THE EFFECT OF BRISK WALKING EXERCISE THERAPY ON BLOOD GLUCOSE LEVELS OF PATIENTS WITH DIABETES MELLITUS

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Abstract

Background: Diabetes mellitus (DM) is a metabolic disorder characterized by an increase in blood glucose levels above normal limits. High blood glucose levels, if uncontrolled, can cause serious complications such as heart disease, kidney damage, and blindness. This study aims to determine the effect of brisk walking exercise therapy on blood glucose levels of patients with diabetes mellitus in the working area of the garuda health center. Methods: This study is a quantitative study with a quasy experimental design with a pre-test and post-test without control design. The study was conducted in February with the intervention given brisk walking exercise therapy to 36 respondents. The number of respondents was selected using purposive sampling technique in accordance with the inclusion and exclusion criteria. The instruments used in this study were SOP, glucometer (Easy Touch) and observation sheet. The analysis used in this study is univariate and bivariate using paired test statistical analysis. Results: The results showed that the average pre-test blood glucose level was 247.39mg/dl and post-test 196.58mg/dl. Conclusion: Statistical tests found that the p-value of 0.000 (<0.05) means that Ho is rejected, thus there is a difference in the average blood glucose levels before and after brisk walking exercise therapy. Recommendations for brisk walking exercise as a physical activity exercise that can be done independently for people with diabetes mellitus.

Keywords: *Brisk Walking Exercise, Diabetes Mellitus, Blood Glucose Levels*

INTRODUCTION

Diabetes mellitus (DM) is defined as a hormonal disorder caused by impaired glucose metabolism in the blood, metabolic abnormalities, and a deficiency of insulin produced by the body or pancreas, resulting in an inability to use the insulin produced sufficiently [1]. Diabetes Mellitus (DM) is a disease characterized by the occurrence of hyperglycemia and an inability to oxidize carbohydrates, fats, and proteins linked to an absolute or relative deficiency in insulin secretion. Common symptoms experienced by individuals with Diabetes Mellitus include polyuria, glycosuria, hunger, thirst, weakness, and tingling sensations, and may even lead to dyspnea, ketonuria, and ultimately coma [2] .

Southeast Asia Indonesia ranks third with a prevalence of 11.3% [3]. According to SKI [4], the prevalence of diabetes mellitus in all age groups based on doctor's diagnosis is 1.7%, while the prevalence in the population aged 15 years is 2.2% and based on blood sugar level tests is 11.7%. In Indonesia, the highest prevalence of diabetes mellitus cases in all age groups is in DKI Jakarta province with a prevalence of 3.1%, followed by DI Yogyakarta province with a prevalence of 2.9%, and East Kalimantan province with a prevalence of 2.3%. According to the Riau Province health profile, in 2021 there were 71,654 people with diabetes mellitus, with the district/city of Pekanbaru ranking first with 18,245 people, or 25.46% (Provincial Health Office, 2022). Based on data obtained from the Riau Provincial Health Office, the number of DM patients in Riau continued to increase in 2023. The results of the

2021 Pekanbaru City Health Office Profile estimated the number of DM patients in the city of Pekanbaru to be 18,245, increasing to 19,587 in 2023. Garuda Community Health Center ranks first with the highest total number of DM cases, namely 1,848, while Simpang Tiga Community Health Center has 1,513 cases, Payung Sekaki Community Health Center has 1,461 cases, Sidomulyo Community Health Center has 1,425 cases, and Sail Community Health Center has 1,335 cases, regardless of age [5].

Diabetes mellitus can be treated pharmacologically, one such drug being metformin, which lowers blood glucose levels by increasing insulin hormone activity. Non-pharmacological treatment involves limiting carbohydrate consumption, reducing intake of foods that can cause obesity and are high in sugar, consuming foods high in fiber and low in saturated fat, and maintaining a healthy weight and physical activity (Sugion, 2020). Engaging in regular physical activity or exercise can improve insulin sensitivity, which offers both short-term and long-term benefits, such as reduced blood glucose levels, decreased body fat, and improved cardiovascular health [6].

Brisk walking is one of the physical activities that can be done. For people with diabetes, brisk walking is a type of moderate-intensity aerobic exercise performed by people with diabetes using brisk walking techniques for 20-30 minutes, 2-3 times a week, at a speed faster than normal walking [7]. Brisk walking triggers the production of endorphins, which help a person feel happy and can alleviate stress and depression. Exercises like brisk walking do not cause an increase in insulin but rather enhance glucose absorption by active muscles. This is due to increased sensitivity of muscle insulin receptors and the increase in insulin receptors during exercise, aiming to improve the function and efficiency of the body's metabolic system, thereby enhancing health and making the body feel better afterward [8].

This study differs from previous studies that examined the effect of brisk walking therapy on blood glucose levels in people with diabetes mellitus, because the intervention in this study was conducted by brisk walking barefoot. Several previous studies have shown that brisk walking can lower blood glucose levels (Hati & Muchsin, 2022), but research on the benefits of walking barefoot is still limited. Walking barefoot has been known to improve proprioception, postural stability, and activate the leg muscles more optimally, which may have a greater effect on controlling blood glucose levels in people with diabetes mellitus [9].

A preliminary study conducted by researchers through brief interviews with five people with DM on October 12, 2024, found that three people (60%) with a history of DM said they took medication but rarely spent their free time doing physical activities. Meanwhile, 2 people (40%) with DM said that they still regularly took medication and balanced it with physical activities such as light walking outside their homes and visiting the nearest health facility. However, regarding brisk walking exercise therapy, the 5 people with DM had never applied this physical therapy.

RESEARCH METHODS

The type of research conducted was quantitative research with a quasi-experimental design. This research was conducted at the Garuda Community Health Center in Pekanbaru based on data from the Pekanbaru City Health Office in 2024. The research was conducted from December to February 2025. The population in this study was people with diabetes mellitus in the Garuda Community Health Center working area. In this study, the population size was 40 people selected using a sampling technique by the researcher, namely non-probability sampling (non-random sample) with a purposive sampling approach, where sample selection was based on specific aims and objectives, such as willingness to be a respondent and being able to

perform physical activities while barefoot. The exclusion criteria were patients with movement disorders, foot problems such as ulcers, wounds, or pain, and uncooperative patients. The respondents in this study were 36 patients with diabetes mellitus in the working area of the Garuda Community Health Center in Pekanbaru City.

In this study, the research instruments used were SPO, glucometer (easytouch), and observation sheets. SPO (Standard Procedure Operating) brisk walking exercise therapy was developed based on the pre-interaction stage, orientation stage, work stage, and termination stage. The glucometer used must be clinically validated and certified by health authorities such as the FDA (Food and Drug Administration). The observation sheet consists of demographic data (age, gender, occupation, education, duration of DM) and blood glucose level data (pre-test and post-test.

The analysis in this study is univariate and bivariate analysis. Univariate analysis determines the distribution and frequency of each variable. Bivariate analysis uses a paired test to determine the effect between the independent and dependent variables. This study was declared ethical by the Ethics Committee of the Faculty of Nursing, Payung Negeri Pekanbaru Health Institute, with No: 133/IKES PN/KEPK/XII/2024.

RESEARCH RESULTS

A. Univariate Analysis

Univariate analysis is an analysis used to obtain data on the characteristics of respondents. The univariate results obtained in this study are:

Table 1. Characteristics of Respondents of Diabetes Mellitus Patients in the Garuda Health Center Area, Pekanbaru City

NO	Characteristics	Frequency	Percentage (%)
1.	**Gender**		
	a. Men	3	8,3
	b. Woman	33	91,7
	Total	**36**	**100%**
2	**Age**		
	a. Early Adulthood (26-35 years old)	2	5.6
	b. Late Adulthood (36-45 years old)	4	11.1
	c. Early Elderly (46-55 years old)	30	83.3
	Total	**36**	**100%**
3	**Final Education**		
	a. Elementary School	3	8,3
	b. Junior High School	3	8,3
	c. Senior High School	23	63,9
	d. University	7	19,4
	Total	**36**	**100%**
4	**Work**		
	Homemaker	22	61,1
	Self-employed	10	27,8
	Civil Servant	4	11,1
	Total	**36**	**100%**
5	**Long Suffering from DM**		

a. <1 year	5	13.9
b. 1-5 years	17	47,2
c. > 5 years	14	38,9
Total	**36**	**100%**

(Source: Primary Data Analysis 2025)

Based on Table 4.1, almost all respondents were aged 46-57 years (early elderly), namely 30 people (83.3%). Almost all respondents were female, namely 33 people (91.7%). More than half of the respondents had a high school education, namely 23 people (63.9%). More than half of the respondents worked as housewives, namely 22 people (61.1%), and nearly half of the respondents had suffered from diabetes mellitus for 1-5 years, namely 17 people (47,2%).

Table 2. Average Blood Sugar Levels Before and After Binahong Leaf Decoction Intervention in DM Patients

Variabel	N	Mean	Min-Max	SD
Intervention Groups			185-364	
Pre Test	36	247.39		42.663
Pre Test			127-287	
	36	196.58		31.959

(Source: Primary Data Analysis, 2025)

Based on Table 4.2, the average blood glucose level of 36 respondents before brisk walking exercise therapy was 247.39 mg/dl, and the average blood glucose level after brisk walking exercise therapy was 196,58 mg/dl.

B. Analyzes Bivariat

Bivariate analysis was carried out to see the effect of binahong leaf decoction on blood sugar levels in patients with diabetes mellitus in the Garuda Pekanbaru Health Center area where normality tests were previously carried out.

1. Difference in the Average Value of the Effect of Blood Sugar Levels on Diabetes Mellitus Patients Before and After in the Garuda Pekanbaru Health Center Area

Table 3. Difference in Mean Blood Glucose Levels Before and After Brisk Walking Exercise Therapy

Variabel	*Mean*	SD	SE		N	P *Value*
			Lower	*Upper*		
Pre-test						
Post-test	50.806	30.363	40.532	61.079	36	.000

(Source: Primary Data Analysis 2025)

The results of the study in Table 4.3 show that the average blood sugar level before the test was 247.39 and after the test was 196.58, with a standard deviation of 42.663 before the test and 31.959 after the test. It was found that the difference of 50.806 between the pre-test and

post-test results indicates a significant increase after the intervention was given. The average blood sugar levels in patients with diabetes mellitus before and after being given brisk walking exercise therapy. P value = 0.000, which is < α=0.05, meaning that H0 is rejected. Thus, it can be concluded that there is a significant difference in blood glucose levels before and after brisk walking exercise therapy on blood glucose levels in patients with diabetes mellitus.

DISCUSSION

A. Univariate Analysis

1. General Data

a. Gender

Based on the results of the study, it can be seen that almost all respondents were female, namely 33 people (91.7%). Women show an increased vulnerability to diabetes mellitus (DM), which is influenced by various factors, both biological and social. The study shows that unhealthy dietary changes and decreased physical activity are the main risk factors contributing to the increased prevalence of DM in women. In addition, social factors, such as the burden of domestic and work roles that often neglect personal health, can worsen health management and delay the diagnosis of DM. Several studies have also identified a link between obesity and insulin resistance in women, which is an important factor in the development of DM. Physiological changes that occur in women, such as a decrease in metabolism with age, also contribute to an increased risk of DM. Therefore, the prevention and management of diabetes in women requires a comprehensive approach, with a focus on lifestyle changes, health awareness, and early detection through more frequent screening [10].

According to [11], another factor contributing to DM in women is unstable estrogen levels (increases or decreases), which affect blood glucose levels. When estrogen levels increase, the body becomes resistant to insulin. Another factor that can cause women to be more at risk of developing DM is that women have higher levels of low-density lipoprotein (LDL) or bad cholesterol and triglycerides than men.

According to researchers, women have a higher risk of developing diabetes mellitus (DM) than men, mainly due to unhealthy lifestyle factors, such as irregular eating patterns and low physical activity. In addition, older women or those who have had gestational diabetes are more likely to develop DM. Social factors also play a role, as women often focus more on their families than on their own health, which can increase the risk of DM. Therefore, it is important to pay attention to lifestyle and health on a regular basis as a preventive measure.

b. Age

Based on the results of the study, it can be seen that almost all respondents aged 46-55 years old numbered 30 (83.3%). Based on research conducted by [11], it was found that the majority of respondents were early elderly, numbering 80 (66.7%) respondents. At the age of 46 and above, the body's organs experience aging. Humans experience drastic physiological changes (rapid decline) after the age of 40, especially at the age of 45 and above, because the body is no longer sensitive due to a decline in body regeneration. According to [12], as individuals age, they experience progressive pancreatic β-cell depletion, resulting in insufficient hormone production and elevated glucose levels, which increases the risk of DM after the age of 45. This is because people at this age are less active, gain weight, lose muscle mass, and undergo a aging process that causes progressive β-cell depletion.

According to [13] Characteristics according to age show that most respondents are aged 50-59 years old, which means that people in this age group are at greater risk of developing DM.

Increasing age will affect the incidence of glucose intolerance. Where the incidence of glucose intolerance results in a decrease in the body's ability to metabolize glucose, balanced by genetic factors in a person. According to the researchers' assumption, humans generally experience rapid physiological changes with age after 40 years. Diabetes often appears at that age. This disease is caused by lifestyle and dietary patterns. The older a person is, the higher the risk of developing diabetes mellitus.

c. Education

Based on the results of this study, it was found that more than half of the respondents with diabetes mellitus had a high school education, namely 23 people (63.9%). Based on the research by [14], there is an influence of the risk factor of education level on the risk of developing diabetes mellitus, and those with the highest chance of developing diabetes mellitus are those with a high school education or equivalent. This is consistent with the literature, which states that low levels of education and knowledge are among the causes of high disease rates. Knowledge can be obtained through health promotion efforts. Health promotion, which includes health education, economic factors, and the environment, supports the formation of healthy behaviors and can reduce the risk factors for diabetes mellitus.

According to [15] stated that the level of education from elementary to secondary school greatly affects blood sugar levels, such as behavior and attitudes that are less concerned with healthy lifestyles and the importance of physical activity due to low levels of education. The lower a person's level of education, the lower their awareness of health and health status. DM patients with low levels of education tend to be unaware of the symptoms of DM.

Based on the researchers' assumptions, a person's level of education can influence their ability to accept and understand information about diabetes mellitus. The higher a person's level of education, the easier it is for them to accept information about blood sugar disorders, including blood sugar management, adopting a healthy diet, checking blood sugar levels regularly, and exercising regularly.

d. Duration of Illness

Based on the results of the study, it can be seen that almost half of the respondents had suffered from DM for 1-5 years, namely 17 people (47.2%). The duration of DM can affect depression in patients, causing them to experience boredom and feel hopeless in dealing with their illness. In line with the research by [16], which states that the duration of a person's illness can affect their quality of life, especially in people with diabetes mellitus. The longer a person lives with this disease, the greater the challenges they may face in managing their condition. Some respondents may experience dependence on medication or medical assistance, as well as fatigue or limited energy. However, each individual responds to illness differently, and not all people with diabetes feel hopeless. Factors such as social support, an individual's ability to manage stress, and access to good care can play a major role in influencing their quality of life. According to researchers, the duration of diabetes mellitus (DM) can affect the management of the condition and quality of life. Some individuals may face challenges in maintaining stable blood sugar levels due to various factors, but many also strive to maintain their health through medication and a healthy lifestyle. DM management is greatly influenced by social support, personal motivation, and access to adequate medical care.

2. Difference in the Average Value of the Effect of Blood Sugar Levels on Diabetes Mellitus Patients Before and After in the Garuda Pekanbaru Health Center Area

The blood glucose levels of diabetes mellitus patients before brisk walking exercise therapy on the first day were 247.39 mg/dl, and after brisk walking exercise therapy on the last day, the results were 196.58 mg/dl.

The results of this study are reinforced by researchers [17], who state that brisk walking has benefits for maintaining stable blood glucose levels, increasing insulin sensitivity, controlling blood glucose, reducing the risk of heart and vascular disease, lowering blood pressure, and reducing bad cholesterol levels in the blood. According to the researchers, respondents were willing to undergo brisk walking exercise therapy because it is one of the easiest exercises to perform, as it can be done anywhere, especially outdoors, and is even better when done on a grass field.

Previous studies have shown that brisk walking can lower blood glucose levels [18], but research on the benefits of walking barefoot is still limited. Walking barefoot has been found to improve proprioception, postural stability, and optimize foot muscle activation, which may have a greater effect on blood glucose control in people with diabetes mellitus.

According to the researchers' assumptions prior to the brisk walking exercise intervention, many respondents were not fully aware of the benefits of exercise, such as brisk walking, for lowering blood glucose levels. The lack of a regular exercise habit can affect their blood glucose levels. Therefore, researchers were interested in testing the effectiveness of brisk walking therapy, especially barefoot walking, as a way to lower blood glucose levels in people with diabetes mellitus. This therapy is expected to improve blood glucose control and provide other health benefits.

B. Analyzes Bivariat

Based on the results of the paired sample t-test, the P-value = 0.000 is greater than alpha <0.005, Ho is rejected, meaning that there is a difference in blood glucose levels before and after brisk walking exercise therapy in the pre-test and post-test scores.

Regular physical activity over time provides both short-term and long-term benefits. Brisk walking has short-term benefits by ensuring that all cells in the body, especially the brain, receive an adequate supply of blood. Although the brain accounts for only 2% of body weight, it requires about 20% of the body's total oxygen supply. Therefore, blood flow to the brain must be smooth, which can only happen if the heart is strong enough to pump blood. Body organs that are well supplied with blood will remain healthy, including the skin and the entire body, thanks to a heart that is trained to pump blood efficiently. Meanwhile, the long-term benefits of brisk walking are reducing the risk of various diseases. A well-trained heart remains strong and stable in pumping blood, ensuring that body organs function smoothly. Thus, diseases caused by organ dysfunction can be prevented. Brisk walking also serves as therapy, including for hypertension, diabetes, osteoporosis, depression, and obesity [19].

Research conducted by [18] found that blood sugar levels remain relatively high before brisk walking due to a lack of physical activity, causing the amount of energy consumed to exceed the amount of energy expended, resulting in a positive energy balance that is stored in adipose tissue. This causes insulin resistance, which develops into DM. Physiologically, moderate- and high-intensity walking exercises can increase glucose uptake by muscles compared to hepatic glucose release during exercise. Although blood glucose decreases significantly, blood glucose levels remain higher than normal, so no DM patients experience hypoglycemia. The effect of physical activity or exercise is directly related to an increase in muscle glucose velocity. During exercise, muscles utilize stored glucose, and if glucose levels decrease, muscles replenish the deficiency by taking glucose from the blood, which causes a decrease in blood glucose levels, thereby enhancing blood glucose control.

Research conducted by [20] shows that brisk walking triggers the production of endorphins, which help a person feel happy and can relieve stress and depression. Exercises such as brisk walking do not cause an increase in insulin but rather increase glucose absorption by active

muscles. This is due to increased muscle insulin receptor sensitivity and increased insulin receptors during exercise, which aims to improve the function and efficiency of the body's metabolic system, thereby improving health and making the body feel better after doing it.

In line with the research by [3], the blood sugar levels before and after the test had a p-value of 0.002. This value indicates a significant difference between before and after the brisk walking exercise intervention. The decrease in blood sugar levels may be due to the fact that brisk walking is effective in lowering blood sugar levels. When performing this activity for 15 minutes, the heart rate increases and breathing becomes faster, so that the body's muscles require more glucose contained in the blood. This physical activity helps maintain normal blood sugar levels and improves insulin performance in the body. Insulin not only plays a role in carbohydrate metabolism, but also regulates fat and protein tissue. Insulin works mainly in the liver, muscles, and soft tissue, with most (about 80-85%) of its action occurring in the liver. Regular walking exercises can improve insulin sensitivity, helping the body absorb glucose from the blood more effectively, and stimulate glycogen formation in muscles and the liver. Thus, this exercise helps control blood sugar levels and improve overall metabolic function

Based on the researcher's assumptions, brisk walking exercise therapy has been proven to reduce blood glucose levels in people with diabetes mellitus. If brisk walking exercise therapy is done consistently, it will have a significant effect on reducing blood glucose levels, especially for people with diabetes mellitus who need better blood glucose management.

CONCLUSION

Based on the results of the study, it was found that almost all respondents were aged 46-55 years (early elderly), namely 30 people (83.3%). Almost all respondents were female, namely 33 people (91.7%). More than half of the respondents had a high school education, namely 23 people (63.9%). More than half of the respondents worked as housewives, namely 22 people (61.1%), and almost half of the respondents had suffered from diabetes mellitus for 1-5 years, namely 17 people (47.2%).

Based on the results of the analysis using the Paired Test on blood glucose levels in DM patients, a p-value of 0.000 (P <0.05) was obtained, and Ho was rejected. Thus, it can be concluded that there is a significant difference in blood glucose levels before and after brisk walking exercise therapy on blood glucose levels in patients with diabetes mellitus

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