Research Article

The Effect of Diabetes Exercises on Decreasing Glucose Levels in the Elderly

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Abstract.
High blood glucose levels often appear after a person is over 45 years old in those who are overweight because their body has decreased sensitivity to insulin. Glucose levels that are not appropriately controlled for an extended period can lead to complications in the heart, brain blood vessels, leg blood vessels, nerves, kidneys and eyes. One of the physical activities that can reduce blood glucose levels is exercise. The study aimed to determine the effect of diabetes exercises on blood glucose levels in the elderly at risk of DM. The research design used a quasi-experimental with one group pretest and post-test to determine the effect of diabetes exercises on blood glucose levels and exercise on diabetes three times a week within four weeks. Exercises were done every two days with a duration of 30 minutes. Blood glucose levels were measured before and after the intervention of diabetes exercise. The measuring instrument used to assess blood glucose levels is a glucometer. The result of the Wilcoxon test was ($p = 0.000$), which means that exercise affects the blood glucose level of the elderly. Diabetic exercise for four weeks showed a significant decrease in blood glucose levels.

Keywords: Blood Glucose, Diabetes Exercise, Elderly

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1. INTRODUCTION

The Elderly is a woman or man aged 60 years or more. The increase in the number of elderly people every year is always increasing, marked by the level of problems in the health sector that often arise including changes in physical functioning abilities, changes in body systems, body metabolic systems, psychological changes. Therefore the ability of the elderly to fight various health problems is weakened, so that the elderly are prone to various health problems, one of which is high glucose levels [1].

High blood glucose often occurs when someone is >45 years old in the elderly who experience excess blood sugar, which causes their body to experience a decrease in sensitivity to insulin. The existing theory states that someone who is ≥45 years old has an increased risk of developing Diabetes Mellitus (DM).

Glucose levels that are not properly controlled can trigger various types of diseases. Many studies have shown that high blood glucose levels if not controlled properly for a long period of time will lead to complications in the heart, blood vessels in the limbs, blood vessels in the brain, kidneys, nerves and eyes [2].

There are several ways to lower blood glucose levels, namely by doing physical exercise. Physical exercise can cause a decrease in blood glucose. Diabetic gymnastics is a physical activity specifically designed for those who have complaints of excessive blood glucose levels using several movements that are deliberately chosen by following the strains of the sound of music so that it makes rhythmic provisions, continuity and with the use of certain times to achieve certain goals. Diabetes exercise will be very good if applied for 30 minutes with a frequency of 3 times a week [3]. Diabetes exercise can reduce blood glucose levels in adults with type II Diabetes Mellitus [4], However, it is currently unknown whether diabetes exercise can reduce blood glucose levels in the elderly.

2. METHODS

The method used in this study is a quasi-experimental pre-test and post-test which examines the causal relationship between the two dependent variables and the independent variables within a predetermined time. The number of samples in this study were 20 people. Blood glucose measurement using a glucometer. The normality test in this study used the Shapiro Wilk test, the effect test used was the Wilcoxon singed rank test.

3. RESULTS

The results of the study regarding "The Effect of Providing Diabetes Exercise on Blood Glucose Levels in the Elderly with DM Risk" are as follows:

3.1. Analysis Univariate Result

3.1.1. Characteristics of respondents based on Age

Based on the table above, the distribution of research samples ranged in age from 60-70 years, of which 60-62 years were 6 respondents (30%), 63-65 years were 3

Table 1: Respondens Age.

Age	Percentage	Amount
60-62 years old	30	6
63-65 years old	15	3
66-68 years old	30	6
69-70 years old	25	5

respondents (15%), 66-68 years were 6 respondents (30%), age 69 - 70 years a number of 5 respondents (25,%).

3.1.2. Characteristics of respondents based on Body Mass Index (BMI)

The following is a table of the characteristics of respondents based on BMI

Table 2: respondens BMI.

IMT	Percentage	Amount
Normal	20	4
Over Weight	55	11
Obesitas 1	20	4
Obesitas 2	5	1

Based on the table above, there are several categories of body mass index classification. According to the WHO asian-BMI classification which was published in 2020 there were several categories of BMI categories in this study as many as 4 people in the normal category (20%), the overweight category 11 people (55), the obese category 1 as many as 4 (20%) and 1 person in the obese category 2 (5%).

3.1.3. Characteristics of respondents based on work

The following is a table of the characteristics of respondents based on work

Table 3: Respondents Occupation.

Occupation	Percentage	Amount
Housewife	50	10
Self-employee	10	2
government employees	10	2
Trader	25	5
Farmer	5	1

Based on the table above, the distribution of research samples in which 10 respondents (50%) were housewives, 2 private workers (10%), 2 civil servant workers (10%), 5 traders (25%) and farmers as much as 1 person (5%)

3.2. Results of Bivariate Analysis

3.2.1. Normality Test

Following are the results of the normality test which uses the Shapiro-Wilk test with a sample of 20 respondents.

TABLE 4: Normality Test.

Group	Sig. 2 Tailed	
	Pre test	*Post test*
Diabetes Exercise	0,015	0,031

From the results of the normality test in the table described above, it shows significant pre-post Diabetes Gymnastics results of 0.015 and 0.031. Based on the results of the normality test above, it is concluded that the data is not normally distributed, this is because the value of α is less than 0.05.

3.2.2. Effect of Diabetes Exercise on Glucose Levels

TABLE 5: wilxocon test results.

Group	n	Sig.2-tailed
Diabetes Exercise	20	0,000

Based on table 5, the Wilcoxon test results obtained a significance value of 0.000, which means it is smaller than the α value of 0.05 so it can be concluded that there is an effect of giving diabetes exercise on blood glucose in the elderly.

4. DISCUSSION

4.1. Characteristics of Respondents based on Age

The ages of the respondents ranged from 60 to 70 years where the ages of the most respondents ranged from 60-62 years and 66-68 years. The results of previous studies indicate that there is a relationship between age and the risk of diabetes mellitus [5].

This means that someone aged ≥45 years has 8 times greater risk of developing DM compared to people aged less than 45 years. Diabetes risk increases with age, especially at the age of more than 45-64 years, because at that age an increase in glucose intolerance begins. Changes start at the cellular level, continue at the tissue level and finally at the organ level which can affect homeostatic functions resulting in reduced activity of pancreatic beta cells to produce insulin and decreased cell sensitivity so that the ability of the body's function to control high blood glucose is less than optimal [6]

4.2. Characteristics of Respondents based on BMI

Body mass index or abbreviated BMI is the result of calculating a person's weight in kg and then dividing a person's height using the square meter unit with the formula BB/TB2 (kg/m2). Someone with excess body weight, the leptin levels produced will increase. Leptin is a hormone associated with the obesity gene. Leptin has an important role in the hypothalamus which functions as a regulator of the amount of fat in the body, is useful as a fat burner which is used as energy and makes a person feel full. So that the level of glucose in the blood increases [7].

Most diabetes mellitus patients have an obese BMI which has high blood glucose levels. This is because in obese people there is accumulation of fat in the body, fat tissue can release cytokine hormones that can inhibit insulin and even cause insulin resistance so that glucose levels in the body increase [14].

4.3. Characteristics of Respondents Based on Occupation

Work is a process of someone carrying out activities to earn income in a company/agency to meet their daily needs, both work in the formal and informal sectors. If someone works, that person is very useful because it affects blood glucose control through the activities carried out by the worker [10]. Work factors can be a big risk for the occurrence of DM, working with physical activity that is not too strenuous can also affect the decrease in energy that is burned and managed by the body so that excess energy in the body will be stored to form fat lumps in the body and cause obesity which is one of the risk factors from DM [15]. The results of these observations are also in line with other studies, namely the majority of respondents who work are 70.8% able to influence blood glucose levels based on activities (physical activity) carried out by respondents every day [13].

4.4. Effect of Diabetes Exercise on Decreased Blood Glucose

Based on the results of the analysis tests that have been carried out, the results show that diabetes exercise greatly affects the reduction of blood glucose levels. The food we eat every day consists of carbohydrates, proteins and fats which will be processed through the mouth to the stomach and then to the intestines. In the food absorption link there are three substances, these substances will be broken down as basic food ingredients through the process of absorption of food by the intestines and then enter the blood vessels and then circulated throughout the body so that the physical organs use it for fuel. In order to be useful for fuel, these nutrients must first enter the cells so they can be recycled. Food substances will be burned in the cells through difficult chemical reactions so that the end result is energy, in this reaction it is called the body's metabolism [8].

Diabetes exercise is a series of gymnastic movements that are designed according to age and physical status, and are part of the treatment of diabetes mellitus. When doing physical exercise, the muscles of the body, the heart and blood circulation and respiratory systems are activated, so that the body's metabolism can balance fluids, electrolytes and acid-base must adjust so that the muscles will use free fatty acids and glucose as a source of power or energy. If physical exercise begins glucose which comes from glycogen in the muscles during physical exercise begins as a source of energy and muscle glycogen decreases, then the use of blood glucose and free fat will increase [9]. Dynamic physical activity involving major muscle groups will increase oxygen uptake by 15-20 times due to increased metabolic rate in active muscles. Pulmonary ventilation can reach 100 L/min and cardiac output increases to 20-30 L/min, to meet the demands of active muscles. Arterial and capillary dilation occurs which causes more capillary nets to open so that there are more and more insulin receptors and are more active/more sensitive [11]. Insulin is a hormone secreted by beta cells in the pancreas. Insulin is then taken up by the receptor and then opens the entrance into the cell so that glucose can be burned for energy, causing a decrease in blood glucose levels [16].

5. CONCLUSION

Based on the result of the research and discussion, it was found that diabetes exercise had an effect on reducing blood glucose levels in the elderly.

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