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The Difference in Blood Glucose Levels with Brisk Walking Exercise in Diabetes Patients

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ABSTRACT

Background: Diabetes mellitus is caused by an insufficient amount of insulin produced by the pancreas or the body that cannot use the insulin produced adequately. The purpose of this study was to determine the difference in blood glucose levels before and after *brisk walking exercise* in patients with diabetes mellitus in the Working. **Method:** The type of research used is *quasi-experimental* with a *nonequivalent control group design.* The population in this study was all DM sufferers in the Working Area of UPTD Puskesmas II West Denpasar. The sampling technique used was *non-probability sampling* with *purposive sampling*, with 30 respondents (15 control groups and 15 intervention groups). The research process was carried out by checking blood sugar while first doing *brisk walking* for 30 minutes at a distance of 2 km and checking again after 10 minutes of intervention. **Result and Conclusion:** The results of research before brisk walking exercise, the average blood glucose in the intervention group was 184.47 mg/dL, and after *brisk walking exercise* was 167.20 mg/dL. There was a decrease in average blood glucose in the intervention group of 17.27 mg/dL. The results of *Wilcoxon* test showed p-value 0.001 <alpha (0.05) and the results of the *Mann-Whitney* difference test obtained a value of p-*value* 0.036*,* it can be concluded that there is a difference in glucose levels before and after *brisk walking exercise* in patients with diabetes mellitus in the Working. It is expected that the results of this study, *brisk walking exercise* can be used as a non-pharmacological therapy to lower blood glucose levels.

Keywords: Brisk Walking; Blood Glucose; Diabetes Mellitus

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INTRODUCTION.

Non-communicable diseases are one of the current global and national health focus areas. One of the NCDs that can be found is Diabetes Mellitus (DM)[1].This chronic metabolic disease called diabetes mellitus is caused by insufficient insulin production by the pancreas or the body's inability to use the produced insulin adequately. Non-communicable diseases are one of the current global and national health focus areas. One of the NCDs that can be found is Diabetes Mellitus (DM).(1) This chronic metabolic disease called diabetes mellitus is caused by insufficient insulin production by the pancreas or the body's inability to use the produced insulin adequately[2].

The number of cases and the prevalence of DM have been steadily increasing over the past few years. The International Diabetes Federation (IDF) (2021) stated that in 2021, the global number of DM cases reached 537 million, and it is estimated that by 2030, this number will increase to 643 million cases. The estimate suggests that it will further rise to 783 million cases by 2045[3]. The World Health Organization (WHO) (2021) indicates that the majority of DM patients reside in low- and middle-income countries[4]. In 2019, the Southeast Asian region, including Indonesia, ranked third with a DM prevalence of 11.3%[5].

The cases of DM in Indonesia in 2021 reached 19.47 million cases and are predicted to increase to 28.57 million cases by 2045[3]. According to the Bali Provincial Health Office (2021), the number of DM cases in Bali is 53,726 cases, with Denpasar city having the highest number of cases, specifically 10,354 cases[6]. According to the Denpasar City Health Office (2021), Denpasar Barat District ranks first with 2,949 cases of DM[7]. The number of diagnosed DM patients at the UPTD Puskesmas II Denpasar Barat increased by 66.4% from 1,446 people in 2021 to 2,406 people in 2022.

Factors that can influence blood glucose are closely related to lifestyle, particularly in terms of diet and physical activity[8]. Inappropriate dietary patterns can result in an imbalanced intake of carbohydrates and other nutrients. Consequently, the body's blood sugar levels rise beyond the pancreas's threshold, leading to diabetes[9]. Physical inactivity is another contributing factor to diabetes, alongside poor eating habits. People who rarely engage in physical activities are 2,455 times more likely to develop diabetes compared to those who regularly participate in physical activities[10].

Recent research involving brisk walking exercise for 30 minutes, covering a distance of 1-2 kilometers, conducted six times, has shown to stabilize insulin levels. Exercises like brisk walking do not lead to an increase in insulin but enhance glucose absorption by active muscles. This is due to the improved sensitivity of muscle insulin receptors and increased insulin receptor activity during exercise[2].

METHOD

A quasi-experimental study with a nonequivalent control group design was conducted, involving two groups: a control group and an intervention group. The study population consisted of 200 respondents who were diabetes mellitus (DM) patients in the working area of UPTD Puskesmas II Denpasar Barat. Sampling was done using non-probability sampling, with a total of 30 samples - 15 respondents in the control group (0) and 15

respondents in the intervention group (1). Primary data was obtained through blood glucose measurements before and after brisk walking exercise following informed consent.

Data collection was carried out after obtaining informed consent from both the control and intervention groups, following these steps:

1. Initial Stage (Pre-test): Blood glucose levels were measured in both the control and intervention groups. Fifteen respondents from each group were included in this stage.

2. Working Stage: The intervention group (1) underwent brisk walking exercise three times a week for two weeks, with each session lasting 30 minutes, covering a distance of 2 kilometers. The control group (0) did not receive any treatment.

3. Post-test Stage: After receiving brisk walking exercise treatment for six sessions, blood glucose levels were measured again in the intervention group. Similarly, blood glucose measurements were taken in the control group.

Univariate analysis was performed to determine the frequency distribution of respondent characteristics, including age, gender, occupation, and blood glucose levels before and after brisk walking exercise. Bivariate analysis was used to determine the relationship between the two variables. If the data was not normally distributed, the Wilcoxon test was used. Results were considered significant if p < 0.05. A comparison between the control and intervention groups was also conducted using the Mann-Whitney test.

RESULTS

1. Respondent characteristics based on age, gender, and occupation.

Table 1. Respondent characteristics based on age, gender, and occupation.

Characteristics	Frequency	Percentage (%)
a. Age		
40-45	0	0
45-50	11	36,7
51-55	5	16,7
56-59	14	46,6
Total	30	100
b. Gender		
- Male	11	36,7
- Female	19	63,3
	30	100

2. Blood Glucose Levels Before and After Intervention.

Table 2. Blood glucose levels

Blood glucose levels		Before brisk walking exercise Pre test				After brisk walking exercise Post test			
Group	N	Mean	Median	SD	Minimum-Maksimum	Mean	Median	SD	Minimum-Maksimum
Control	15	190,87	179,00	41,454	159-331	190,53	180,00	33,494	150-289
Intervention	15	184,47	175,00	30,870	150-239	167,20	163,118	23,118	139-210

3. Analysis

Table 3. Analysis of Wilcoxon and Whitney Tests

	Group	Wilcoxon Test Result *p-value*	Whitney Test Result *p-value*
Pre test- post test	Control group	0,776	
Pre test –post test	Intervention group	0,001	
Pre test	Group Kontrol-kelompok Intervensi		0,589
Post test	Group Kontrol-kelompok Intervensi		0,036

Based on Table 4, the results of the Wilcoxon signed-rank test in the intervention group yielded a ρ-value of 0.001 (ρ < 0.05).

Therefore, it can be concluded that the hypothesis is accepted, indicating a significant difference in blood glucose levels before and after brisk walking exercise in the intervention group. Meanwhile, in the control group, the ρ-value obtained was 0.776 (ρ > 0.05), leading to the conclusion that the hypothesis is rejected, meaning there is no significant difference in blood glucose levels before and after brisk walking exercise in the control group.

DISCUSSION

This section answers the hypothesis/research objectives described in the background section and interprets the results that have been obtained. In this section, more effort is made than in the background, methods, and results section. this section is focused on answering the question of why facts and data have been obtained. At its core, this section is like the principle of a pyramid of special sections then extends which is supported by relevant studies.

Based on the research conducted on 30 respondents, the results showed that the average blood glucose levels in the pre-test for both the control group and the intervention group exceeded the normal limit (>139 mg/dL). It is assumed that high blood glucose levels can lead to nerve damage and stiffness in blood vessels, disrupting blood circulation. To prevent this, individuals can adopt a healthy lifestyle and regularly monitor their blood glucose levels through healthcare services.

This research is supported by a study conducted by Listyarini and Fadilah (2017) in Klumpit Village, Gebog District, Kudus Regency, regarding the effect of Brisk Walking on Blood Glucose Levels in Diabetes Mellitus patients. The study found that 37 respondents had blood glucose levels above the normal limit before receiving brisk walking exercise, with average blood glucose levels in the control and intervention groups being 204.05 mg/dL and 208.28 mg/dL, respectively[15].

The results of the average post-test blood glucose levels in the control and intervention groups showed a decrease of 17.27 mg/dL. This result aligns with Listyarini and Fadilah (2017), who found a decrease in the average blood glucose levels of 19.26 mg/dL among 19 participants[15]. A study by Hamonangan and Paskah (2019) also indicated that after brisk walking, the average blood glucose levels in DM patients decreased by 2.63 mg/dL[16].

Bivariate analysis using the Wilcoxon test in the intervention group yielded a ρ-value of 0.001 (ρ < 0.05). Therefore, it can be concluded that the null hypothesis is not rejected, indicating a significant difference in blood glucose levels before and after brisk walking exercise in the intervention group. Regular brisk walking exercise can help lower blood glucose levels. In addition to regular medication, engaging in physical exercises like brisk walking can also reduce blood glucose levels in DM patients. During exercise, muscle cells become active, and muscle contractions trigger the insertion of GLUT-4 into the muscle cell plasma membrane, even in the absence of insulin. Active muscles absorb and use some of the excess glucose in the blood, reducing overall insulin requirements[17].

This research aligns with Damanik et al. (2019) regarding the impact of fast walking on the reduction of blood sugar levels in type 2 DM patients who receive treatment at RSU Imelda Pekerja Indonesia Medan. The study obtained a ρ-value of 0.002 < 0.05, indicating an effect of brisk walking on reducing blood glucose levels in

type 2 DM patients[16]. A similar study was conducted by Hati and Muchsin (2022), which obtained a ρ-value of 0.0001, indicating that brisk walking had an effect on reducing blood glucose levels in type 2 DM patients in the working area of Puskesmas Batu Tunggal, NA IXX District[19].

A difference test between the control group and the intervention group was also conducted to determine the difference in means between the intervention and control groups. The difference test between pre-test and post-test blood glucose levels was performed using the Mann-Whitney test. The results of the pre-test difference test were ρ = 0.589 (ρ > 0.05), indicating no significant difference in pre-test blood glucose levels between the control and intervention groups. The results of the post-test difference test for blood glucose levels were ρ = 0.036 (ρ < 0.05), indicating a significant difference in post-test blood glucose levels between the control and intervention groups.

CONCLUSION(S)

The average post-test blood glucose levels in the control and intervention groups showed a decrease of 17.27 mg/dL. The results of the post-test difference test for blood glucose levels were ρ = 0.036 (ρ < 0.05), indicating a significant difference in post-test blood glucose levels between the control and intervention groups.

Conflict of Interest

The author(s) declare that they have no conflict of interest, and this research has no conflicts of interest and was conducted smoothly with ethical approval from the ethics commission under reference number LB.02.03/EA/KEPK/0283/2023.

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