validity and may not represent people with diabetes who do not attend outpatient services. Third, the questionnaire is self-reported and may be affected by recall and social-desirability bias. Fourth, the source thesis does not provide a complete validity and reliability report for the instrument or a detailed clinical definition and verification procedure for wound occurrence. Fifth, the contradictory totals across the Chapter IV tables and frequency output materially affect the descriptive estimates and the labelling of the cross-tabulation. Although the reported Pearson statistic is statistically significant, its interpretation depends on correct category coding and accurate underlying data. These issues should be resolved before the results are treated as publication-ready.

Future studies should use a clearly documented wound-assessment protocol, report instrument validity and reliability, and describe the foot-care scoring system and cut-off in sufficient detail for replication. Larger multisite samples and prospective follow-up would help clarify whether improved foot-care behaviour precedes a reduction in wound incidence. Studies should also measure clinical risk factors such as neuropathy, peripheral arterial disease, foot deformity, glycaemic control, and previous ulceration, because foot ulceration is multifactorial and cannot be explained by self-care behaviour alone (3,4,18). Intervention studies could evaluate nurse-led education, demonstration, family involvement, appropriate footwear support, and follow-up, using both behavioural and clinical outcomes. Integrated preventive care that combines professional foot assessment, structured education, and adequate footwear is particularly relevant for people at moderate or high risk (6,11).

Clinical interpretation of foot-care behaviour

Foot-care behaviour should be understood as a set of repeated protective actions rather than a single isolated activity. The questionnaire used in this study covered hygiene, inspection, nail care, footwear, skin moisturising, warmth, and foot exercises. These domains are clinically relevant because they address different pathways through which tissue injury may occur. Inspection may identify blisters, fissures, redness, callus, or minor wounds; appropriate footwear can reduce friction and pressure; and careful skin and nail care can limit avoidable trauma. Nonetheless, the effectiveness of these behaviours depends on the patient's ability to perform them consistently and to act when an abnormality is detected. Daily inspection without an appropriate response pathway, for example, may not prevent progression of a lesion. International recommendations therefore pair self-care education with access to trained professionals and timely referral (5,6,8).

Neuropathy, perfusion, and the multifactorial pathway to wounds

The association observed in this study should not be interpreted as evidence that foot-care practice is the sole determinant of wound occurrence. Diabetic foot disease is multifactorial. Peripheral sensory neuropathy can reduce protective sensation, allowing repetitive pressure or minor trauma

to continue unnoticed. Motor neuropathy and structural deformity may alter load distribution and create focal areas of high plantar pressure. Autonomic dysfunction may contribute to dry skin and fissuring, while peripheral arterial disease can impair tissue perfusion and healing. Infection may then complicate an established wound and increase the risk of tissue loss. The interaction of these mechanisms explains why prevention requires more than general advice: patients need individual risk assessment, examination of skin and deformity, neurological testing, and vascular assessment where indicated (3,4,7,9,16,18).

Foot-care education as a continuing nursing intervention

Education is most likely to be useful when it is practical, individualized, and repeated. A brief discussion during a clinic visit may not be sufficient for patients who have limited health literacy, visual impairment, restricted mobility, difficulty reaching their feet, or competing demands related to diabetes treatment. Nurses can assess these barriers before selecting an educational approach. Demonstration with return-demonstration, teach-back, pictorial materials, and involvement of a family member or caregiver may improve the feasibility of daily inspection and hygiene. The patient's confidence and perceived susceptibility should also be explored, because people who do not believe that they are at risk may not prioritize foot care. Qualitative evidence from Indonesia has identified low perceived susceptibility, limited knowledge, financial constraints, lack of motivation, and limited family or provider support as barriers, while personal benefits and family involvement can facilitate practice (12,14,15).

Footwear, pressure prevention, and early escalation

Footwear counselling should be specific rather than limited to advising patients to wear comfortable shoes. Nurses should encourage patients to select footwear that accommodates foot shape, does not rub or compress the toes, and provides adequate protection indoors and outdoors. Patients should be taught to inspect the inside of shoes for foreign objects, rough seams, or damaged lining before putting them on, and to avoid walking barefoot or in thin-soled slippers when they are at risk. For individuals with deformity, pre-ulcerative lesions, or a history of plantar ulceration, standard footwear advice may be insufficient and referral for therapeutic footwear or pressure-relieving devices may be required. Evidence from a multicentre randomized trial indicates that custom footwear can reduce recurrence when it effectively offloads high-pressure areas and is worn consistently; guideline recommendations likewise emphasize pressure-relieving footwear for selected high-risk patients (6,17,20).

Clinical surveillance and referral pathways

Daily self-inspection should be linked to a clear action plan. Patients should be advised to contact a healthcare professional promptly when they notice a blister, skin break, bleeding, new swelling, redness, warmth, discharge, colour change, or an area that does not heal. Nurses should not assume that the absence of pain excludes a serious problem, particularly in patients with sensory loss. At the clinical level, comprehensive foot evaluation includes inspection of skin and deformity, assessment for loss of protective sensation, and evaluation of pedal pulses and other signs of peripheral arterial disease. Risk stratification can guide the frequency of reassessment and the need for specialist involvement. Current standards recommend annual comprehensive evaluation for all people with diabetes and inspection at every visit for those with sensory loss or a history of ulceration or amputation (7-9). When an ulcer is present, assessment of infection, ischaemia, and mechanical

loading is essential; management may require an interprofessional team and appropriate offloading rather than education alone (8-10).

Behavioural and service-level considerations in the Indonesian context

Foot-care practice is shaped not only by individual knowledge but also by the resources and organisation of care. Patients may face barriers related to footwear affordability, transport, competing household responsibilities, or limited access to specialist services. In some communities, routine foot washing may be familiar, but systematic inspection, nail care, footwear assessment, and recognition of warning signs may receive less attention. These contextual factors support the use of education materials that are culturally and linguistically appropriate and that demonstrate concrete actions. The Indonesian community programme reported by Oktarina and colleagues combined education, foot exercises, and ankle-brachial index assessment, with improvements in participants' knowledge and skills; although this type of programme does not establish a reduction in ulcer incidence, it illustrates the feasibility of combining education with practical screening activities (13). Health services may strengthen continuity by documenting foot-risk status, providing reminders, and establishing referral links between outpatient clinics and trained foot-care professionals (6,11,12).

Interpreting the statistical result in light of data quality

The reported Pearson chi-square result indicates that the distribution of wound occurrence differed across the foot-care categories in the cross-tabulation. The p value below 0.001 is evidence against statistical independence under the assumptions of the test, but it does not quantify the magnitude of the association, establish causation, or correct inconsistencies in the underlying data. The category totals in Table 2 are 34 and 43, whereas Table 1 reports 43 and 34; the source appendix is also described as reporting different frequency totals. These discrepancies may reflect reversed labels, data-entry errors, differences in coding, or transcription problems, but the available manuscript does not establish which explanation is correct. The authors should compare each respondent's raw response, derived foot-care score, wound classification, and SPSS coding; rerun descriptive and bivariate analyses; and update all tables and narrative results from one verified dataset. Until this audit is completed, the reported association should be presented cautiously and the descriptive proportions should not be treated as final.

Implications for research and quality improvement

Future work at RSUD dr. Rasidin could begin with a standardized outpatient foot-assessment pathway. Such a pathway could record history of ulceration or amputation, symptoms of neuropathy and vascular disease, skin integrity, deformity, callus, footwear, and protective sensation. A structured checklist may support consistency between nurses and physicians, while a referral protocol can help ensure that patients with high-risk findings receive timely assessment. A prospective design would be preferable for examining whether foot-care behaviour predicts subsequent wound development, and a controlled intervention study could evaluate whether repeated nurse-led education changes both self-care behaviour and clinical outcomes. Researchers should also report the instrument's content validity, construct validity where applicable, internal consistency, scoring rules, and the clinical criteria used to define a wound. These improvements would increase reproducibility and make local findings more useful for nursing practice and service planning (5-9,11,18,21-25).

CONCLUSION

The study reported a statistically significant association between foot-care practices and wound occurrence among patients with type 2 diabetes mellitus attending RSUD dr. Rasidin, Padang, in 2025 (Pearson x^2=31.263; p<0.001). The finding supports the role of nurses in providing practical, repeated education on daily foot inspection, hygiene, nail care, and appropriate footwear. However, the descriptive frequencies and cross-tabulation in the source thesis are inconsistent. The original dataset and coding must be rechecked, and the corrected tables should replace the current values before the manuscript is submitted.

AUTHOR CONTRIBUTION

Rhona Sandra: Conceptualization, Methodology, Data curation, Supervision. Cindy Yolanda: Investigation, Formal analysis, Writing – original draft. Weni Sartiwi: Collecting data fasilitator, data Analysis Checker. The contribution statement should be confirmed by the author and revised if other contributors meet the journal's authorship criteria.

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