Family Support and the Risk of Diabetic Ulcer Development in Individuals with Diabetes Mellitus

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ABSTRACT

Diabetes Mellitus (DM) is a chronic metabolic disorder characterized by persistent hyperglycemia, which frequently leads to severe complications such as diabetic ulcers resulting from peripheral neuropathy and microvascular angiopathy. These ulcers pose risks of tissue damage, recurrent infections, limited mobility, and even amputation if not adequately managed. This study aimed to determine the correlation between family support and the incidence of ulcers in DM patients Methods: This research employed a quantitative design with a cross-sectional approach, involving 71 respondents. Research instruments included the Hensarling's Diabetes Family Support Scale (HDFSS) and the Wagner Ulcer Classification System. Data were analyzed using the Spearman's rho test. Results: The findings revealed a very strong and significant correlation between family support and ulcer incidence ($p = 0.000$; Rho = -0.957). The negative correlation indicates that higher family support is associated with a lower risk of ulcers. Conclusion: Adequate family support significantly contributes to reducing the risk of diabetic ulcers. Therefore, family-centered nursing interventions should be optimized to enhance diabetes management and improve patients' quality of life.

Keywords: Family Support; Diabetic Ulcer; Diabetes Mellitus

INTRODUCTION

Diabetes Mellitus (DM) is a metabolic disorder characterized by elevated blood glucose levels. Type 1 is caused by autoimmune processes, type 2 results from genetic factors and lifestyle, while gestational diabetes occurs during pregnancy (Bus *et al.,* 2023). DM disrupts the body's metabolism and increases the risk of chronic complications such as microangiopathy (nephropathy, neuropathy, retinopathy) and macroangiopathy (heart disease, stroke). Individuals with DM are also vulnerable to foot problems, such as neuropathy and arterial disorders, which can lead to non-healing wounds and even amputation (Scaper *et al*.,2020).

According to the World Health Organization in 2023, 10.5% of the global population (537 million people) were living with diabetes, and this number is projected to rise to 783 million by 2045. The International Diabetes Federation (IDF) Diabetes Atlas 2023 reports that Indonesia ranks fifth in the world with 28.6 million people with diabetes, many of whom remain undiagnosed due to modern lifestyles, obesity, and urbanization; meanwhile, global expenditure on diabetes reaches USD 966 billion per year (Yusuf *et al.,*2020).

The Indonesian Health Survey (SKI) 2023 conducted by the Ministry of Health of the Republic of Indonesia shows that diabetes prevalence (age ≥15 years) increased from 10.9% in 2018 to 11.7% in 2023. This figure is based on objective blood glucose measurements (fasting plasma glucose or HbA1c), with an estimated 28.6 million cases projected by 2045 without significant intervention (Appil *et al.,*2020). A preliminary study conducted by researchers at the Karanganyar Health Office in 2024 reported 18,867 diabetes mellitus cases. Outpatient visits of diabetes patients at Gondangrejo region were 1,049 in 2023 and increased to 1,577 in 2024. Meanwhile, data in 2024 showed 236 diabetes patients with ulcers and 78 patients with a history of ulcers (Dinkes Karanganyar, 2024).

Diabetic ulcers are a complication of type 2 diabetes in the form of chronic wounds in the lower extremities caused by neurological and vascular disorders, potentially leading to tissue damage and necrosis. Symptoms include foot deformities, muscle atrophy, callus formation, and vascular impairment (Simamora *et al.,* 2021). A review study based on the Indonesian Health Survey data from 2018–2023 reported that the prevalence of diabetic ulcers in Indonesia is approximately 15%. The amputation rate due to ulcers reaches 30%, while the one-year post-amputation mortality rate is 14.8% (Riskesdas, 2024). Family support plays an important role in the healing and management of diabetic ulcers, including diet, physical activity, medication adherence, blood glucose monitoring, and foot care (Suciana *et al*., 2024). The role of the family includes motivation, practical assistance, and emotional support, which can improve both the quality of care and the quality of life of patients, even when living separately (Li *et al.,* 2026). Based on these considerations, the researcher is interested in examining the relationship between family support and the incidence of ulcers in patients with Diabetes Mellitus.

METHODS

Research Stages Flowchart:

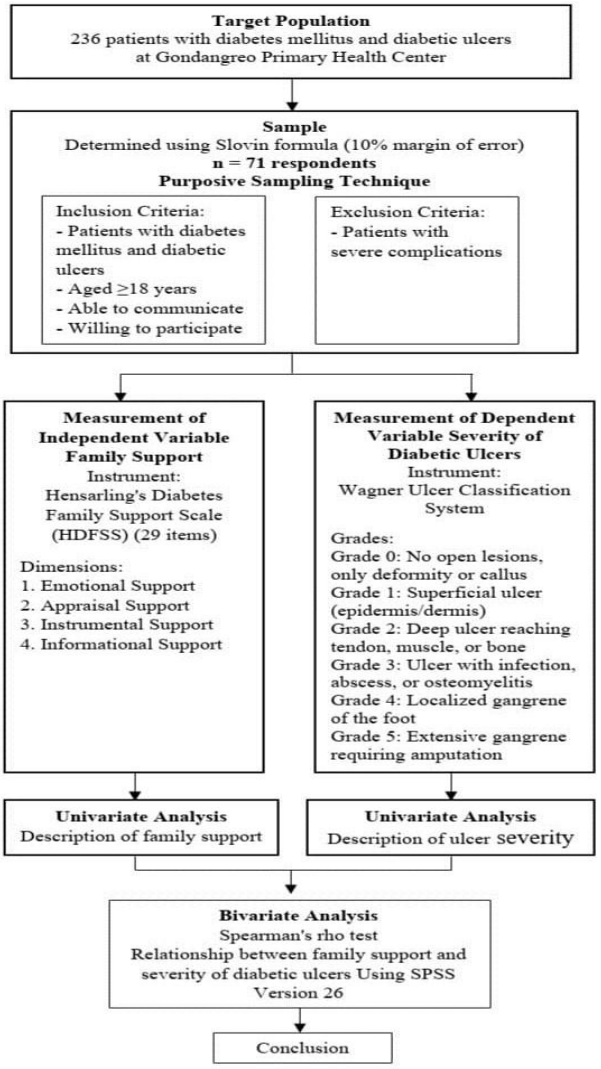

Figure 1. Research Stages Flowchart

This study employed a quantitative cross-sectional design. The sample was determined using purposive sampling from a population of 236 patients with diabetes mellitus and diabetic ulcers in the working area of Gondangrejo Primary Health Center, resulting in 71 respondents. This number was calculated using the Slovin formula (10% margin of error) and met the minimum requirement for the Spearman's rho test (>30 respondents), thus considered representative. The purposive sampling technique was selected because only subjects with specific characteristics meeting the inclusion criteria (patients with diabetes mellitus and ulcers, aged ≥18 years, able to communicate, and willing to participate).

The research instruments consisted of the Hensarling's Diabetes Family Support Scale (HDFSS), which includes 29 items covering emotional support, appraisal, instrumental support, and informational support. In addition, the Wagner Ulcer Classification System was used to classify the severity of diabetic ulcers into six grades: Grade 0 (no open lesions, only deformity or callus), Grade 1 (superficial ulcer involving the epidermis/dermis), Grade 2 (deep ulcer reaching tendon, muscle, or bone), Grade 3 (ulcer with infection, abscess, or osteomyelitis), Grade 4 (localized gangrene of the foot), and Grade 5 (extensive gangrene requiring amputation). Data analysis was performed using the Spearman's rho test with SPSS version 26.

RESULTS

Table 1. Respondent Characteristic (n=71)

Charactheristic Respondent		Frequency	%
Age	45–55 years old	27	38,0
	56–65 years old	16	22,5
	44–75 years old	28	39,4
Education	Out Of School	37	50,7
	Elementary School	22	32,4
	Middle School	8	11,3
	High School	4	5,6
	Master Degree	0	0
Occupation	Housewife	40	56,3
	Teacher/Lecture	0	0
	Employer	23	32,4
	Farmer	0	0
	Civil servant	0	0
	Nursing/Midwifery	0	0
	Trader	8	11,3
	Entrepreneur	0	0
Religion	Islam	53	74,6
	Christianity	18	25,4
	Hinduism/Buddhism	0	0
	Catholicism	0	0
	Confucianism	0	0
duration of illness	10-12 years	38	53,5
	13-15 years	22	31,0
	16-18 years	11	15,5
Gender	Man	19	26,8
	Woman	52	73,2

Table 2. Frequency Distribution of Respondents Based on Family Support

	Category	Frequency	%
Family support	well	8	11,3
	middle	45	63,4
	low	18	25,3

Table 3. Frequency Distribution of Respondents Based on ulcer grade

Category	Frequency	%
Grade 0	1	1,4%
Grade 1	6	8,5%
Grade 2	21	29,6%
Grade 3	25	35,2%
Grade 4	14	19,7%
Grade 5	4	5,6%

Table 4. Cross-tabulation between Family Support and Ulcer Grade

Ulcer grade	Family support								*p-value*	Spearman
	well		middle		low		Total			
	f	*%*	*f*	*%*	*f*	*%*	*f*	*%*		
Grade 0	1	1.4%	0	0.0%	0	0.0%	1	1.4%	0.000	-.923
Grade 1	6	8.5%	0	0.0%	0	0.0%	6	8.5%		
Grade 2	1	1.4%	20	28.2%	0	0.0%	21	29.6%		
Grade 3	0	0.0%	25	35.2%	0	0.0%	25	35.2%		
Grade 4	0	0.0%	0	0.0%	14	19.7%	14	19.7%		

Based on the research findings, the distribution of the relationship between family support and the incidence level of ulcers in patients with diabetes mellitus shows that among 8 respondents who received good family support, the majority (85.7%) experienced a low level of ulcer incidence, and only 14.3% experienced a moderate level. There were no respondents with good family support who experienced a high level of ulcer incidence. Meanwhile, among 45 respondents who received moderate family support, most (82.2%) experienced a moderate level of ulcer incidence, 15.6% experienced a high level, and only 2.2% experienced a low level of the 18 respondents who had low family support, the majority (66.7%) experienced a high level of ulcer incidence, 33.3% experienced a moderate level, and none experienced a low level.

DISCUSSION

The research results show that there is a significant relationship between family support and the occurrence of diabetic ulcers in elderly individuals with diabetes mellitus (DM). This finding is consistent with statemen (Manggasa *et al.,* 2024), which explains that DM in the elderly is influenced by nutritional status, lifestyle, and a decline in metabolic function with age. Complications such as neuropathy and vascular disorders, which are common in the elderly, increase the risk of diabetic foot ulcers (Ahmed *et al.,* 2021). Patients with good family support have a lower risk of complications. Conversely, elderly individuals without adequate support tend to be more vulnerable to developing wounds due to physical and cognitive limitations (Yuliastuti *et al.,* 2022).

This can be associated with biological factors such as post-menopausal hormonal changes and body composition that increase insulin resistance, as well as behavioral factors such as a greater tendency to utilize healthcare services. However, dual roles within the family

may limit women's time for self-care, thereby increasing the risk of diabetic foot ulcers. Women also tend to be more compliant and open in communication, which supports family involvement in care (Fajriyah *et al.,* 2023). Nevertheless, family support remains important for both genders, depending on communication patterns and roles within the family (Fadhlia *et al.,* 2025).

Low educational level affects patients' understanding of diabetic foot wound care. Patients with lower education tend to have difficulty understanding medical education and rely more on family support [15]. In this context, the family plays an important role as a caregiver in treatment (Zhang *et al.,* 2022). Previous studies have shown that family-based educational interventions are effective in improving adherence among patients with low educational levels (Wang *et al.,* 2023). Therefore, family support becomes an important strategy in addressing risks associated with low levels of education.

Employment status influences the risk of diabetic foot ulcers. Patients who are unemployed tend to have limited access to healthcare services and rely more on family support for their care (Ahmed *et al.,* 2021). Meanwhile, informal workers such as farmers and self-employed individuals are at higher risk of foot injuries and often neglect treatment due to work pressures (Lopez *et al., 2022*). Therefore, family support is important for all employment groups in preventing and managing diabetic foot ulcers.

A longer duration of diabetes increases the risk of peripheral neuropathy, circulatory disorders, and reduced healing capacity, which contribute to lower adherence to care and decreased patient motivation (Chen *et al.,* 2021). Patients with diabetes for ≥10 years tend to have difficulty detecting wounds early due to decreased foot sensitivity. In this context, family support is crucial, including monitoring symptoms, controlling blood glucose levels, and providing care reminders (Patel *et al.,* 2021). Consistent family interventions have been shown to be effective in reducing the risk of diabetic ulcers in chronic patients (Martin *et al.,* 2023).

Although religion does not directly influence diabetic ulcers, religious values have been shown to shape health behaviors and enhance family support. In Islamic teachings, caring for the sick is considered an act of worship, thereby encouraging active family involvement in the care of patients with diabetes (Rahman *et al.,* 2024). Religious values also support adherence to medication and wound care (Robert *et al.,* 2022). Health education that integrates spiritual values has been proven to increase empathy, compliance, and family involvement in the prevention of diabetic ulcers (Rahman *et al.,* 2024).

Family support reflects the suboptimal role of the family in diabetes management. Inadequate support whether emotional, informational, or instrumental contributes to poor patient adherence to self-care, including foot care (Kim *et al.,* 2021). Previous studies have shown that strong family support can reduce the risk of diabetic ulcers, accelerate wound healing, and improve patients' emotional regulation. In addition, feeling supported enhances quality of life and motivation in diabetes management (Martins *et al.,* 2023). Factors such as family knowledge, economic status, and cultural background also influence the quality of support (Kim *et al.,* 2021), highlighting the need for family education through community nursing approaches to sustainably increase their involvement.

The findings of this study confirm that family support plays a crucial role in the prevention and management of diabetic ulcers. Strong support has been proven to improve patient adherence to foot care, glycemic control, and early detection of wounds. Conversely, lack of family support is associated with low motivation for self-care and an increased risk of complications (Roberts *et al.,* 2022). Previous research also indicates that family. involvement both emotionally and practically accelerates wound healing and reduces the incidence of diabetic ulcers (Hernandez *et al.,* 2023). Family-based educational interventions, such as the family-centered care approach, are considered effective in promoting sustained family involvement and improving patients' quality of life (Yuliastuti *et al.,* 2022). Therefore, family

support should be a key focus in community nursing strategies to comprehensively prevent and manage diabetic ulcers.

The study results indicate a very strong relationship between family support and the incidence of diabetic ulcers. Respondents who received good family support mostly experienced mild-category ulcers, whereas those with moderate or low support tended to experience moderate to severe ulcers. This pattern suggests that the higher the level of family support received, the lower the severity of ulcers experienced by patients.

Family support plays an important role in improving patients' adherence to foot care, blood glucose control, and healthy lifestyle practices (Patel *et al.,* 2021). Conversely, lack of support leads to low motivation for self-care and increases the risk of complications (Ibrahim *et al.,* 2021). Other studies have also shown that emotional and instrumental family involvement can accelerate early detection of wounds and improve the healing process in the prevention and management of diabetic ulcers, nursing practice must actively involve the family through education, empowerment, and foot care training to reduce complication rates and improve the quality of life of patients with diabetes.

Knowledge is one of the factors that influence behavior. One aspect that affects a person's knowledge is the source of information. Ease of access to information can accelerate the acquisition of new insights. Individuals with diabetes mellitus have a crucial role in preventing diabetic foot ulcers, making preventive measures extremely important to carry out. If people with diabetes mellitus have an adequate understanding of their health condition, they are more likely to adhere to treatment plans and be able to perform early detection to prevent diabetic foot ulcers. Preventive behavior in individuals with diabetes mellitus is influenced by the duration of the disease. If a person has had diabetes mellitus for a long time, they are at risk of developing peripheral neuropathy, which can lead to foot injuries if not treated promptly (Nguyen *et al.,* 2024).

Foot wounds caused by diabetes are one of the problems that arise due to the lack of patient knowledge regarding prevention and treatment. Health information plays an important role in the management of diabetes mellitus. With this knowledge, individuals with diabetes mellitus can better understand their condition, enabling them to perform self-care and avoid complications (Peterson *et al.,* 2025).

Based on this study, 55 participants were found to have good self-care, which was influenced by several factors, one of which is the level of education. Most of them demonstrated good self-care because their knowledge was still adequate, although the majority of respondents had only completed elementary school (SD). A person's level of education affects their ability to think and perform self-care. The higher the level of education, the easier it is to rationally accept new information, including in self-care for diabetes mellitus. Individuals with low levels of education still have limited understanding of how to achieve good preventive behaviors and do not sufficiently understand the level of knowledge as well as the treatment required for patients. The knowledge possessed by respondents has not been able to optimally influence preventive actions because there are still other, stronger factors affecting behavior, such as social and economic factors, environmental support, personal motivation, limited focused education, and long-standing habits that are deeply ingrained (Nguyen *et al.,* 2024).

More intensive, repeated, and practical educational efforts must be provided so that knowledge is not only cognitive in nature, but can be applied into real behavior in daily life. Personal assistance programs by healthcare professionals, as well as involving families in education on the prevention of diabetic foot ulcers, are also highly necessary to increase awareness and promote behavioral change among patients (Peterson *et al.,* 2025).

CONCLUSION

This study shows that family support has a significant negative relationship with the incidence of diabetic ulcers in patients with diabetes mellitus. The better the family support provided, the lower the severity of ulcers experienced by patients. These findings emphasize that the role of the family is very important in diabetes care, particularly through foot care, medication adherence, and blood glucose monitoring.

Based on these results, the implementation of family-centered care in nursing practice is necessary so that families can play a more active role in both the prevention and management of diabetes complications. Comprehensive health education for families need to be improved so that the support provided can be more optimal. Future research is recommended to include social variables and environmental factors to enrich the analysis, thereby providing a more comprehensive understanding of the factors influencing the occurrence of diabetic ulcers.

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