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Correlation between Foot Care Self Efficacy and Risk Ulcer in Type 2 Diabetes Mellitus Patients

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ABSTRACT

Background : Diabetes is a chronic disease often accompanied by life-threatening complications, such as diabetic foot ulcers and lower limb amputations. Low self-efficacy in foot care is a major factor contributing to the development of diabetic foot complications. This study aimed to analyze the correlation between foot care self-efficacy and ulcer risk in patients with type 2 diabetes mellitus. **Methods :** This study employed an analytical observational design with a cross-sectional approach. A total of 112 respondents were recruited using a consecutive sampling technique. Data were collected using the Foot Care Confidence Scale questionnaire and the Inlow's 60-Second Diabetic Foot Screen Tool observation sheet. Data were analyzed using the Spearman test. **Results:** The results showed that the mean score of foot care self-efficacy was 37.96 (SD = 8.24), while the mean ulcer risk score was 6.32 (SD = 2.88). There was a strong negative correlation between foot care self-efficacy and ulcer risk ($p < 0.001$; $r = -0.773$). **Conclusions:** Higher foot care self-efficacy was associated with a lower risk of ulcers in patients with type 2 diabetes mellitus. Assessment of ulcer risk and interventions to improve foot care self-efficacy are essential to reduce the prevalence of ulcer risk in patients with type 2 diabetes mellitus.

Keyword: Foot Care Self-Efficacy; Type 2 Diabetes Mellitus; Ulcer Risk.

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INTRODUCTION:

Diabetes is a chronic disease that is often accompanied by various life-threatening complications, such as diabetic foot ulcers and lower extremity amputations (Tekir et al., 2023). The most common complication of diabetes is diabetic foot ulcers (Perkumpulan Endokrinologi Indonesia, 2021). Diabetic foot ulcers are the leading cause of non-traumatic lower limb amputation in diabetic patients (Ikura et al., 2021). The negative impact of ulcers can cause reduced physical function, psychological status, and social status of patients (Mahdalena & Purwanti Ningsih, 2016). People with diabetes have low levels of knowledge, attitudes, and behavior towards foot care. This can increase the risk of ulcers ((Alshammari et al., 2019);(Widodo et al., 2024)). Low self-efficacy in foot care

planning among patients with diabetes can contribute to the development of diabetic foot ulcers (Toygar et al., 2020). Several previous studies indicate that self-efficacy in foot care among patients with type 2 diabetes mellitus remains inadequate. A study involving 48 patients reported a mean foot care self-efficacy score of 73.15 ± 15.61 (Polat et al., 2026). Another study of 115 patients found a mean score of 56.2 ± 23.1 on the diabetic foot care self-efficacy (Dağcı et al., 2024). Additionally, the mean score on the diabetes management self-efficacy in foot care among 108 patients was 40.52 ± 10.17 (Sezgunsay et al., 2025).

The global prevalence of foot ulcers is 6% and the prevalence of diabetic foot ulcers in Asia is around 5.5% (Yazdanpanah et al., 2018). In Indonesia, patients with diabetes mellitus with foot ulcers are around 15% (Oktalia et al., 2021). The risk of ulcers occurs due to poor foot care. Previous research stated that self-efficacy of diabetes patients was in the low category, where the indicator with the lowest percentage was foot care ((Khusnul Khotimah & Ika Silvitasari, 2024);(Pratiwi, 2018);(Aluf, 2019)). This low foot care behavior is due to the respondents low self-efficacy. In previous studies, it was found that there was a significant relationship between self-efficacy and compliance with foot care behavior (Susilawati et al., 2021). Previous research related to the relationship between foot care and the risk of ulcers found that the results of irregular foot care were 69.6% followed by a high risk of ulcers of 72.5% (Rahmanita et al., 2024).

Foot ulcers can develop as a result of inappropriate behaviors among patients, particularly poor foot care practices. Poor foot care has been associated with an increased risk of ulcer development (Widodo et al., 2024). Foot care is considered an important behavior for maintaining foot hygiene in individuals with diabetes and serves as an early preventive measure against wounds that may lead to infection (Nestriani et al., 2023). Previous studies have reported that common inappropriate practices among patients with diabetes include neglecting foot care, not wearing proper footwear, and leaving toenails untrimmed (Indarwati et al., 2019). Therefore, efforts to promote positive behavioral changes are essential. Enhancing self-efficacy plays a crucial role in supporting these behavioral changes and preventing ulcer development (Andini, 2021). Patients with higher self-efficacy are more likely to perform proper foot care practices (Hidayat et al., 2023).

METHODS:

The design of this research was observational analytic with a cross-sectional approach. The population was type 2 diabetes mellitus patients who visited the Internal Polyclinic of RSD dr. Soebandi Jember, East Java. Data were collected between November and December 2024. The sample size was calculated using the G*Power 3.1.9.4 software, resulting in a total of 112 participants. A consecutive sampling technique was applied. The inclusion criteria were patients with type 2 diabetes mellitus aged over 18 years, who were able to communicate well and willing to participate in the study. The exclusion criteria were patients with diabetic foot ulcers, those who had undergone amputation, and individuals with physical limitations that impaired communication, such as an inability to speak.

Foot care self-efficacy was measured using the Foot Care Confidence Scale (FCCS), developed by Sloan (2002). The instrument consists of 12 items, with total scores ranging from 12 to 60; higher scores indicate greater self-efficacy (Ikura et al., 2021). The Indonesian version was translated and validated by Salam and Hamim (2019), with all items meeting validity criteria ($r > 0.632$) and demonstrating high reliability (Cronbach's alpha = 0.92). The risk of diabetic foot ulcers was assessed using the Inlow's 60-Second Diabetic Foot Screen Tool, developed by the Canadian Association of Wound Care in 2009. This instrument comprises 12 indicators and is administered as an observational checklist, with scores ranging from 0 to 23; higher scores indicate a greater risk of ulcer development. The instrument was validated

by Murphy et al. (2012) and demonstrated acceptable reliability (Cronbach's alpha > 0.60). In Indonesia, it was further translated and validated by Rahmawati (2023), with all items found to be valid (r > 0.361) and reliable (Cronbach's alpha = 0.758).

Data were analyzed using the Spearman correlation test with a significance level of 0.05. This study was approved by the Research Ethics Committee of the Faculty of Nursing, University of Jember (No. 363/UN25.1.14/KEPK/2024).

RESULTS:

In this study, the mean age of respondents with type 2 diabetes mellitus was 55.54 years (SD = 10.05). The mean duration of the disease was 7 years (SD = 5.5). The results also showed that the majority of respondents were female (59.8%). Most respondents had an elementary school education (50.9%), were housewives (47.3%), and were married (96.4%).

Table 1. Characteristics of Respondents (n=112)

Variabels	n (%)	Mean (SD)
Age (years)		55.54 (10.05)
Duration of Diabetes (years)		7 (5.5)
Gender		
Male	45 (40.2%)	
Female	67 (59.8%)	
Educational Background		
No formal education	5 (4.5%)	
Elementary School	57 (50.9%)	
Junior High School	6 (5.4%)	
Senior High School	29 (25.9%)	
Diploma	1 (0.9%)	
Bachelor/master/doctoral	14 (12.5%)	
Occupation		
Housewife	53 (47.3%)	
Farmer	16 (14.3%)	
Civil Servant	9 (8%)	
Private Employee	4 (3.6%)	
Retired	6 (5.4%)	
Unemployed	10 (8.9%)	
Others	14 (12.5%)	
Marital Status		
Married	108 (96.4%)	
Widow/Widower	4 (3.6%)	

Table 2. Foot Care Self-efficacy in Type 2 Diabetes Mellitus Patients (n=112)

Variable	Mean (SD)	Achievement (%)
Foot Care Self Efficacy	37.96 (8.242)	63.26%
Checking foot condition	18.38 (6.385)	74.10%
Maintaining foot hygiene	6.16 (2.137)	61.60%
Cutting nails	3.48 (1.065) 6.26 (2.48)	69.64%
Choosing footwear	3.71 (1.071)	62.58%
Preventing injuries		61.27%

Based on Table 2, the mean score of foot care self-efficacy was 37.96 ± 8.24, with an achievement of 63.26%. The highest achievement was found in the indicator of foot inspection (74.10%). In contrast, the injury prevention indicator had the lowest achievement (61.27%).

Risk Ulcer in Type 2 Diabetes Patients

Table 3. Ulcer Risk in Type 2 Diabetes Mellitus Patients (n=112)

Variable	Mean	SD
Risk Ulcer	6.32	2.880

Based on the table above, the results indicate that the mean score of ulcer risk was 6.32, with a standard deviation of 2.88.

Table 4. Frequency Distribution of Inlow's 60-Second Diabetic Foot Screen Tool in Type 2 Diabetes Mellitus Patients (n=112)

No	Indicator	Right	Left
		n (%)	n (%)
1	**Skin condition**		
	Intact and healthy	50 (44.6%)	53 (47.3%)

	Dry with mild fungus or callus	36 (32.1%)	38 (33.9%)
	Formation of thickening callus	20 (17.9%)	16 (14.3%)
	Presence of skin ulcer formation or history of ulcers	6 (5.4%)	5 (4.5%)
2	**Nail condition**		
	Well maintained	38 (33.9%)	38 (33.9%)
	Unkempt and rough	63 (56.2%)	63 (56.2%)
	Thick, damaged, or infected	11 (9. 8%)	11 (9.8%)
3	**Presence or absence of deformity**		
	No deformity	93 (83%)	94 (83.9%)
	Mild deformity	18 (16.1%)	18 (16.1%)
	Severe deformity up to amputation	1 (0.9%)	0 (0%)
4	**Appropriate footwear**		
	Worthy	51 (45.5%)	51 (45.5%)
	Not feasible	10 (8.9%)	10 (8.9%)
	Causing trauma	51 (45.5%)	51 (45.5%)
5	**Cold feet**		
	Feet feel warm	108 (96.4%)	108 (96.4%)
	Feet feel colder than other feet or ambient temperature	4 (3.6%)	4 (3.6%)
6	**Hot feet**		
	Feet feel warm	111 (99.1%)	112 (100%)
	Feet feel hotter than other feet or ambient temperature	1 (0.9%)	0 (0%)
7	**Foot range of motion**		
	Big toe can be moved (normal)	85(75.9%)	87 (77.7%)
	Hallux limitus (limited)	22 (19.6%)	21 (18.8%)
	Hallux rigidus (stiff)	4 (3.6%)	4 (3.6%)
	Hallux amputation	1 (0.9%)	0 (0%)
8	**Sensation test with monofilament**		
	Feeling sensation in 10 places	38 (33.9%)	40 (35.7%)
	Feeling sensation in 7-9 places	71 (63.4%)	71 (63.4%)
	Feeling sensation in 0-6 places	3 (2.7%)	1 (0.9%)
9	**Sensation test with 4 questions**		
	“no” to all questions	22 (19.6%)	24 (21.4%)
	“yes” to one or more questions	90 (80.4%)	88 (78.6%)
10	**Leg pulse**		
	Palpable	91 (81.2%)	93 (83%)
	Not palpable	21 (18.8%)	19 (17%)
11	**Is there any redness on the feet**		
	No	112 (100%)	112 (100%)
	Yes	0 (0%)	0 (0%)
12	**Presence of erythema**		
	No	112 (100%)	112 (100%)
	Yes	0(0%)	0(0%)

Based on the table above, several indicators show high percentages, indicating problems that may increase the risk of ulcers. One of these is the footwear suitability indicator, as many respondents reported wearing flip-flops, which can increase the risk of foot trauma and infection. In addition, the monofilament sensation test indicates that a considerable number of respondents experienced reduced sensation, as they were only able to perceive stimuli at 7–9 out of 10 points. Furthermore, the sensation assessment using four questions also revealed persistent issues, with most respondents reporting frequent tingling sensations, which are indicative of peripheral neuropathy.

Table 5 Analysis of the Relationship between Foot Care Self-Efficacy and Ulcer Risk in Type 2 DM Patients (n=112)

Variable	p	r	Correlation

	value		Direction
Foot Care Self-Efficacy with Ulcer Risk	0,000	-0,773	Negative

Based on the Spearman statistical test, the p value is 0.000 <0.05, indicating a significant relationship between foot care self-efficacy and ulcer risk. The results of the analysis showed a correlation coefficient value of -0.773 which can be interpreted that the direction of the correlation is negative with strong strength. This means that the higher the of foot care self-efficacy, the lower the risk of ulcers in Type 2 DM patients.

DISCUSSION:

Foot Care Self Efficacy in Type 2 Diabetes Patients

Based on Table 2, the mean score of foot care self-efficacy was 37.96 ± 8.24. The FCCS questionnaire has a total score range of 12–60, where higher scores indicate greater levels of self-efficacy (Sloan, 2002). This finding indicates that foot care self-efficacy remains suboptimal and needs further improvement. Foot care self-efficacy can be influenced by several factors, including age, education level, occupation, marital status, and duration of the disease. In this study, the mean age of respondents was 55.54 years. This finding is consistent with previous research indicating that the majority of patients with type 2 diabetes mellitus are aged 35–59 years (53.8%) (Susilawati et al., 2021). According to Bandura (1977), self-efficacy is shaped by performance or mastery experiences, where repeated successes strengthen individuals' beliefs in their abilities. However, the findings of this study indicate that respondents, despite having a mean age of 55.54 years, still demonstrated less than optimal levels of self-efficacy. This suggests that other factors may also influence self-efficacy. Increasing age is often associated with a decline in physical function and capability, which may contribute to lower self-efficacy among individuals with diabetes.

In terms of educational level, most respondents had completed elementary school (50.9%). Education is an important factor influencing self-efficacy in patients with type 2 diabetes mellitus, as it affects an individual's ability to access, understand, and utilize health-related information, including disease management and complication prevention (Gea et al., 2022). Therefore, improving access to health education and information is essential to enhance patients' self-efficacy.

Regarding occupation, the majority of respondents were housewives (47.3%). Self-efficacy may be influenced by type of occupation, particularly due to its association with financial capacity. Limited financial resources can restrict access to healthcare services and information, which in turn may reduce motivation and confidence in managing the disease (Suhariyati et al., 2019). Thus, occupation may play a role in determining an individual's level of self-efficacy.

The study also found that most respondents were married (96.4%). Marital status is closely related to family support, which plays a crucial role in disease management. Family members can assist in maintaining dietary control, encouraging physical activity, supporting regular blood glucose monitoring, and providing emotional motivation (Huda et al., 2023). Although most respondents were married, self-efficacy levels remained less than optimal. This may be influenced by factors that potentially reduce individual capacity to manage the disease effectively.

Regarding the duration of diabetes, the mean duration among respondents was 7.71 years. A longer duration of illness may expose individuals to more challenges and complications. Individuals with low self-efficacy tend to focus on their limitations and may be more likely to give up when facing difficulties (Huda et al., 2019). In this study, the mean duration of diabetes was 7.71 years, which may influence their level of self-efficacy. Therefore, the duration of diabetes should be carefully considered in the management of diabetic foot care.

Risk Ulcer in Type 2 Diabetes

The results showed that the mean ulcer risk score was 6.32, with a standard deviation of 2.88. The Inlow's observation sheet has a scoring range of 0–23, where higher scores indicate a

greater risk of ulcer development. Based on this range, the respondents in this study can be considered to have a relatively low level of ulcer risk, as the mean score is closer to the minimum value. This finding differs from previous studies, which reported that 72.5% of patients were categorized as having a high risk of ulcer development (Rahmanita et al., 2024).

Diabetic foot ulcers (DFU) are one of the most common chronic complications of type 2 diabetes mellitus. Physiological changes resulting from hyperglycemia in the lower extremities, including impaired oxygen exchange and damage to the autonomic nervous system, can reduce the supply of oxygen-rich blood to the skin. Decreased tissue oxygenation, along with impaired sensory and motor nerve function, contributes to the development of DFU. Loss of sensation due to neuropathy in the joints can cause chronic, progressive, and destructive atrophy. The process of collagen glycolysis also worsens the decline in Achilles tendon function in patients with Type 2 DM so that Achilles tendon movement causes deformity. In this condition, if the feet are under high pressure, it can facilitate ulceration in patients with Type 2 DM. DFU is also caused by impaired blood flow in the leg blood vessels which is a manifestation of peripheral arterial disease. Peripheral arterial disease in the leg blood vessels can be caused by chronic hyperglycemia, endothelial damage, and the formation of atherosclerotic plaque (Decroli, 2019). Therefore, the researchers assume that the risk of ulcers among respondents in this study may be due to chronic hyperglycemia, as well as sensory, motor, and autonomic neuropathy, deformities, or vascular disorders of the lower extremities.

The Inlow's 60-Second Diabetic Foot Screen Tool used in this study showed that several indicators had high percentages, indicating potential problems that may increase the risk of ulcer development. One of these is footwear suitability, as many respondents reported wearing flip-flops, which may increase the risk of foot trauma and infection. In addition, the monofilament sensation test indicated that a considerable number of respondents experienced reduced sensation, as they were only able to detect stimuli at 7–9 out of 10 points. Another notable finding was observed in the four-question sensation assessment, where most respondents reported frequent tingling sensations, suggesting the presence of peripheral neuropathy. Therefore, health education on the proper use of footwear and the assessment of neuropathy is important to be implemented in type 2 DM patients.

Correlation Foot Care Self Efficacy and Risk Ulcer in Type 2 Diabetes Patients

The results of this study showed a strong negative correlation between foot care self-efficacy and ulcer risk. This indicates that higher levels of foot care self-efficacy are associated with a lower risk of ulcer development in patients with type 2 diabetes mellitus. These findings are supported by previous research, which reported that higher self-efficacy among patients with type 2 diabetes is associated with better foot care behaviors and a lower likelihood of engaging in harmful foot care practices. Foot care self-efficacy is essential in promoting optimal foot care behaviors to prevent diabetic complications. Therefore, patients are encouraged to enhance their self-efficacy in performing proper foot care practices (Huda et al., 2019).

Self-efficacy in health-related behavior is an important factor in improving self-care practices among individuals with diabetes toward a healthier lifestyle. In diabetes management, self-efficacy influences individuals' ability to perform recommended self-care behaviors (Susanti et al., 2020). Self-efficacy is a key factor in foot care among patients with diabetes, as it determines patients' ability to perform effective foot care behaviors that can prevent diabetic foot complications (Toygar et al., 2020). Individuals with high self-efficacy tend to perceive barriers as challenges to overcome and continue striving to achieve their goals in order to obtain expected outcomes (Rizana et al., 2023). This occurs because self-efficacy is a determinant factor related to how individuals feel, think, motivate themselves, and behave (Bandura, 1994).

Individuals are more likely to engage in self-care behaviors when they believe in their own ability to perform them successfully. Strengthening self-efficacy in self-care is considered one of the most effective ways to improve foot care practices in patients with diabetes. This process begins with increased patient awareness, which ultimately leads to consistency in performing foot care behaviors (Yarnita et al., 2023). Individuals with high self-confidence are also more motivated to maintain their health by adhering to diabetes management, including proper foot care (Rizana et al., 2023).

Self-confidence encourages individuals to develop self-control abilities in maintaining behaviors necessary for diabetes self-management (Susilawati et al., 2021). Optimal foot care practices can reduce the risk of diabetic foot ulcers, ultimately improving the quality of life of patients with diabetes (Amelia, 2018). Higher self-efficacy is associated with better foot care practices among patients with diabetes (Sa'adah, 2016). The better the foot care behavior, the lower the risk of foot ulcers, and vice versa (Nestriani et al., 2023). Therefore, providing interventions aimed at improving foot care self-efficacy, such as cognitive behavioral therapy, is important to enhance patients' self-efficacy and potentially reduce the prevalence of ulcer risk.

A limitation of this study is that it was conducted in only one hospital, which may limit the generalizability of the findings. Since the study was carried out at a single setting, the results may not fully represent patients with type 2 diabetes mellitus in other healthcare facilities or regions.

CONCLUSIONS:

The findings of this study showed a significant relationship between foot care self-efficacy and ulcer risk in patients with type 2 diabetes mellitus. Higher levels of foot care self-efficacy were associated with a lower risk of ulcers in patients with type 2 diabetes mellitus. Therefore, assessing ulcer risk and providing interventions to improve foot care self-efficacy are important for reducing the prevalence of ulcer risk. Future research is recommended to explore other factors influencing foot care self-efficacy and to develop and evaluate interventions that enhance foot care self-efficacy among patients with type 2 diabetes mellitus.

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