



RELATIONSHIP BETWEEN DIET AND GANGRENE DEGREE IN DIABETES MELLITUS PATIENTS

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ABSTRACT: Diabetes Mellitus (DM) is a metabolic disease characterized by hyperglycemia caused by defects in insulin secretion, insulin action, or both. The number of people with DM has increased to approximately 463 million individuals aged 20-79 worldwide. Several complications can arise due to DM, one of which is gangrene wounds. Gangrene wounds are the most common microvascular complication in DM patients. Nutritional intake is a crucial component in the wound healing process. The aim of this study is to determine the relationship between diet and the degree of gangrene in DM patients. The method used is an observational analytical approach with a cross-sectional design. The sample size consists of 51 respondents obtained from medical records and questionnaires filled out by DM patients. Data analysis was conducted using the Chi-Square test. The results showed that 23 respondents had a moderate diet (45.1%), and the majority of respondents had wounds classified as degree 3 (21.6%). A significant relationship was found between diet and the degree of gangrene in DM patients ($p < 0.005$). Thus, it can be concluded that a significant relationship exists between diet and the degree of gangrene in DM patients.

Keywords: diabetes mellitus, diet, gangren wound degree.

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INTRODUCTION

Diabetes mellitus (DM) is a metabolic disease characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action, or both. In DM there are metabolic abnormalities in carbohydrates, proteins and fats due to insufficient insulin level to reach target organ, particularly in adipose tissue, skeletal muscle, liver, and others. Some patients may not show symptoms during early stages of the disease (Kharroubi, 2015). According to International Diabetes Federation (IDF), Indonesia ranks third in Southeast Asia with a diabetes prevalence of 11.3% (Kementerian Kesehatan RI., 2020).

DM can lead to various chronic complications, which divided into microvascular and macrovascular complications. Diabetic ulcers are the most common macrovascular complications, with prevalence of 29.9% (Saputri, 2020). Diabetic ulcers occurs when there is injury, necrosis, or gangrene in the skin layer, the blood vessel become obstructed, leading to tissue death due to peripheral vascular obstruction, typically found on the soles of the feet (Rosyid, 2017). In Indonesia, the incidence of diabetic ulcers is 15%, with a mortality rate of 32.5%

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and an amputation rate of 23%. If gangrene wounds are not managed properly, they can spread widely and vulnerable to bacterial infections and they can lead to serious complications such as amputations or even death (Langi, 2013; Lestari & Kusumaningrum, 2021). Basic management of diabetic ulcers or gangrene wounds includes four components: debridement, offloading, diagnosing the type of bacteria and providing appropriate antibiotics, and dressing (Rosyid, 2017). Along with footcare, people with DM are highly recommended to be mindful of their diet and nutrition (Lestari & Kusumaningrum, 2021; Vas et al., 2017).

Wound healing is a complex process that requires collagen synthesis, which is significantly influenced by proper nutritional intake. Nutrition plays a crucial role in the repair of tissue injuries and the overall healing of wounds. (Lestari & Kusumaningrum, 2021) The American Diabetes Association (ADA) emphasizes the importance of a healthy diet that is dense in nutrients to support the healing process in appropriate portions (Vas et al., 2017).

Previous research by Silaban et al. (2019), has indicated a relationship between nutritional intake and the healing of diabetic ulcers. Another research conducted by Ran, et al, also shows that diabetic ulcer patients who experiences malnutrition will have an extended hospital stay (Ran et al., 2024). However, contrasting findings from Soelistyo & Songjanan (2021), suggest that there may be no significant relationship between dietary adherence or nutritional intake and wound healing outcomes. Given the ongoing debate in the existing literature, this study aims to further explore the relationship between diet and the degree of gangrene in patients with Diabetes Mellitus. The objective is to optimize the wound healing process in diabetic patients by gaining a better understanding of how dietary factors influence the severity of gangrene.

METHOD

This research was approved by ethics committee of Faculty of Medicine Universitas Trisakti number 21/KER-FK/II/2022. This study is an observational analytical research using a cross-sectional design. The research was conducted at the Hanifah Medika Center (HMC) Primary Clinic in Tangerang. The population of this study consists of patients with diabetes mellitus who have gangrenous wounds, totaling 56 patients who meet the inclusion and exclusion criteria. The sampling technique used in this study was non-probability sampling, specifically consecutive sampling. Based on the calculations, 51 respondents were needed.

Data collection was conducted using primary data through the completion of the Self Management Dietary Behavior (SMDB) questionnaire to assess the patients' dietary management. Additionally, secondary data was obtained from medical records taken from the HMC Primary Clinic to evaluate the degree of the patients' wounds. The data analysis was performed using the SPSS (Statistical Package for the Social Sciences) computer program to determine the relationship between diet and the degree of gangrenous wounds in patients with diabetes mellitus using the Chi-square test with a significance level of 0.05, which means that if the p-value is less than 0.05, the independent variable is significant to dependent variable.

RESULT AND DISCUSSION

Based on the results of the research data collection, respondent characteristic data was obtained as presented in Table 1.

Table 1. Subjects Characteristics

Variable	Frequency (n)	Percentage
Diet		
SMDB Low	10	19,6%
SMDB Moderate	23	45,1%
SMDB High	18	35,3%
Wound Degree		
Degree 0	6	11,8%
Degree 1	7	13,7%
Degree 2	10	19,6%
Degree 3	11	21,6%
Degree 4	10	19,6%
Degree 5	7	13,7%

Based on Table 1 above, a total of 51 respondents participated in the study. In the dietary variable, it was found that the majority of respondents had a moderate diet, with 23 respondents (45.1%), followed by a high diet with 18 respondents (35.5%), and a low diet with 10 respondents (19.6%). In terms of the degree of wounds, the majority of respondents had wounds classified as degree 3, with 11 respondents (21.6%), followed by degrees 2 and 4, each with 10 respondents (19.6%). Additionally, degrees 1 and 5 had 7 respondents (13.7%), while degree 0 had 6 respondents (11.8%).

Table 2. Relation Between Diet and Gangrene Wound Degree

Variable	Gangrene Wound Degree				Total (n)	P-value
	Mild		Severe			
	n	%	n	%		
Diet						
SMDB low	16	48,5	17	51,5	33	0,000*
SMDB high	18	100	0	0	18	

*: Chi-square test (p-value <0,05)

The Chi-square test analysis was used to examine the relationship between dietary variables and the degree of gangrenous wounds. The results of the Chi-square test indicated a p-value of 0.000 ($p < 0.05$), which demonstrates a significant relationship between diet and the degree of gangrenous wounds. According to Table 2, the group with high Self Management Dietary Behavior (SMDB) showed a higher percentage of mild wounds at 100%, compared to a 0% incidence of severe wounds. In contrast, the group with low SMDB had a severe wound percentage of 51.5%, followed by a mild wound percentage of 48.5%.

Based on the research conducted at the Hanifah Medika Center Primary Clinic, it can be concluded that there is a relationship between diet and the degree of gangrene wounds with a p-value of 0.000. In Table 2 above, it can be seen that the higher the dietary management of the respondents, the lower the degree of the



wounds. This result is in line with the study by Silaban R et al., which was conducted on 27 respondents, where the results showed a relationship between nutritional intake and the area of the wound with a p-value of 0.002. (Silaban et al., 2019) In another study conducted by Lestari MP et al. on 367 respondents, the results indicated a relationship between the role of nutrition in the healing of diabetic wounds with a p-value of <0.001. This is because nutritional intake, such as micronutrients and macronutrients, plays a role as an anti-inflammatory and as a source for the growth of tissue and muscle in the areas with wounds (Lestari & Kusumaningrum, 2021).

Soep & Triwibowo (2019) research also reported that wound healing occurs more quickly when nutritional needs are met. Based on Ridwan et al. (2017) study of 36 respondents, it was found that 24 respondents had abnormal serum albumin levels, indicating that the respondents' nutritional adequacy was not met. Serum albumin is a protein molecule found in red blood cells that binds with oxygen and carbon dioxide to be transported in the bloodstream, helping to maintain plasma oncotic pressure to prevent ascites, and assisting in metabolism and the transport of endogenous compounds in the body. Albumin can function optimally in the body with the help of various factors, one of which is nutritional adequacy. Therefore, insufficient protein levels in the body will affect the transition from the inflammatory phase to the proliferative phase of wound healing.

However, this contradicts the study conducted by Soelistyo & Songjanan (2021) on 432 respondents, which stated that there is no relationship between dietary compliance and the healing of diabetic wounds with a p-value of 0.360. A similarity in this study is that both used the same research design employing chi-square analysis. The difference in this study is that dietary compliance in Soelistyo's research was influenced by uncontrolled blood glucose levels and poor circulation, making it more difficult for the body to deliver nutrients to the areas where wounds are present. In contrast, this study did not measure the blood glucose levels of the respondents.

CONCLUSION

Based on research conducted at the Hanifah Medika Center Primary Clinic from March-May 2022, the results obtained were that (1) a significant relationship between dietary intake and the degree of gangrene, with a p-value of 0.000; (2) the dietary management of patients with gangrene wounds who have diabetes mellitus was mostly categorized as moderate SMDB, with a percentage reaching 45.1%; (3) the degree of wounds in diabetes mellitus patients was mostly at degree 3, with a percentage of 21.6%. These findings provide important insights into the significance of dietary management in the management of gangrene wounds in patients with diabetes mellitus.

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