

DIETARY COMPLIANCE AND WOUND CONDITION IN DIABETIC ULCER PATIENTS

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Info Artikel	Abstract
DOI : https://doi.org/10.26751/ijp.v10i2.3156	<p>Diabetic ulcers are a complication in patients with uncontrolled diabetes mellitus. Patients with diabetic ulcers feel anxious and burdened economically, socially, and medically. There is an increasing number of diabetic ulcer cases in hospitals globally and nationally. Seeing this fact, it is necessary to know factors that can accelerate wound healing such as diet, medication, and physical activity. The purpose of this study was to analyze the relationship between dietary compliance and wound conditions in diabetic ulcer patients. This study was a quantitative study, correlation analysis with a cross-sectional approach. The independent variable was dietary compliance. The dependent variable was the wound condition of diabetic ulcer patients. The study was conducted at Dr. Rehatta Regional General Hospital in June-July 2025. A total of 66 samples were selected through a purposive sampling technique. 66 samples were obtained using the Slovin formula. The inclusion criteria were patients diagnosed with diabetes mellitus, diabetic ulcer wounds, composmentis, surgical poly patients, able to read or hear and answer questions on the questionnaire. The exclusion criteria were patients with other disease complications. The research instrument used a dietary compliance questionnaire and a Bates Jensen wound assessment tool observation sheet. Data analysis used the Spearman Rho correlation test. The Spearman Rho test results showed a value ($p = 0.000$; $p > 0.05$). It was concluded that there was a significant relationship between dietary compliance and wound conditions in diabetic ulcer patients. The correlation coefficient value showed a positive correlation direction with a strong category. It is expected that patients with diabetic ulcers can improve compliance in implementing the recommended dietary pattern. Hospitals are expected to always provide motivation and education to diabetes sufferers regarding diabetes, through service activities inside and outside the building such as posbindu, posyandu and home visits.</p>
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I. INTRODUCTION

One of the chronic complications of diabetes mellitus is a *diabetic ulcer* caused by neuropathy and vascular disorders in the feet (PERKENI, 2021). Patients who have had diabetes mellitus for more than 5 years are twice as likely to develop diabetic ulcers (Sari et al., 2020). (WHO, 2020) states that there has been an increase in sufferers of *diabetic ulcers* in the adult population, namely, 122 million people suffer from

diabetic ulcers in the world. Especially in countries with a middle- or low-income status. It is estimated that in people under 70 years of age, there are 2.2 million deaths caused by *diabetic ulcers*. In fact, the number is expected to continue increasing by 600 million by 2035.

A diabetic ulcer is a wound that occurs in people with diabetes mellitus due to complications of microangiopathy and macroangiopathy. This leads to vascular

insufficiency and neuropathy. Wounds in patients, which are often not visible, can develop into infections caused by both aerobic and anaerobic bacteria (Marissa & Ramadhan, 2017). Maintaining a *diabetic ulcer* requires long-term treatment and is not cheap, due to the size of the ulcer and the length of the wound healing process. People often feel anxious and feel like a burden, whether economically, socially, or medically. Risk factors for diabetic ulcers include unhealthy lifestyles such as smoking, non-compliance with a diabetes mellitus diet, irregular medication, lack of physical activity, inadequate foot care, and inappropriate footwear. This unhealthy lifestyle can lead to obesity, hypertension, neuropathy, and hemoglobin glycolysis.

The prevalence of diabetic *ulcers* worldwide is 6.3% (McDermott et al., 2023). The prevalence of diabetic ulcers in Indonesia is 15% of all diabetes mellitus patients, with amputations occurring in 30% of cases and mortality in 32%. Diabetic ulcers are the leading cause of hospitalization, accounting for 80% of cases of diabetes mellitus (Aryani et al., 2022). At Dr. Rehatta Regional Hospital from January to December 2024, the total number of visits made by patients to the surgical polyclinic was 1,472, and the number of visits by patients diagnosed with diabetic ulcers was 330. Visits by patients diagnosed with diabetic ulcers recorded the largest number of patients diagnosed in the surgical polyclinic of Dr. Rehatta Regional Hospital.

Research by Silalahi et al., (2022) shows that factors that influence the duration of wound healing consist of age, the majority of which is 40-44 years old, nutrition, the majority of which is good, infection, the majority of which is mild infection, necrotic, the majority of which is normal, and foreign body factors, the majority of which is normal. *Diabetic ulcers* in patients are inseparable from continuous and long-term hyperglycemia, which then has the potential to cause basic changes and the formation of complications such as neuropathy and blood vessel disorders that cause problems in the diabetic foot (Roza et al., 2015). Neuropathy

is the cause of more than 60% of diabetic foot problems. *Diabetic ulcer peripheral neuropathy* causes loss of sensation in the distal areas of the feet, which can lead to diabetic ulcers and even amputation (Alzamani et al., 2022).

Complications that occur in diabetic *ulcers*, among other things, include cellulitis, a soft tissue infection found in diabetic feet with or without ulcers. Cellulitis is primarily treated with antibiotics. Immediate action is required if an abscess forms, including incision and drainage of the abscess. Anaerobic bacteria and MRSA can cause the spread of soft tissue infections along the muscle fascia (*necrotic fasciitis*), so that extensive debridement is necessary to remove all the infected muscle fascia. The impact of diabetic *ulcer*. If not handled properly, it will cause extensive damage to the leg tissue and threaten life, which is when amputation is performed (PERKENI, 2021).

To reduce the risk of diabetic ulcers and prevent further complications such as cellulitis, amputation, and sepsis, an assessment is necessary for diabetic patients with a history of wounds and those experiencing them. Diabetic ulcers are defined as full-thickness skin lesions extending from the subcutaneous tissue to the tendon, muscle, or bone. The diagnosis of infection is based on clinical signs (redness, warmth, swelling, induration, tenderness, pain, and purulent discharge) (Meloni et al., 2020). Characteristics assessment of diabetic *ulcer*. It is crucial to accurately predict the duration of healing and provide information about the wound condition, which serves as the basis for determining the appropriate intervention for clinicians.

Diabetic ulcer treatment can be performed using wound care techniques such as debridement, antibiotic administration, and blood sugar control (Silalahi et al., 2022). Proper management of diabetic ulcers can reduce the incidence of amputations. To reduce the incidence of amputations, nurses play a crucial role in providing appropriate nursing care, including providing accurate dietary education, administering medication

according to the doctor's recommended dosage, and encouraging physical activity. Research conducted by Febrianti et al., (2023), showed that 87.5% of respondents who followed a nutritionally adequate diet experienced improved wound conditions. According to Faridah et al., (2020), a relationship exists between the nutritional status of elderly individuals with diabetes mellitus and their cognitive function. In line with research conducted by Rassi & Efendy, (2023), on diet patterns and the Diabetic Wound Healing Process, it was found that dietary patterns in patients with diabetes mellitus significantly influence diabetic wound healing. When the diet pattern is implemented properly, blood sugar in diabetes patients can be controlled, and vice versa. When blood sugar is controlled, sufficient nutrients reach the diabetic ulcer tissue, thereby accelerating the healing process.

Research conducted by Febrianti et al., (2023), showed that age and gender factors were not related to the wound healing process of diabetic ulcer patients, and there was a significant relationship between nutrition, blood sugar levels, circulation, and wound stage with the wound healing process of diabetic ulcer patients at Dr. Suyoto Hospital, South Jakarta. Research conducted by Trisnawati et al., (2023), demonstrated a significant relationship between the level of knowledge, duration of suffering, and obesity, and the occurrence of diabetic ulcers in patients with diabetes mellitus.

Nutrition is a major factor influencing the growth and maintenance of healthy body tissues. When someone experiences an injury or wound, the continuity and structure of body tissues are disrupted. However, to date, specific studies examining the relationship between dietary adherence and wound condition in diabetic ulcer patients are limited.

This research is a novelty compared to previous studies because it discusses issues related to wound conditions in diabetic ulcer patients, namely dietary compliance. The study's results will have implications for the

accuracy of nurses in providing education to patients, aiming to accelerate the recovery of diabetic ulcer patients. The results of the study will also provide insights into the latest developments in healthcare, such as whether diabetic ulcer patients can be cured. The research conducted demonstrates the role of nurses as researchers. The role of nurses helps identify nursing problems, and nurses play a role in implementing research findings in nursing practice. Research activities and education for patients align with the hospital's mission to consistently deliver excellent service to patients, prioritizing *Patient Experience* based on *Patient-Centered Care*. The aim of this study was to investigate the relationship between dietary compliance and wound conditions in patients with diabetic ulcers.

II. METHOD

The type of research used is observational *correlation analysis with a cross-sectional approach*, where independent variables and dependent variables are collected or measured, eliminating the need for further follow-up with respondents. The independent variable in this study is Diet Compliance. The dependent variable in this study is Wound Condition in Diabetic Ulcer Patients. This study was conducted at the outpatient clinic of Dr. Rehatta Hospital, Central Java Province, in June and July 2025. The population of this study consisted of all patients with Diabetes Mellitus and Diabetic Ulcers at Dr. Rehatta Hospital, Central Java Province, from October to December 2024, totaling 78 patients. The determination of the number of samples used the Slovin formula, namely 66 respondents. Sampling was carried out purposively. *Purposive sampling*, with inclusion criteria of patients diagnosed with Diabetes Mellitus, with Diabetic Ulcer wounds, patients with level of consciousness, Outpatient Surgery Polyclinic patients, and patients able to read or hear and answer the questionnaire questions. Exclusion criteria included patients who withdrew unilaterally during data collection, patients who did not follow the procedure to the end, patients with

other medical complications, and patients with diabetic ulcers who had never received treatment. The data collection technique in this study was carried out in several stages. The preparation stage included submitting an application for initial data survey permission and research permits. The implementation stage involved identifying respondents who met the inclusion criteria, obtaining consent, and administering a questionnaire regarding dietary compliance and assessing wound conditions.

The research instrument used a dietary compliance questionnaire, which consists of 16 statements with answer options of "never," "sometimes," "often," and "routine." The score range is 16-64, with the interpretation results divided into three categories: high compliance (total score 49-64), moderate compliance (total score 32-48), and low compliance (total score <32). The reliability value, as reported by previous researchers, is 0.968, based on Cronbach's

alpha results, indicating that the questions in the questionnaire are highly reliable (Sundari, 2018). The Bates-Jensen Wound Assessment Tool (BWAT) observation sheet for assessing diabetic ulcers consists of 13 statements with answer choices ranging from 1 to 5. The final score ranges from good wound condition (1-13), moderate wound regeneration (14-30), degenerative wound condition (31-60), and very poor wound condition (61-65). The reliability value of the BWAT is 0.84 (Bates-Jensen et al., 2019; Temu et al., 2020). The analysis employed was univariate and bivariate analysis, with the Spearman correlation test (Rho) using the IBM SPSS Statistics 25 application. This research has been declared to have passed the ethical review by the Research Ethics Committee (KEPK) of Muhammadiyah University of Kudus, with number 398/Z-7/KEPK/UMKU/VIII/2025.

III. RESULTS AND DISCUSSION

A. Characteristics of Diabetic Ulcer Patients

Table 1. Characteristics of diabetic ulcer patients (n=66)

Characteristic	Category	f	%
Age	< 45 years	8	12.1
	45-59 Years	48	72.7
	> 60 years	10	15.2
Gender	Male	20	30.3
	Female	46	69.7
Level of education	Elementary School/Equivalent	22	33.3
	Junior School/Equivalent	8	12.1
	High School/Equivalent	31	47.0
	College	5	7.6
Work	Doesn't work	15	22.7
	Housewife	21	31.8
	Self-Employed/Other	18	27.3
	Private sector employee	10	15.2
	Civil Servants/TNI/POLRI	2	3.0
Income	No Income	21	31.8
	< Rp. 2.640.248*	27	40.9
	>= Rp. 2.640.248*	18	27.3
Long-term DM Suffering	> 5 Years	38	57.6
	< 5 Years	28	42.4
Long-term Ulcer Suffering	> 2 Years	4	6.1
	< 2 Years	62	93.9
Total		66	100

*)Jepara Regency Minimum Wage in 2025

Based on table 1 shows that of the 66 respondents, the majority of respondents were aged 45-59 years as many as 48 respondents (72.7%), most of the respondents were female as many as 46 respondents (69.7%), the majority of respondents' education level was high school/equivalent as many as 31 respondents (47.0%), most of the respondents' jobs were as housewives 21 respondents (31.8%), the majority of respondents' income was <Rp. 2,640,248 as many as 27 respondents (40.9%), most of the respondents had suffered from DM for > 5 years, as many as 38 respondents (57.6%), and the majority of respondents had suffered from ulcers for <2 years, as many as 62 respondents (93.9%).

The study's results showed that the majority of respondents were pre-elderly, aged 45-59 years. Gender data showed that the majority of respondents were female. Mamurani et al (2023) in their study stated that age is a risk factor for diabetic ulcers, because respondents aged > 45 years are more likely to be at high risk of developing diabetic ulcers. Therefore, it can be concluded that the older the person, the higher the risk of developing diabetic ulcers. Ginting (2025) in his study showed that the majority of respondents who experienced diabetic ulcers were female. In line with research conducted by Silalahi et al., (2022) which found that the majority of respondents experiencing diabetic ulcers were female. Age affects delayed wound healing in patients with diabetic ulcers (Hidayat et al., 2022).

The study results showed that the majority of respondents had a high school education or equivalent. According to Zantour et al., (2020) education level influences the occurrence of diabetic ulcers in patients with diabetes mellitus. This finding aligns with research conducted by Azizah et al., (2022) who stated that individuals with higher levels of education are more likely to obtain information, both from others and through mass media. The more information they receive, the better their knowledge, including information related to health, especially regarding risk factors for diabetic ulcers.

The study results showed that the majority of clients earned less than the minimum wage. Based on occupational data, the majority of respondents worked as housewives. According to Arania et al., (2021) occupational factors can influence the risk of developing diabetes mellitus. Jobs involving minimal or low physical activity cause the body to burn less energy, resulting in excess energy being stored as fat, which can lead to obesity. Yimam et al., (2021) also reported a relationship between occupation and the incidence of diabetic ulcers. Patients who work as day laborers and farmers are more likely to develop diabetic ulcers.

Mayawati (2020) stated in their research that socioeconomic status, including income, influences a person's self-care management in preventing complications of diabetes mellitus, specifically diabetic ulcers. This finding aligns with research conducted by Banik et al., (2020), which identified a correlation between income and the incidence of diabetic ulcers. Patients with low incomes showed a higher chance of developing diabetic ulcers.

The study results showed that the majority of respondents had suffered from diabetes for more than 5 years, and the majority had a history of diabetic ulcers for less than 2 years. According to PERKENI (2021) DM patients also often experience serious acute and chronic complications, which can lead to death. Diabetic ulcers, which are chronic wounds in the ankle area that increase morbidity and mortality and reduce the patient's quality of life, are a common complication. Eltrikanawati (2021) stated that DM sufferers with a duration of more than 5 years will increase the risk of diabetic neuropathy by 4-5 times compared to those with a duration of less than 5 years. The duration of DM is directly proportional to the risk of complications, meaning that the longer the sufferer suffers from DM, the higher the risk of complications.

Rahmi et al., (2022) in their study stated that suffering from diabetes mellitus for more than 5 years will increase the risk of peripheral neuropathy. This finding aligns with research conducted by Billa et al.,

(2023), which demonstrated a significant relationship between glycemic control and the duration of diabetes for more than 5 years, as well as the occurrence of diabetic peripheral neuropathy (diabetic ulcers).

Research conducted by Hidayat et al., (2022) found that the duration of diabetes affects the delay in wound healing in patients with diabetic foot ulcers. In line with research by Dasong et al.,(2020),), which

stated that the duration of diabetes is a risk factor for diabetic ulcers, where patients who have had diabetes for a long time have an 8 times greater risk of developing diabetic ulcers than those who have just suffered from it. Research by Astuti et al., (2020) also suggested a significant relationship between the duration of diabetes mellitus and suffering from diabetic foot ulcers.

B. Overview of Diet Compliance and Wound Conditions in Diabetic Ulcer Patients

Table 2. Description of dietary compliance and wound condition of diabetic ulcer patients (n=66)

Characteristic	Category	f	%
Diet Compliance	High	42	63.6
	Currently	16	24.2
	Low	8	12.1
Wound Condition	Good	30	45.5
	Regeneration	22	33.3
	Degeneration	12	18.2
	Bad	2	3.0
Total		66	100

Table 2 shows that, of the 66 respondents, the majority had high dietary compliance, with 42 respondents (63.6%), and the majority were in good wound condition, with 30 respondents (45.5%). The high dietary compliance rate (63.6%) in this data indicates that most respondents followed dietary recommendations effectively, and a relatively optimal wound healing process was experienced by most patients (45.5%), with a small number experiencing complications or a worsening of the wound. Dietary compliance refers to the extent to which patients adhere to the recommended dietary guidelines to manage blood glucose levels and promote wound healing.

Diet and weight control are the basis of managing Diabetes Mellitus patients with diabetic ulcers. Regulating the content, quantity, and timing of food intake allows patients with diabetes mellitus and diabetic ulcers to achieve an ideal body weight and maintain well-controlled blood sugar levels. The principle of nutritional management for patients with Diabetes Mellitus is a balanced diet tailored to each individual's calorie needs (Ministry of Health of the Republic of Indonesia, 2020); Sabita et al., 2024). A

balanced diet containing a carbohydrate intake of at least 45% of total energy, as well as calorie restrictions, especially restrictions on total fat and saturated fat to achieve normal blood glucose and lipid levels to reduce the risk of complications such as diabetic ulcers (Decree of the Minister of Health of the Republic of Indonesia Concerning National Guidelines for Medical Services for the Management of Type 2 Diabetes Mellitus in Adults, 2020). Diabetes Mellitus diet management includes the 3 elements (right schedule, right type, and right amount) (Sabita et al., 2024).

Assessment of wound condition includes wound size, wound depth, wound edges, GOA or holes in the wound, type of necrotic tissue, amount of necrotic tissue, type of exudate, amount of exudate, color of skin around the wound, tissue edema, hardening of the edge tissue, granulation tissue, and epithelialization (Bates-Jensen et al., 2019; Temu et al., 2020). Wound conditions can be classified based on the healing process and the degree of tissue damage. A wound in good condition is usually characterized by the presence of healthy granulation tissue, optimal moisture, and no signs of infection or necrosis. The regeneration process indicates

that damaged skin and tissue are undergoing healing, with the formation of new tissue. Conversely, degeneration and poor conditions indicate more severe tissue damage, possible infection, necrosis, or vascular disorders that hinder healing (Herman et al., 2023); Patel et al., 2024).

Previous research confirms that good wound health and regeneration are influenced by several factors, such as nutritional status,

optimal blood sugar control, and adherence to medication and wound care (Seth et al., 2024; Donnelly et al., 2024). Studies show that patients with diabetic ulcers who receive adequate nutrition and good diabetes management have a greater chance of experiencing effective wound healing (Donnelly et al., 2024).

C. The Relationship Between Diet Compliance and Wound Condition in Diabetic Ulcer Patients

Table 3. Analysis of the relationship between dietary compliance and wound conditions in diabetic ulcer patients (n=66)

(n=66)										
	Wound Condition								Total	
	Good		Regeneration		Degeneration		Bad			
Diet Compliance	f	%	f	%	f	%	f	%	f	%
High	30	45.5	7	10.64	4	6.1	1	1.5	42	63.6
Currently	0	0	10	15.2	6	9.1	0	0	16	24.2
Low	0	0	5	7.6	2	3	1	1.5	8	12.1
Total	30	45.5	22	33.3	12	18.2	2	3	66	100
Spearman's rho test results ($p = 0,000$) ($r = 0,615$) Direction +										

Spearman's rho test results ($p = 0,000$) ($r = 0,615$) Direction +

Based on table 3, it shows that respondents with good wound conditions and high dietary compliance were 30 people (45.5%), respondents with regenerating wound conditions and high dietary compliance were 7 people (10.6%), respondents with degenerating wound conditions and high dietary compliance were 4 people (6.1%), respondents with poor wound conditions and high dietary compliance were 1 person (1.5%).

Respondents with regenerating wound conditions and moderate dietary compliance comprised 10 people (15.2%), while those with poor wound conditions and low dietary compliance numbered 1 person (1.5%). Based on the Spearman test results, the p-value is 0.000. This value is significant because it is <0.05 , which means the hypothesis is accepted. This indicates a significant relationship between dietary adherence and wound conditions. The Spearman's Rho correlation coefficient value of 0.615 indicates a positive (unidirectional) correlation with a strong correlation coefficient value.

The study's results revealed a significant correlation between dietary adherence and

wound condition in patients with diabetic ulcers. This correlation was positive, and the correlation coefficient was strong. This means that the higher the level of dietary adherence, the better the condition of the diabetic ulcer. These results align with research conducted by Ade Maharani et al., (2025), which stated a relationship between dietary adherence and the duration of diabetic ulcer healing. Isnandari (2022) also stated in his study that dietary adherence is associated with the incidence of diabetic ulcers.

Patients who adhere to a diet by consuming recommended foods tend to heal faster than those who do not, because good blood sugar control will prevent disruptions in tissue regeneration caused by hyperglycemia. Research by Astutisari et al., (2022) indicates that disturbances in blood sugar levels, resulting from an uncontrolled diet, can hinder the distribution of essential nutrients and impede wound healing. Overall, adherence to a diabetes mellitus diet significantly affects the wound healing process, particularly due to its impact on blood sugar control and the balance of nutrients required for body tissue repair.

Nutritional needs in diabetic ulcer patients are fundamental physiological needs. Poor nutritional patterns lead to unstable blood sugar control (Ikbal, 2020). Abnormal blood glucose levels result from impaired carbohydrate metabolism. Therefore, several important factors in controlling blood sugar levels are dietary fiber content, digestion, cooking methods, meal timing, the influence of glucose intolerance, and the concentration of food (Levia Ds., 2020). Excess body fat, particularly in the abdominal area, can impair insulin action, elevate blood glucose levels, and hinder wound healing. Overall, poor nutritional status, including deficiencies in vitamins, minerals, and protein, can slow wound healing. Adherence to a proper diet, which includes high protein, vitamins A, C, and B12, as well as iron and calcium, as well as good blood sugar control, is crucial for supporting the healing process of diabetic ulcers (Ginting, 2025).

Efforts to lower blood sugar levels through a diet program include consuming nutritious and balanced foods, including vegetables and fruits, reducing sugar consumption to a maximum of 50 grams per day, and avoiding foods and drinks that contain a high amount of sugar. Furthermore, lifestyle changes such as regulating sleep and eating habits, avoiding smoking, alcohol, and carbonated beverages, and engaging in regular exercise are crucial. These can become risk factors for diabetes if left untreated (Murtiningsih et al., 2021).

Nutrition is a key factor influencing growth and maintaining healthy body tissues. Injury means disruption of the continuity and structure of body tissues. Repair is necessary to restore balance and prevent further complications from occurring (Febrianti et al., 2023).

Dietary adherence will affect the nutritional status of patients with diabetes mellitus. Adequate nutrition and adequate intake will accelerate wound healing, but excessive nutrition and sugar levels will slow the healing process (Gangren et al., 2023). For individuals with diabetes mellitus, it is essential to consistently regulate the type,

frequency, and quantity of food consumed to maintain an ideal body weight and achieve well-controlled blood sugar levels (Ministry of Health of the Republic of Indonesia, 2020).

Research conducted by Silalahi et al., (Silalahi et al., 2022) states that mild infections, necrotic lesions, and abnormal foreign bodies can affect the duration of wound healing. In addition to adherence to diet, other factors that influence wound condition/the wound healing process are foot care management, wound control, and the use of extensive dressings that cover the entire surface of the ulcer. This will accelerate the success of ulcer healing if the patient has good compliance. Several factors that influence the wound healing process, such as blood sugar levels, wound care techniques, obesity levels, and knowledge levels, cannot be discussed or studied in this study. This is due to methodological and procedural constraints so that these factors are beyond the scope and control of the researcher.

IV. CONCLUSION

A significant relationship exists between dietary compliance and wound condition in diabetic ulcer patients. The correlation coefficient indicates a positive correlation with a strong category. It is hoped that patients with diabetic ulcers can improve their adherence to the recommended dietary pattern. Hospitals are expected to consistently provide motivation and education to diabetic patients about diabetes through service activities inside and outside the building, such as integrated health service posts (Posbindu), integrated health service posts (Posyandu), and home visits. Further research is needed to determine the development of wound conditions over time, after patients have followed a proper diet.

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