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Effect of Diabetic Exercise on Reducing Cholesterol Levels in Type 2 Diabetes Mellitus Patients in the Prolanis Exercise Group Argasunya

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ABSTRACT

Introduction: Diabetes Mellitus (DM) or diabetes is a condition of disturbed metabolism in the body caused by the body's inability to produce and distribute the hormone insulin, causing instability in blood glucose levels. DM patients besides experiencing an increase in blood sugar levels also increase cholesterol levels caused by the body's inability to synthesize glucose into energy so that energy is formed from fat synthesis which can cause lipid deposits in the form of cholesterol. Management of diabetes mellitus (DM) which consists of diet, education, pharmacology and physical exercise. One of the physical exercise efforts is diabetes exercise, if done regularly it can burn 150 calories per day and is important in lowering plasma cholesterol through regulatory mechanisms.

Methods: This study aims to determine the effect of physical exercise on reducing cholesterol levels in patients with type 2 diabetes mellitus in the Prolanis Benowo Sukoharjo gymnastics group. This research is a quantitative study using a quasi-experimental design approach one group pretest-posttest. The sample in this study was patients with type 2 DMas many as 30 people, with statistical analysis using (paired sample t-test) with p-value (0.05).

Results: The mean difference in cholesterol levels betweenpre andpost exercise in respondents who did gymnastics once a week for 4 weeks with a duration of 30 minutes per session was 35.8 with an SD of 34.7. While valuep (value) 0.000, meaning that there is a significant decrease in cholesterol levels betweenpre andpost physical exercise in respondents with type 2 diabetes mellitus.

Conclusion: There is an effect of diabetes exercise on reducing cholesterol levels in patients with type 2 diabetes mellitus after being controlled with cholesterol medication in the prolanis exercise group.

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1. INTRODUCTION

Diabetes mellitus (DM) is a group of chronic metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both (Reno, 2006). Most of the pathological features of diabetes mellitus can be related to one of the main effects due to lack of insulin, namely reduced use of glucose by the body's cells, increased fat metabolism which causes abnormal fat metabolism accompanied by cholesterol deposits in the walls of blood vessels resulting in symptoms of atherosclerosis and reduced protein in the blood. body tissue (William, 2007).World Health Organization (WHO) stated that in 2000 the number of DM sufferers worldwide over the age of 20 amounted to 150 million people, in 2011 that number had increased to 346 million people, more than 80% of deaths in DM patients occurred in countries with per capita income. low to medium. These deaths are expected to double by 2030 (WHO, 2011). In developed countries, it is estimated that around 3-5% of the total population has been affected by this disease, while in developing countries infectious

diseases and lack of food are still major health problems (Suyono, 2006). Although it is a developing country, Indonesia ranks fourth in the number of diabetics with a prevalence of 8.4 million people, the order above is India (31.7 million people), China (20.8 million people), and the United States (17 .7 million people) (WHO, 2011). The results of the 2013 Riskesdas showed that DM sufferers in Indonesia based on a doctor's diagnosis were around 1.5%, while based on a diagnosis or symptoms it was 2.1%. While in West Java the prevalence of DM based on a doctor's diagnosis is around 1.3% and based on a diagnosis or symptoms of around 2.0% (Ministry of Health, 2013).

According to Sachdev (2009), of all DM sufferers the prevalence of type 2 DM is greater than type 1 DM, type 2 DM sufferers reach 90-95% of all DM sufferers, meaning that type 1 DM is only around 5-10%. According to Utami (2009), in Indonesia the prevalence of DM in urban areas is 5.7% and as many as 73.7% of DM patients are undiagnosed. Meanwhile, the high number of sufferers in urban areas is partly due to the wrong lifestyle, but this disease has also penetrated rural areas even though the number is still small at 0.9% (Utami, 2009).

The high number of diabetes cases is mainly triggered by the shift in people's lifestyles in this era of globalization, especially those living in urban areas in various countries in Asia. One of the most prominent aspects is the high consumption of ready-to-eat foods such as instant foods which contain lots of high levels of sugar, cholesterol, preservatives, other mixed substances and the lack of consuming foods that come directly from nature (Utami, 2009).
Cholesterol is a chemical compound needed by the body which is the precursor of all steroids in the body such as corticosteroids, sex hormones, bile salts and vitamin D (Alberti, 2010). One of the complications of DM is cholesterol levelsHigh-density lipoproteins (HDL) is low. DM is a metabolic syndrome characterized by loss of glucose homeostasis causing damage to glucose metabolism and other energy sources such as lipids and proteins (Alberti, 2010).

According to Nathan (2010), an increase in blood sugar levels above normal tends to occur in people with obesity who are lazy and have difficulty moving, causing less movement of the skeletal muscles so that fat accumulation increases because fat is not used as energy to move the skeletal muscles. Fat accumulation can activate the secretion of a chemical mediator, namely leptin. This leptin damages the function of insulin receptors and decreases the number of insulin receptors.

If there is a failure of insulin action, then blood sugar cannot be processed into energy as a result, blood sugar levels will increase excessively, excessive sugar will damage blood vessels because sugar cannot be processed into energy in DM sufferers. then energy will be made from other sources such as fat and protein. As a result, cholesterol formed in the chain of fat and protein metabolism can accumulate and threaten the blood vessels. In DM sufferers, impaired function of the insulin hormone will also cause disturbances in fat metabolism which is characterized by levels of several fat-derived substances such as cholesterol. Almatsier, 2009). Excess cholesterol in the blood can form deposits on the walls of blood vessels calledatherosclerosis. Tasteatherosclerosis will attack almost all blood vessels, especially peripheral vascular tissue, this situation is the basis for complications of DM (Almatsier, 2009). Diabetes Mellitus, elevated cholesterol levels will accelerate vascular disease. This is a long-term complication of DM (Almatsier, 2009).

A typical change in fat levels in DM is an increase in triglycerides (another type of fat in the blood) a decrease in HDL cholesterol levels, from the fats found in blood cholesterollow density lipoprotein (Utomo, 2011) Furthermore, in Alberti (2010) the mechanism of cardiovascular disease in DM is very complex and the risk ofatherosclerosis influenced by many factors including hypertension, hyperglycemia, total cholesterol levels, LDL cholesterol levels, HDL cholesterol levels, triglyceride levels.

Reducing cholesterol levels is an important way to reduce the risk of DM disease. The results of the analysis of 2 large studies namelyThe Framingham Heart Study (FHS), andThe Lipid Research Clinic prevalence mortalilty Follow-up study (LRCF) concluded that each increase in plasma HDL cholesterol levels by 1 mg/dl can reduce cardiovascular disease, further in the studyDiabetes Atherosclerosis Intervention Study (DAIS) proved that angiographically reducing triglyceride levels and increasing HDL cholesterol could prevent the progression of coronary artery atherosclerosis and type 2 DM (Masjhur et al, 2005).

According to Parkeni (2006), there are 4 pillars of DM control, namely conducting health education, meal management, physical exercise, and medication. One of the DM therapies to prevent the development of the disease is physical exercise which aims to help control blood sugar and body weight. Regular and measurable physical exercise for 6 weeks with a duration of 30 minutes is useful for increasing insulin production in DM (Huang et al, 2011). This is due to the sensitivity of insulin receptors in the muscles and the increasing number of insulin receptors that are active during physical exercise. This happens because during physical exercise blood flow increases which causes the capillary nets to open so that more insulin receptors in the intracellular or insulin receptors in the muscles are available and active (Ilyas, 2005).

Sari (2012), the habit of doing sports is an important factor. Families who consume foods that are a source of fat but have regular exercise habits, apparently have relatively the same blood cholesterol levels as families who consume low-fat foods with little physical activity (do not have exercise habits). The benefits of physical exercise on cholesterol are that it can increase HDL cholesterol levels, regular exercise can reduce LDL cholesterol levels, which can

clog coronary arteries while HDL collects cholesterol to be sent to the liver and then discarded.

Research by Utomo et al, (2012) entitled aerobic exercise to lose weight, fat, and cholesterol concluded that aerobic exercise is proven to reduce body weight by 66.78%, body fat by 86.42%, and cholesterol levels by 27, 67%. The conclusion from this study is that there is a significant effect of gymnastic exercisesaerobik low impact on weight loss, body fat and cholesterol levels in obese patients.

Based on the description above, the researcher is interested in researching "The effect of diabetic exercise on reducing cholesterol levels in patients with type 2 diabetes mellitus in the Argasunya prolanis exercise group".

2. METHODS

Study Design

The research design used in this study is quasy experiment with approach one group pretest-post test, namely a design that uses one group that is tested before and after treatment. Test were carried out to find out whether there were changes in the group before and after being given treatment (Notoatmodjo, 2010).

Population, Samples, and Sampling

The population is the entire object of research (Notoatmodjo, 2010). The population in this study were type II DM patients in the Prolanis Argasunya Exercise Group with a total of 30 people. The sample is the object under study and is considered to represent the entire population (Notoatmodjo, 2010). This research uses technique purposive sampling. Calculation of the number of samples in this study were 28 people using the Nursalam formula (2013).

Inclusion criteria

The inclusion criteria in this study were: Be prepared to be a responden, fully conscious, patients with type II DM and respondents aged 50-70 years.

Exclusion criteria

Exclusion criteria are characteristics of members of the population that cannot be taken as a sample (Notoatmodjo, 2010). The exclusion criteria in this study were: DM patient sufferers with complications (stroke, heart, kidney failure) and don't participate in exercise club continuously.

Instruments

The instruments used in this study are Cholesterol meter. This physical exercise was adopted from Ilyas (2005) and Sari (2012), namely the diabetes exercise method for 4 weeks, 1x per week with a duration of 30 minutes each exercise.

Procedure

Research begin with examination of cholesterol levels, diet pattern and drug consumption especially cholesterol drug that the patient used before. The first day before physical exercise in 28 patient that join exercise, physical exercise every week for 4 weeks and cholesterol level check last day after physical exercise. Duration of the exercise is 1x per week with a duration of 30 minutes each exercise.

Data Analysis

In this study, use univariate and bivariate analysis. It will be explained below. This analysis is to explain or describe the characteristics of each variable studied (Notoatmodjo, 2010). Used to determine the percentage of cholesterol levels in patients with type 2 diabetes mellitus before and after diabetes exercise. Bivariate Analysis

Used to prove whether there is an effect of physical exercise on reducing cholesterol levels in patients with type 2 diabetes mellitus. The test used is the t testdependent (paired) with the aim of comparing whether before and after treatment (physical exercise) there is a change in cholesterol levels in type 2 DM patients. In bivariate analysis, to calculate the effect of physical exercise on reducing cholesterol will be controlled by variablesconfounding (diet and cholesterol-lowering drugs). Data collection will be done with the following steps: (1) Licensing management; (2) Data collection of club members who suffer from type 2 DM; (3) Explain to the respondent about the purpose of the research; (4) Submitinformed consent research to respondents; (5) Examination of cholesterol levels the first day before physical exercise; (5) Physical exercise every week for 4 weeks; and (6) Cholesterol level check last day after physical exercise.

Ethical Clearance

Ethical consideration number of ethical clearances is No.0131/KEPK/STIKMA/VII/2022.

3. RESULTS

The results of univariate and bivariate analysis will be presented by t-independent. The aim is to compare the differences before and after treatment (Diabetes Gymnastics physical exercise). There is a change in cholesterol levels in type 2 DM patients.

Characteristics of Respondents

The characteristics of the respondents in this study were divided based on age, gender, education, diet and current treatment. Based on table 1 above, most of the respondents (75%) were aged <65 years and over (elderly), most of the respondents (82.1%) were female and most of the respondents (42.8%) had high school education. Most of the respondents (82.1%) were not following

Diet program and (71.4%) and most of the respondents (71.4%) were not currently taking cholesterol-lowering drugs.

Table 1 Distribution of Respondents Based on Age, Gender and Education of Argasunya Prolanis Gymnastics Group

Characteristics of Respindents	n	%
Age		
< 65 years	19	75
≥ 65 years	9	25
Gender	n	%
Man	8	17.9
Woman	20	82.1
Education	n	%
Elementary school	4	17.9
Junior High School	8	25
Senior High School	10	42.8
Bachelor	6	14.3
Diet	n	%
Diet	6	17.9
No Diets	22	82.1
Take Cholesterol Drugs	n	%
Drink	9	28.6
No drinking	19	71.4

Table 2 Distribution of Respondents Based on Cholesterol Levels of Argasunya Prolanis Gymnastics Group

Cholesterol Level	Average	SD
Pre Test	212.43	34.565
Post Test	177.82	38.156
Total	28	100

Table 3 Test results *Paired Sample Test* Against Cholesterol Levels *Pre* and *Post* Diabetes Exercise

Variable	Average	SD	p-value
Cholesterol level Pre Test – Post Test	33.517	32.526	0.000

Table 2 shows that the 28 respondents had an average initial cholesterol level of 212.43 mg/dL with a standard deviation of 34,565. After participating in diabetes exercise, the respondents' cholesterol levels fell by an average of 177.82% with a standard deviation of 38,156. Bivariate analysis aims to determine the effect of physical exercise for diabetes exercise on reducing cholesterol levels in respondents with type 2 diabetes mellitus in Argasunya Prolanis Exercise Group. The analysis used the paired sample t formula (Paired Sample t- Test).

Table 3 shows that the average difference in cholesterol levels betweenpre andpost exercise of 33,517 with a standard deviation of 32,526. While valuep-(value) 0.000, meaning that there is a significant decrease in cholesterol levels between pre and post physical exercise in respondents with type 2 diabetes mellitus inin the Argasunya prolanis gymnastics group.

4. DISCUSSION

Most of the respondents in this study were aged < 65 years, female, and had high school education. This is related to increasing age, especially in old age (65 years) muscle strength, organ capacity, physical strength are also decreasing so that when the elderly try to participate in activities, especially sports such as gymnastics, walking, cycling,jogging will also decrease. While women are usually more concerned about their health so they will do anything that can maintain their health, including participating in sports. Besides that, gymnastic activities are mostly attended by those with secondary education and above, because the higher the education, the higher the knowledge about health. The higher the knowledge, the more concerned you will be to do things that have a good impact on health.

If you pay attention to the results of the calculation of the average cholesterol before and after doing routine physical activity, there is a difference. There was a decrease in the average cholesterol level before and after physical exercise, where before it was 212.43 mg/dL and after that it was 177.82mg/dL. Meanwhile, the characteristics of the respondents were that a greater number were not on a diet and were not taking cholesterol medication. This shows that there is the effectiveness of physical exercise in reducing cholesterol levels.

Based on the results of paired sample t test calculations (paired sample test) earned valuep (value) 0.000, meaning that there is an effect of physical exercise on reducing cholesterol levels in respondents with type 2 diabetes mellitus in the Prolanis Argasunya Gymnastics group. While the results of calculations on those who are not on a diet are 82.1% and not taking cholesterol medication 71.4% both show thatp (hairy)0.000. This shows that there was a decrease in cholesterol in respondents who did physical exercise such as diabetes exercise even though they were not on a diet or were not taking cholesterol medication.

Physical exercise is proven to reduce cholesterol, this is in accordance with research by Utomo et al, (2012) that physical exerciseaerobik low imfact proven to reduce body weight by 66.78%, body fat by 86.42%, and cholesterol levels by 27.67%. According to Santoso (2010) and Sari (2012) the benefits of physical exercise can increase levelshigh density lipoprotein (HDL), and lower levelslow density lipoprotein (LDL).

HDL functions to carry cholesterol to the liver which will then be broken down, and then excreted into the gallbladder as bile acid (liquid). While LDL functions to transport cholesterol from the liver to the body's cells including the heart and brain. Research resultThe Framingham Heart Study (FHS), andThe Lipid Research Clinic prevalence mortalilty Follow-up study (LRCF) concluded that each increase in plasma HDL cholesterol levels by 1 mg/dl can reduce cardiovascular disease (Masjhur et al, 2005). Next in researchDiabetes Atherosclerosis Intervention Study

(DAIS) proved that increasing HDL cholesterol can prevent progressionatherosclerosis coronary arteries in type 2 DM (Masjhur et al, 2005).

The effect of physical exercise on cholesterol in type 2 DM patients can reduce heart risk by lowering triglycerides and increasing HDL cholesterol levels (Freeman, 2008). Lack of body movement will have an impact on decreasing skeletal muscle movement. Skeletal muscles that do not move will make fat unable to be converted into energy so that fat deposits are higher in the walls of blood vessels and skeletal muscles. Fat accumulation can activate the secretion of a chemical mediator, namely leptin. This leptin is detrimental to the function of insulin receptors and reduces the number of insulin receptors (Masjur et al, 2005). If there is a failure of insulin action, then blood sugar cannot be processed into energy, so energy will be made from other sources such as fat and protein. As a result, cholesterol formed in the chain of fat and protein metabolism can accumulate and threaten the blood vessels. In addition, impaired insulin function will cause impaired fat metabolism which is characterized by increased cholesterol (Almatsier, 2009).

Increased cholesterol levels will accelerate vascular disease. This is a long-term complication of DM (Almatsier, 2009). Excessive cholesterol in the body will accumulate in the walls of blood vessels and cause a condition called atherosclerosis namely fat accumulation resulting in narrowing of blood vessels. This condition will lead to heart disease, stroke, and diabetes mellitus.

CONCLUSION

The conclusion in this study was that cholesterol levels before physical exercise with diabetes exercise in patients with type 2 diabetes mellitus in the Prolanis Argasunya group, averaged 212.43 mg/dL. Cholesterol levels after physical exercise in type 2 diabetes mellitus patients in the Prolanis Argasunya gymnastics group, an average of 177.82 mg/dL. As well asthere is an effect of physical exercise on reducing cholesterol levels in patients with type 2 diabetes mellitus in the Prolanis Argasunya gymnastics group.

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CONFLICT OF INTEREST

The author declares that there is no conflict of interest

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