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EFFECTIVENESS OF ERGONOMIC EXERCISE ON BLOOD SUGAR IN DIABETES MELLITUS PATIENTS

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ABSTRACT

Diabetes is a chronic metabolic disorder characterized by hyperglycemia because the pancreas is unable to produce enough insulin and the body is unable to use insulin effectively. If diabetes mellitus is not treated properly, it will cause acute and chronic complications. Physical activity training is one of the non-pharmacological management of diabetes mellitus. One form of physical activity training is ergonomic gymnastics. This study aims to determine the effect of ergonomic exercises on blood sugar levels in patients with diabetes mellitus in Krembung Public Health Center. This research is a quantitative study using Pre-Experimental Design One Group Pre- Test Post-Test with 36 respondents. This study shows that there is a decrease in the average blood sugar level on the first day of 234 mg/dL to 209.5 mg/dL, on the second day the average blood sugar level from 211.5 mg/dL to 187.7 mg/dL while the average blood sugar level of the third meeting from 175.7 mg/dL to 148.8 mg/dL. Ergonomic gymnastics involves the main muscles that can make insulin receptors increase and more sensitive so as to reduce blood sugar levels. This is evidenced by the results of the analysis using the Paired T-Test test obtained a p-value of 0.000 (<0.05) which shows the effect of ergonomic exercises on blood sugar levels in patients with diabetes mellitus in Krembung Public Health Center. Based on the results of this study, ergonomic exercises are important to be done routinely in patients with diabetes mellitus to reduce blood sugar levels.

Keywords

Blood Sugar Levels, Diabetes Mellitus, Ergonomic Exercises

INTRODUCTION

People with diabetes mellitus often experience conditions of hyperglycemia or hypoglycemia (Muhaimin et al., 2024). This condition can occur if diabetics are unable to control their blood glucose levels and can cause the risk of instability in blood glucose levels (Wilda et al., 2022). The phenomenon that often occurs is that

there are still many patients who experience instability in glucose levels. The impact on patients who experience instability in blood sugar levels is macrovascular disease (such as coronary heart disease, leg blood vessels and blood vessels to the brain) and microvascular diseases such as nephropathy, retinopathy and neuropathy (Hasina, 2022). One way to overcome or stabilize blood sugar levels in patients with diabetes mellitus is to do ergonomic exercises. In 2021, there were 19.47 million people with diabetes in Indonesia (Nurisyah & Dewi, 2024). In 2019 the incidence rate of diabetes mellitus in East Java was 807.7 and in 2021 it reached 867.26 (93.3%) cases. Thus, the incidence of diabetes mellitus has increased since the last 3 years (Dinkes, 2022). Diabetes mellitus in East Java province ranks fifth highest in prevalence at 2.6%. In 2019, Sidoarjo district was the second highest in East Java with 72,291 people with diabetes mellitus (Kemenkes, 2018). Based on data from the Sidoarjo Health Office in 2022, the incidence of diabetes mellitus in Krembung Community Health Center, Sidoarjo Regency was 90 people. Management of patients with diabetes mellitus can be with pharmacological therapy and non-pharmacological therapy (Dewi et al., 2023). One of the non-pharmacological therapies that can be the solution is to do ergonomic exercises (Raveendran et al., 2018). This ergonomic exercise involves the main muscles so that it causes increased permeability in the contracting muscles, insulin receptors will be numerous and more sensitive. By doing ergonomic exercises can reduce blood glucose levels by increasing glucose uptake by muscles (Rivai & District, 2020).

METHOD

This study used an experimental analytic research design of preexperimental type with a pretest-post test one group design approach. The study population was all diabetics in the Krembung Health Center Work Area, Sidoarjo Regency with purposive sampling technique obtained 36 respondents. Independent variable ergonomic gymnastics and dependent variable Blood glucose levels. After the data is collected, editing, coding and tabulating are done. Test analysis using Paired t-Test Test.

RESULTS

Table 1. Distribution of Respondents based on General Data

Characteristics of Respondents	F	%
Age		
26-35 Years	1	2,8
36-45 Years	3	8,3
46-55 Years	14	38,9
56-65 Years	16	44,4
>65 Years	2	5,6
Gender		
Men	8	22,1
Women	28	77,8
Education		
No School	3	8,3
Elementary	18	50,0
High School	14	38,9
Collage	1	2,8
Use of Blood-Lowering Drugs		
Insulin Oral	36	100
Insulin Injeksi	0	0

Based on table 1 shows that the data of almost half of the respondents aged 56-65 years as many as 16 people (44.4%). based on gender shows that almost all respondents are female as many as 28 people (77.8%). Based on education shows that half of the respondents have basic education (elementary school, junior high school) as many as 18 people (50.0%). based on work shows that almost half of the respondents do not work as many as 16 people (44.6%). based on the use of drugs to lower blood sugar levels shows that all respondents use oral blood sugar lowering drugs (Oral insulin) as many as 36 people (100%).

Table 2 Frequency distribution of respondents based on blood sugar levels of diabetes mellitus patients before ergonomic gymnastics at Krembung Community Health Center, Sidoarjo Regency.

Blood sugar levels	Day-1		Day-2		Day-3	
	F	%	F	%	F	%
<60mg/dL	0	0	0	0	0	0
60-200 mg/dL	7	19,4	11	30,6	27	75
>200mg/dL	29	80,6	25	69,4	9	25
Total	36	100	36	100	36	100
Minimum	150		135		102	
Maximal	362		303		232	
Mean	234		211,5		175,7	
Std. Deviation	49,13		36,01		32,94	

Table .2 shows that at the 1st day meeting, the blood sugar levels of respondents before ergonomic exercise were almost entirely in the category of >200 mg/dL, namely 29 people (80.6%). On the second day the respondents' blood sugar levels before ergonomic exercise were mostly >200 mg/dL, namely 25 people (69.4%) with an average of 211.5 mg/dL. While on the third day the respondents' blood sugar levels before ergonomic exercises were mostly between 60-200 mg/dL, namely 27 people (75%) with an average of 175.7 mg/dL. Blood sugar levels in patients with diabetes mellitus in Krembung Public Health Center, Sidoarjo Regency on the first and second days before ergonomic exercises were performed, the average blood sugar levels were in the hyperglycemia category, while the average blood sugar levels before ergonomic exercises were in the normal category. This is because at the 3rd meeting the patient has received ergonomic exercises 2 times.

Table 3 Frequency distribution of respondents based on blood sugar levels of diabetes mellitus patients after ergonomic exercises at Krembung Community Health Center, Sidoarjo Regency.

Blood sugar levels	Day-1		Day-2		Day-3	
	F	%	F	%	F	%
<60mg/dL	0	0	0	0	0	0
60-200 mg/dL	19	52,8	25	69,4	33	91,7
>200mg/dL	17	47,2	11	30,6	3	8,3
Total	36	100	36	100	36	100
Minimum	122		112		85	

Maximal	328	264	219
Mean	209,5	187,3	148,8
Std. Deviation	46,89	34,96	31,97

Table 3 shows that on the first day after ergonomic exercise, most of the respondents' blood sugar levels were 60-200 mg/dL, namely 19 people (52.8%) with an average of 209.5 mg/dL. On the second day the respondents' blood sugar levels after ergonomic exercise were mostly between 60-200 mg/dL, namely 25 people (69.4%) with an average of 187.3 mg/dL. Whereas on the third day the respondents' blood sugar levels after ergonomic exercise were almost entirely between 60-200 mg/dL, namely 33 people (91.7%) with an average of 148.8 mg/dL. On the first day the average blood sugar level of respondents was in the hyperglycemia category. However, on the second and third day meetings the average blood sugar levels of respondents after being given ergonomic exercises were in the normal category. This is because the patient has received ergonomic exercises 2 times within 50 minutes at the previous meeting.

Table 4 Tabulation of data on the effect of ergonomic exercises on blood sugar levels in patients with diabetes mellitus in krembung public health center, sidoarjo district.

Blood sugar levels	N	Mean	Modus	Median	Std. Deviasi	Min-max
Pretest Day-1	36	234	278	226,5	49,13	150-362
Posttest Day-1	36	209,5	190	198,5	46,89	122-328
Paired t- test results with a p-value of 0.000, t Count = 12.730						
Pretest Day-2	36	211,5	204	210,5	36,01	135-303
Posttest Day-2	36	187,7	190	188	34,96	112-284
Paired t- test results with a p-value of 0.000, t Count = 17.588						
Pretest Day-3	36	175,7	170	174	32,9	102-232
Posttest Day-3	36	148,8	140	144,5	31,9	85-219
Paired t- test results with a p-value of 0.000, t Count = 18.605						

Table 4 shows that on the first day before ergonomic exercises from 36 respondents, the average blood sugar level of respondents was 234 mg/dL, while the average blood sugar level after ergonomic exercises was 209.5 mg/dL. Based on the Paired t-Test test for blood sugar levels on the first day before and after ergonomic exercise, with a p-value (asymp.sig 2 tailed) of 0.000 <0.05. This shows that there is a difference in blood sugar levels before and after ergonomic exercise, so there is a decrease in blood sugar levels. So it can be concluded that there is an effect of ergonomic exercises on blood sugar

levels in patients with diabetes mellitus. On the second day before ergonomic exercises from 36 respondents, the average blood sugar level of respondents was 211.5 mg/dL, while the average blood sugar level after being given ergonomic exercises was 187.7 mg/dL. Based on the Paired t-Test test for blood sugar levels on the first day before and after being given ergonomic exercise, with a p-value (asymp.sig 2 tailed) of
0.000 < 0,05. This shows that there is a difference in blood sugar levels before and after ergonomic exercise, so there is a decrease in blood sugar levels. So it can be concluded that there is an effect of ergonomic gymnastics on blood sugar levels in patients with diabetes mellitus.

DISCUSSION

1. Blood Sugar Levels Before Ergonomic Gymnastics

Based on the results of the study, it shows that the average value of blood sugar levels in 36 respondents before being given the ergonomic exercise intervention at the first meeting was 234 mg/dL, at the second meeting with an average value of 211.5 mg/dL. The average results of blood sugar levels at the first and second meetings were included in the hyperglycemia category.

While the average value at the third meeting was 175.7 mg/dL. at the 3rd meeting the average blood sugar level of respondents was in the normal category, namely 60-200 mg/dL. The results of the study were supported by (Febrianti et al., 2021) that the results of research conducted by researchers on 15 respondents showed that the average value of blood sugar levels before diabetic foot exercises was 304.40 mg/dL, where the sugar level was classified as high.

A person can be said to have a risk of diabetes mellitus when the blood sugar level at any time has a result of> 200 mg/dL. Diabetes mellitus itself is a chronic metabolic disorder because the pancreas is unable to produce enough insulin or the body cannot use the insulin produced effectively, causing an increase in blood glucose levels. Increased blood sugar levels can be caused by several risk factors, such as age, lack of physical activity, gender, unhealthy diet.

2. Blood Sugar Levels After Ergonomic Gymnastics.

Based on the results showed that the average value of blood sugar levels in 36 respondents after being given ergonomic gymnastics intervention at the first meeting was 209.5 mg/dL, at the second meeting with an average value of 187.3 mg/dL. While the average value at the third meeting was 148.8 mg/dL. It can be concluded that blood sugar levels in patients with diabetes mellitus in Krembung Public Health Center have decreased every meeting after being given an ergonomic exercise intervention. The average decrease in blood sugar levels in patients with diabetes mellitus after doing ergonomic exercises with 50 minutes is 25.27 mg/dL. From the results of the study showed that there were changes in blood glucose levels after doing gymnastics, researchers assume that the decrease in blood sugar levels after gymnastics is due to the use of energy burned by cells that use blood glucose using insulin catalysts. Ergonomic gymnastics involves the main muscles so that it causes increased permeability in the contracting muscles, insulin receptors will be many and more sensitive. By doing ergonomic exercises can reduce blood glucose levels by increasing glucose uptake by muscles and improving insulin use and improving blood circulation. When

ergonomic exercises are performed where each movement relaxes the body and moves the muscles to the maximum, the muscles in the body will react by using stored glucose so that the stored glucose will decrease.

3. Effect of Ergonomic Gymnastics on Blood Sugar Levels

This study proves that at the first meeting there is a difference in the average value of sugar levels before being given ergonomic gymnastics intervention and after being given ergonomic gymnastics, namely from the pretest results of 234 mg / dL and posttest results of 209.5 mg / dL with the results of the Paired t-Test Test obtained p-value (asymp.sig 2 tailed) of 0.000 <0.05, so that H1 is accepted, which means that there is an effect of ergonomic gymnastics on blood sugar levels in patients with diabetes mellitus in Pukesmas Krembung Sidoarjo Regency.

The results of the second meeting also showed differences in the average value of sugar levels before being given ergonomic exercise interventions and after being given ergonomic exercises, namely from the pretest results of 211.5 mg/dL and posttest results of 187.7 mg/dL with the results of the Paired t-Test Test obtained p-value (asymp.sig 2 tailed) of 0.000 <0.05, so that H1 is accepted, which means that there is an effect of ergonomic exercises on blood sugar levels in patients with diabetes mellitus in Krembung Public Health Center, Sidoarjo Regency.

The results of the third meeting also showed differences in the average value of sugar levels before being given ergonomic exercise interventions and after being given ergonomic exercises, namely from the pretest results of 175.7 mg/dL and posttest results of 148.8 mg/dL with the results of the Paired t-Test Test obtained p-value (asymp.sig 2 tailed) of 0.000 <0.05, so that H1 is accepted, which means that there is an effect of ergonomic exercises on blood sugar levels in patients with diabetes mellitus in Krembung Public Health Center, Sidoarjo Regency.

CONCLUSIONS

Based on the results of this study, there is an effect of ergonomic exercises on blood sugar levels in patients with diabetes mellitus in Krembung Public Health Center at every first, second and third meeting using the Paired T-Test Test with a p-value of 0.000 or <α (0.05). The more routine diabetes mellitus patients do ergonomic exercises, the more normal the patient's blood sugar levels are expected.

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