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Factors Associated with the Incidence of Diabetic Ulcers among Diabetes Mellitus Patients at Labuang Baji Hospital Makassar

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Abstract

Background: Clients with Diabetes Mellitus have the potential for 15-25% to experience diabetic foot ulcers caused by the factors of cholesterol, use of footwear, and self-management of diabetes mellitus. **Objectives**: This study aims to determine factors associated with the incidence of diabetic ulcers in clients with diabetes mellitus at Labuang Baji Hospital Makassar. **Methods**: The type of research used was quantitative with a cross-sectional design. The number of samples used was 50 respondents by using accidental sampling. The research instrument used a questionnaires and Standard Operating Procedures for cholesterol examination. **Result**: The study results using the Spearman Correlation Test showed a relationship between cholesterol and the incidence of diabetic ulcers in clients with Diabetes Mellitus with the p-value = 0.001 ($p < 0.05$). There is a relationship between footwear usage and the incidence of diabetic ulcers in clients with diabetes mellitus with the p-value = 0.001 ($p < 0.05$) and there is a relationship between Self-Management Diabetes Mellitus (SMDM) with the incidence of diabetic ulcers in clients with diabetes mellitus with p-value = 0.001 ($p<0.05$). **Conclusion**: Cholesterol, footwear usage, and Diabetes Mellitus Self-Management (SMDM) are the factors of Diabetic ulcers in clients with diabetes mellitus. **Recommendation**: This study could be an adjunct for further systemic review and expected for further study to research about the other factor or the effect of treatment sequacity on diabetic ulcer recovery

Keywords: cholesterol, use of footwear, self-management, diabetic ulcer

Introduction

Diabetes Mellitus is one of the most common chronic diseases in the world and type 2 Diabetes Mellitus occurs globally (1). Diabetes mellitus is the 4th leading cause of death in developing countries and 3rd in the United States (2).

Diabetes Mellitus is classified into a group of metabolic diseases with specific characteristics of increased blood sugar levels or hyperglycemia caused by abnormalities in insulin secretion or insulin action disorders (3), (4). The increased blood sugar levels or chronic hyperglycemia in diabetes leads to long-term damage to several body organs such as the eyes, kidneys, nerves, heart, and blood vessels(5).

International Diabetes Federation report in 2017 people with Diabetes Mellitus in the world reached 425 million people. It was predicted to be 629 million in 2045 (6). In developed countries, the prevalence of diabetics with diabetic foot ulcers is 11% (7). Diabetic ulcers that heal have a 50% to 70% chance of recurrence. This is because people with diabetes mellitus are susceptible to infection which is closely related to the breeding of germs in environments with high glucose levels (8).

Diabetic ulcers are a complication of diabetes mellitus caused by tissue damage necrosis by emboli of large arteries in the body, so the blood supply stops. Diabetic ulcers usually appear in the foot area, followed by local tissue death with an annual incidence rate of 1% to 4% and a lifetime risk of 15% to 25% (9). Diabetic ulcers can be treated in two ways, namely by wound care and through surgery (10).

The other risk factors for complications are age, gender, lifestyles such as physical activity, cholesterol, hypertension, obesity, long-suffering from diabetes mellitus, Self Management of Diabetes Mellitus (SMDM), and others (11).

The high incidence of diabetic ulcers in Indonesia has attracted the attention of several researchers to determine the causative factors. One of the research was conducted by Samidah (2018) showed a significant relationship between age at risk, duration of suffering from diabetes, and foot care with the incidence of diabetic ulcers (12). The second study conducted by Kirana (2019) stated that age, gender, duration of suffering from diabetes mellitus, history of gangrene, the habit of wearing footwear, and habit of cutting nails had a relationship with the incidence of diabetic ulcers (9). The third study conducted by Roza (2015) stated that long-suffering from diabetes mellitus, neuropathy, Peripheral Arterial Disease, history of trauma, and foot care had a relationship with the incidence of diabetic ulcers (13).

Among the results of the three studies, none of them took research related to diabetes mellitus self-management, footwear usage, and cholesterol on the incidence of diabetic ulcers. To fill this gap, the researchers will conduct a study to determine factors associated with the incidence of diabetic ulcers in patients with diabetes mellitus at Labuang Baji Hospital Makassar.

Objective

This study aimed to determine the factors associated with the incidence of diabetic ulcers in clients with diabetes mellitus at Labuang Baji Hospital, Makassar.

Method

Design

The type of research used is quantitative with cross-sectional design to determine the factors associated with the incidence of diabetic ulcers in clients with diabetes mellitus. Cross-sectional study design is a type of observational study design. In a cross-sectional study, the investigator measures the outcome and the exposures in the study participants at the same time.

Sample, Sample Size and Sampling Tehnique

The population in this study was people with diabetes mellitus who were treated at Labuang Baji Hospital, Makassar.

The number of samples in this study was 50 respondents with a sampling technique using incidental sampling. The limited number of respondent due to the limited time to conducted the research, so during one month of data collection, obtained the number above based on the research criteria.

Data collection process

In this study, the team consisted of 2 people, 1 person as the head of the researcher and 1 person as a member of the researcher and was assisted by laboratory workers at Labuang Baji Hospital, Makassar. Data collection was carried out in two stages. The first stage, data collection was carried out by giving questionnaires to respondents which were carried out by the head of the researcher and members of the researcher.

The second stage of data collection was through cholesterol examination according to standard operating procedures. The data collection was assisted by laboratory workers at Labuang Baji Hospital, Makassar. In collecting cholesterol examination data, the respondents are advised to fast for about 8 hours before. Then the respondent's blood was taken to check his cholesterol in the laboratory.

Data Analysis

Univariate analysis was used to describe the characteristics of the research variables. The analysis results are then entered into the frequency distribution table. Bivariate analysis was carried out on two variables that were thought to be related. The statistical test used in this study is the Spearman Correlation Test with a significance level of 0.05 to determine the factors associated with the incidence of diabetic ulcers in clients with diabetes mellitus at Labuang Baji Hospital Makassar..

Ethical Approval

This research was carried out after being approved and granted permission by the Megarezky Makassar University Research and Community Service Board (LPPM) and has received a recommendation to conduct research from Labuang Baji Hospital with the number: 070/278/LB-02/DIKLAT-1/VII/2022.

Results

Demographic and health information on diabetic ulcer among diabetes mellitus

Table 1. Demographic and health information on diabetic ulcer among diabetes mellitus

Characteristics	n	%	p
Age			
36-45	7	14.0	0.018
46-55	25	50.0	
56-65	18	36.0	
Gender			
Female	28	56.0	0.118
Male	22	44.0	
Occupation			
Housewife	12	24.0	0.591
civil servant	14	28.0	
Entrepreneur	23	46.0	
Red Stone Craftsmen	1	2.0	
Education			
Elementary School	8	16.0	0.017
Junior high school	13	26.0	
High school	22	44.0	
Bachelor	7	14.0	
History of therapeutic use			
Pharmacological Therapy	32	64.0	0.188
No Therapy	18	36.0	

Length of Suffering from DM			
1 Years	7	14.0	0.018
2 Years	25	50.0	
≥3 Years	18	36.0	
Total	50	100	

Based on Table 1, the characteristics of respondents in the age category, the most respondents was at the age of 46-55 years as many as 25 people (50%) and the least respondents was aged 36-45 years as many as 7 people (14%).

Characteristics of respondents in the gender category, the most respondents were female respondents as many as 28 people (56.0%) and the least respondents was male as many as 22 people(44.0%).

Characteristics of respondents in the occupational category, most respondents were entrepreneurs as many as 23 people (46.0%) and the least respondents was red stone craftsman jobs was 1 person.

Characteristics of respondents in the education category, the most respondents were high school education level as many as 22 people (44.0%) and the least respondents wasbachelor as many as 7 people (14.0%).

Characteristics of respondents in the category of history of the use of therapy, the most respondents was pharmacological therapy as many as 32 people (64.0%) and the least respondents was without pharmacological therapy as many as 18 people (36.0%).

Characteristics of respondents in the category of the length of suffering from DM, the most respondents was suffering from DM for 2 years as many as 25 people (50.0%) and the least respondents was 1 years (14.0%).

Bihavior and Clinical Factors

In Table 2 showed the highest number of respondents was hypercholesterolemia as many as 40 respondents (64.0%) and the least respondents was normal as many as 10 respondents. (36.0%). The highest number of respondents was not using footwear as many as 46 respondents (92.0%) and the least respondents was using footwear as many as 10 respondents (36.0%). The highest number of respondents was poor self-management of diabetes mellitus as many as 48 respondents (96.0%) and the fewest respondents was good self-management of diabetes mellitus as many as 2 respondents (4.0%).

Table 2. Behavior and Clinical Factors

Behavior and Clinical Factors	n	%	p-value
Cholesterol			
Hypercholesterolemia	40	64.0	0.001
Normal	10	36.0	
Use of Footwear			
Not Using	46	92.0	0.001
Using	4	8.0	
Self-Management implementation			
Good	2	4.0	0.001
Foor	48	96.0	

Correlation between cholesterol level, footwear used, and self-management implementation on diabetic ulcer among diabetes mellitus

Table 3 shows that based on the Spearman Correlation Test, the Spearman's rhor value was 0.505 and the p value = 0.001 was less than 0.05, so it can be interpreted that there is a relationship between cholesterol level with the incidence of diabetic ulcers among diabetes mellitus patients at Labuang Baji hospital Makassar. For the use of footwear variable, based on the Spearman Correlation Test, the Spearman's rhor value was 0.546 and the p value = 0.000 was less than 0.05, so it can be interpreted that there is a relationship between use of footwear with the incidence of diabetic ulcers among diabetes mellitus patients at Labuang Baji hospital Makassar. In the self-management implementation variable,

based on the Spearman correlation test, the Spearman's rhor value was 0.808 and the p value = 0.000 was less than 0.05, so it can be interpreted that there is a relationship between Self-management implementation with the incidence of diabetic ulcers among diabetes mellitus patients at Labuang Baji hospital Makassar.

Table 3. Correlation between cholesterol level, footwear used, and self-management implementation on diabetic ulcer among diabetes mellitus

Variables	n	r	p-value
Cholesterol level	50	0.505	0.001
Use of footwear	50	0.546	0.001
Self-management implementation	50	0.808	0.001

Discussion

Characteristics of respondents

The most respondents in the age characteristics were 46-55 years as many as 25 people (50%) and the least respondents were between 36-45 years old as many as 7 people (14%). Researchers grouped the age of respondents based on age grouping according to the World Health Organization (14). The results of this study are in line with research conducted by Rian Adi Pamungkas (2020) and Yongin (2022) which explains that respondents in type 2 Diabetes Mellitus patients are in the age range above 30 years (14), (15).

The most respondents on gender characteristics in this study were female respondents as many as 28 people (56.0%) and the least respondents were male as many as 22 people (44.0%). The potential for the occurrence of diabetes mellitus is more common in women than men because the incidence of obesity is more common in women. Obesity is one of the factors that causes diabetes mellitus (16). This research is supported by research conducted by Alan Dos Santos (2022) who said that the number of people with diabetes mellitus who were sampled in his study was more female than male, while the comparison was 3776 : 3123(17). Other research that supports this research is research conducted by Firomsa Bekele (2022) whose research results say that out of 162 respondents with diabetes mellitus who were studied, 88 respondents were female and 64 respondents were male (18).

Based on the results of the Spearman Correlation Test, among the six characteristics of the respondents in table 1, there were three characteristics related to the incidence of diabetic ulcers such as age (p-value: 0.018), level of education (p-value: 0.017), and length of time suffering from diabetes mellitus (p-value: 0.018).

Characteristics of age related to the incidence of diabetic ulcers because the older a person, the more opportunity will experience a decrease in organ function, especially the pancreas organ in producing insulin so that the ability of the body's process to control high blood glucose is not optimal. Uncontrolled blood glucose levels lead to the occurrence of neuropathy which causes decreased blood circulation so it has the potential to experience tissue aminecrosis and eventually become diabetic ulcers (19). On the characteristics of the level of education, the results obtained a p-value of 0.017, so it has a correlation with the incidence of diabetic ulcers. The higher a person's level of education, the higher the level of knowledge they have. A person with diabetes mellitus with good knowledge will take early preventive action to reduce complications from diabetes mellitus, on the other hand, a person with diabetes mellitus with less knowledge will have less effort to carry out preventive actions for complications of diabetes mellitus (20). The characteristics of the length of suffering from diabetes mellitus also have a correlation with the occurrence of diabetic ulcers. Because the longer a person suffers from diabetes

mellitus, the greater the chance of experiencing micronic hyperglycemia leading to neuropathy and diabetic ulcers (20).

Correlation between cholesterol level on diabetic ulcer among diabetes mellitus at Labuang Baji Hospital, Makassar

Based on the results of the analysis using the Spearman Correlation Test, the Spearman's rhor value was 0.505 and the p value = 0.001 was less than 0.05.It means that there is a correlation between cholesterol and diabetic ulcers in clients with diabetes mellitus at Labuang Baji Hospital, Makassar. The results are in line with the theory proposed by Jeffcoate& Harding (2003), who stated that patients with diabetes mellitus with long-term uncontrolled cholesterol levels affect endothelial damage in the vascular system, referred to as atherosclerosis (21). Atherosclerosis will affect the narrowing of blood flow so that the blood supply to various tissues decreases, the less sufficient blood supply to tissues will lead to tissue necrosis, and diabetic ulcers will occur (22).

The results of this study are in line with the results of previous studies conducted by Sukatemin (2013) stated that the multiple logistic regression test between the variables of HbA1C values, hyperglycemia, dyslipidemia and vascular status (based on examination of the Ankle Brachial Index/ABI) on the incidence of diabetic foot ulcers showed that the dyslipidemia have relationship with the highest significance that the other three variables, with the p-value is 0.011 <(p-<0.05), the Odd Ratio is 16,338 and the coefficient is 2.793. It means that if all risk factors are within normal values, dyslipidemia has a tendency of 16.338 times more risk to develop foot ulcers, and if each variable increases by 1 value, dyslipidemia tends to be at risk of 2.793 times compared to other variables (12;5).

Correlation between footwear used on diabetic ulcer among diabetes mellitus at Labuang Baji Hospital, Makassar

Based on the results of the analysis using the Spearman Correlation Test, the Spearman's rhor value was 0.546 and the p value = 0.001 was less than 0.05. This means that there is a relationship between the use of footwear and the incidence of diabetic ulcers in clients with diabetes mellitus at Labuang Baji Hospital, Makassar. Patients with diabetic ulcers mainly occur in people with diabetes mellitus who have suffered for 10 years or more if blood glucose levels are not controlled, because complications related to the vasculature will appear so that they will experience macroangiopathy and microangiopathy which will result in vasculopathy and neuropathy which results in decreased blood circulation and tears/wounds in the legs of diabetic patients(19).

The results of this study are in line with Mitasari (2014) stated that people with diabetes mellitus are not allowed to walk without using footwear, this is because people with diabetes mellitus are very susceptible to trauma that results in diabetic ulcers, especially in patients with with neuropathic complications that result in reduced taste sensations, so that the patient has diabetes mellitus does not realize quickly that his leg has been pierced by a sharp object and injured (8).

The results of this study are also in line with previous research conducted by Risman (2020) which said that based on the results using fisher's test statistical test, the significance of the relationship between the two variables was = 0.002 with a value of a = 0.05 (0.002 < 0.05), meaning that there was a relationship between the use of footwear and diabetic foot injuries at Makassar City Wound Care Clinic (24).

Correlation between self-management implementation on diabetic ulcer among

diabetes mellitus at Labuang Baji Hospital, Makassar

Self-Management of Diabetes Mellitus is a behavior focusing on the participation of individual responsibilities in managing the disease including individual actions in controlling diabetes such as taking treatment and preventing complications (25).

The results of this study are in line with research conducted by Tjahjono (2011) which says that DM patients with diabetic ulcers have self-concepts with less controlled, especially in a negative body image of themselves. It is due to the patient's self-acceptance towards the disease called ineffective individual coping (26).

The results of this study are also in line with previous research conducted by Hartono (2019) which said that based on the calculation of the Spearman's statistical test at a significant level = 0.05 with the number of respondents 57 people, it was obtained a ρ value of 0.000 < (0.05) which means that there is a relationship between self-care and complications of diabetes mellitus in patients with Diabetes Mellitus at Mohamad Saleh Hospital, Probolinggo City in 2019 (27).

The results of this study are also supported by the results of a review article conducted by Iksheta Verma (2022) which says that by implementing good self-management of diabetes mellitus in people with diabetes mellitus, blood sugar results can be controlled (28).

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