

EFFECT OF THE DIABETES EXERCISE ON THE BLOOD SUGAR LEVELS IN DIABETES MELLITUS PATIENTS

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Abstract

Diabetes is a condition that the pancreas does not produce enough insulin or the body can't effectively use insulin and its impact on disease complications. Physical exercise is one aspect of the management of diabetes that affects reducing the blood glucose rate. The objective of this research was to find the influence of the diabetes exercise on blood sugar rate at the Public Health Centers Mertoyudan II. This study was a quasi-experimental applying the non-equivalent control group. Respondents were 37 for the intervention group and 37 to the control group. The diabetes exercise performed six times within two weeks. The result found that the paired t-test result with a significance level (α) 95 % was p-value = 0,001. There were significant differences in the decreasing average of the blood sugar rate between the intervention and the control group. Further research is needed by increasing the intervention to become three times per week for 4 weeks' intervention.

Keywords: Blood Sugar levels, Diabetes Mellitus, Diabetes exercise

INTRODUCTION

Diabetes Mellitus (DM) is a metabolic disease characterized by an increase in blood sugar levels above normal. Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin or if the body does not use the insulin it produces effectively. DM has an impact on various complications. (WHO, 2017).

Currently, the compilation of data shows that around 150 million people in the world suffer from diabetes, and it will probably double by 2025. The causes of rising DM sufferers in developing countries are increasing population, aging, unhealthy diets, obesity and lack of activities (WHO, 2018). In Indonesia, in the 2000s, the population aged over 20 years was 125 million people, the prevalence of DM was 4.6%, so the number of DM patients was 5.6 million (Sunaryo, 2014). The health profile of Central Java shows the recapitulation of data on new cases of non-communicable diseases in 2015 was 603,840 cases. The proportion of Diabetes Mellitus was 18.33%

The incidence of Diabetes Mellitus begins with a lack of insulin. On the other hand, the Diabetes Mellitus is occurred because of the relative insulin deficiency as the impact of insulin resistance (Bustan, 2015). Prolonged hyperglycemia results in microvascular complications, neuropathic complications, and peripheral vascular disease (Smeltzer & Bare, 2013). Prevention of complications is effective by managing Diabetes Mellitus.

According to ADA (2017), lifestyle management is a fundamental aspect of Diabetes Mellitus. Diabetes Mellitus Management includes education, self-support, diet, physical activity. Physical activity is carried out 3-4 times a week, minimum time of 75 minutes a week. Diabetes complications can be avoided by doing regular and correct exercise. Component of physical activity in the form of physical exercise or sports is one

of the important things in the management of diabetes because of its effects in reducing blood glucose levels. Increasing glucose uptake by muscles and improve insulin use, so that the risk of complications will be reduced (Syamsyiah, 2017). The principle of exercise for diabetics is not different from other sport. The exercise aims to burn calories, convert glucose into energy, so the sugar in the blood would decrease. One physical exercise that can be done by patients is diabetes gymnastics. This is a low impact aerobics and rhythmic (Widianti, 2010).

The Diabetes Mellitus patients in Mertoyudan II Health Center showed an increase of about 28% (926 patients) based on the visiting report of the Chronic Disease Management Program (Polaris). The main goal of therapy is to normalize insulin activity and blood sugar levels to reduce the appearance of vascular and neuropathic complications. Exercise is important for increasing the effectiveness of insulin (Smeltzer & Bare, 2013). The active muscle absorbs sugar into cells without insulin and also the active muscle t increases insulin sensitivity. This study aims to determine the effect of diabetes exercise on blood sugar levels of patients with Diabetes Mellitus.

RESEARCH METHOD

The method used in this study was a quasi-experimental research design with a non-Equivalent control group. This research was conducted at the Mertoyudan II Health Center. The population in this study was people with diabetes mellitus. The samples were selected using purposive sampling. The number of samples was 34 patients for each group, the intervention group, and the control group, GDS measurement used the Gluco Test Homogeneity that has been calibrated 30 minutes before and after the test

RESULTS

Table 1. the homogeneity test results.

Variables	Intervention		Control	
	f	%	f	%
Gender				
Male	18	48.6	11	29.7
Female	19	51.5	26	70.3
Total (n)	37	100	37	100
Age				
30 - 39	1	2.7	3	8.1
40 - 49	7	18.9	8	21.6
50 - 59	18	48.6	20	54.1
60 - 64	11	29.7	6	16.2
Total (n)	37	100	37	100
Level of Education				
No School	1	2.7		
Elementary	2	5,4	2	5,4 Middle
School	18	48.6	18	48.6
High School	15	40.5	17	45.9
College	1	2.7		
Total (n)	37	100	37	100
Employment				
Civil Servants	1	2.7		
Private	6	16.2	5	13.5
Entrepreneurs	12	32.4	12	32.4
Farmers	2	5.4	5	13.5
Pensioners	2	5.4	1	2.7
Labor / IRT / Not Working	14	37.8	14	37.8
Total (n)	37	100	37	100
Type of DM				
1	3	8.1	2	5.4
2	34	91.9	35	94.6
Total (n)	37	100	37	100
Taking medicines				
Yes	31	83.8	25	67.6
No	6	16.2	12	32.4
Total (n)	37	100	37	100

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Based on table 1, it is known that there were more female respondents than men in the intervention and control groups. Most respondents were a range of 50-59 years. One respondent in the intervention group was not attended School. Most respondents were laborers, housewives or unemployed. The majority of respondents were DM type 2, they have been consuming DM medicines regularly.

Univariate Analysis

Table 2. Blood sugar levels of the intervention group and the control group before doing Diabetes Gymnastics.

Blood Sugar Levels	Mean	SD	Min - Max	N
Pre Intervention	250, 54	24, 05	203 - 287	37
Pre control	255, 43	22, 62	209 - 290	37

The average blood sugar levels before treatment can be seen in table 2. The results showed that the average blood sugar level in the intervention group before diabetes exercise was 250, 54 mg / dL, the lowest blood sugar level was 203 mg / dL and the highest was 287 mg / dL. The average in the control group is 255, 43 mg / dL with the lowest value of 209 mg / dL and the highest value of 290 mg / dL.

Table 3. Blood sugar levels of the intervention group and the control group after the Diabetes exercise.

Blood Sugar Levels	Mean	SD	Min - Max	N
Post Intervention	231, 41	26, 00	187 - 299	37
Control	253, 02	22, 55	208 - 289	37

The results of the study showed that the average of blood sugar levels in the intervention group after diabetes exercises for 6 times each 2 days for 2 weeks, was 231.41 mg / dL with the lowest value of 187 mg / dL and the highest value of 299 mg / dL. The control group had an average value of 253.02 mg / dL, the lowest blood sugar level of 208 mg / dL and the highest blood sugar level of 289 mg / dL.

Bivariate Analysis

Table 4. Paired t-test results

Variable	Group	Mean Pre	Mean Post	SD	p-value
Blood Sugar	Intervention	Level 250.54	231.41	18.9	0.00
	Control	255.43	253.02	3.28	0.00

The results of statistical analysis using paired t-test test values obtained $p = 0.001$ ($p < 0.05$) which means that there was an effect of diabetes exercises on the level of blood sugar levels of diabetes mellitus clients in Mertoyudan II Health Center. the Independent t-test showed that before treatment there was no significant difference where the value of $p > 0.05$. The results after being treated indicated $p\text{-value} < 0.05$ which means that there are significant differences after treatment.

Discussion

Respondents have high blood sugar levels. The baseline of blood sugar levels according to WHO is 180 mg / dL. The high blood sugar levels are caused by impaired beta-cell sensitivity, so the insulin failed to compensate for the insulin resistance. This is in line with the statement of Fatimah (2015) that the damage of pancreatic beta cells would occur progressively which will result in insulin deficiency. ADA states that insulin deficiency is caused by a lack of insulin secretion and reducing the tissue responses to insulin.

Increasing blood sugar levels is caused by impaired insulin sensitivity. It can be compensated by physical activity, the muscle activities cause insulin sensitivity. This is in line with Sanjaya (2016) that regular exercise can reduce insulin resistance and increases insulin sensitivity. From these results, it can be concluded that the Diabetes Mellitus client had a significant decrease indicated by a decrease of 19.13 mg / dL in the intervention group and 2.4 mg / dL in the control group. There is a difference in the decrease between the intervention group and the control group where the intervention group experienced a greater decrease than the control group.

The decrease of blood sugar levels after diabetes exercise is a result of active muscle contraction which results in calorie burning when insulin receptor sensitivity occurs. This is following Suryanto (2009) that the muscles that contract or are active do not need insulin to enter glucose into cells, because of inactive muscles the sensitivity of insulin receptors increases. A decrease in blood sugar levels was also shown in Salindeho's (2016) study regarding blood sugar levels in patients with Diabetes Mellitus who participated in diabetes exercises at the Persadia Gorontalo gym. The results of his study found that the decrease in blood sugar levels in the intervention group was higher than in the control group.

The results of this study are similar to the findings of a study by Nugraha (2016) that blood sugar levels before and after diabetes exercises showed a decrease of about 23,708 mg / dL, he stated that exercise had a major role in regulating blood glucose. This study showed that Ha was accepted which means there is a significant influence of diabetes

exercises on the blood sugar level. In the control group, there was also a decrease due to instability in blood sugar when measuring GDS. The decrease of blood sugar levels occurs due to physical activity such as exercise, an increase in the use of glucose by the muscles affect the calories burned and the glucose switch become energy. During exercise, the permeability of the membrane increases, and then the muscles are contracting muscles, its impact on the increase of insulin sensitivity and glucose in the blood decreases (Widianti, 2010).

According to Asdie listed in Indriyani (2007) the mechanism of glucose uptake by muscles related to activity or exercise is started from releasing insulin which triggers the release of muscle activating factor (MAF) in the muscles, thus causing blood glucose uptake by muscles is increased, and glucose uptake by muscle that does not contract also increases. In addition, the local action of hormones on moving limbs called non-supresible insulin-like activity (NSILA). The hormone is present in the lymphatic flow, not in the blood of the limbs. An increase in glucose and insulin supply is caused by an increase of blood flow to the area muscles that are actively moving.

The results of research conducted by Hastuti (2017) on the effect of diabetes exercises on blood sugar levels in Diabetes Mellitus patients in the area of Kedungwuni II Health Center, Pekalongan District found p-value <0.05, which means there is a significant influence of diabetes exercises on the levels of diabetes. It is also similar to Setiawan's study findings (2015) that there are differences in blood sugar levels before and after diabetes exercises, with p-value <0.05.

The results of this study are in line with Rahayu's research (2014) which analyzes the effect of diabetes exercise on decreasing blood sugar levels in Lampung. Rahayu's research found a p-value of 0.00, it means there is a significant influence on the decrease in blood sugar levels when exercise. The exercise was an aerobic 3 times a week, the exercise is more effective in reducing blood sugar levels. Regular and continuous physical activity can reduce blood sugar levels of patients with Diabetes Mellitus, and

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also reduce the incidence of complications.

Conclusion And Recommendations

There is a significant difference in blood sugar levels before and after the diabetes exercise in the intervention group with a value of $p < 0.05$ which means there is an influence of diabetes exercises on the blood sugar levels of Diabetes Mellitus clients. There is a need for further research with the same topic using randomization in sampling. Society can apply diabetes exercises regularly for their health conditions, maintain blood glucose levels and improve the quality of life. Nurses are expected to increase the ability to provide education and training independently to clients related to physical activity training in the form of gymnastics. A health provider may pay attention to an innovative intervention that would reduce blood sugar levels, for example, the diabetes exercise, and adding this exercise as part of the program for managing diabetes mellitus.

References

- American Diabetes Association. (2017). Standards Of Medical Care In Diabetes. The Journal of Clinical and Applied Research and Education, (online), Vol. 40 Supplement 1, (http://care.diabetesjournals.org/content/diacare/suppl/2016/12/15/40_Supplement_1.DC1/DC_40_S1_final.pdf, accessed January 10, 2018).
- Bustan, M. Najib. (2015). Management of controlling non-communicable diseases. Jakarta: Rineka Cipta
- Central Java Provincial Health Office. (2015). Health Profile of Central Java Province 2015. Semarang: Central Java Provincial Health Office.
- Fatimah, Restyana Noor. (2015). Diabetes mellitus type 2. [Journal]. J Majority, 4, 9.
- Hastuti, Witri, Hajj, Son, & Yusuf. (2017). Effect of Diabetes Gymnastics on Blood Sugar Levels in Type II Diabetes Mellitus Patients in the Region of Kedungwuni II Health Center, Pekalongan Regency. [Journal]. Smart Nursing. 4,1. Indriyani, Puji, Supriyatno, Heru, & Santoso, Agus. (2007). Effects of Physical Exercise; Aerobic Exercise Against Decreased Blood Sugar Levels in Type 2 DM Patients in the Bukateja Purbalingga Community Health Center. Media Nurse, 1(2): 49 - 99.
- Nugraha, Andri, Kusnadi, Engkus, & Subagja, Sigit. (2016). Blood Sugar Levels Before and After Conducting Diabetes Gymnastics in Type II Diabetes Mellitus Patients. Journal of Health Scientific, 9 (2).
- Rahayu, Dwi Urip Puji, Rulina, Elya, Rahma, & Gunawan, Ricko. (2014). Effects of Diabetes Gymnastics Against Decreased Blood Sugar in Patients with Diabetes Militus, in the Rama Indra Health Center, Kec. Raman, Central Lampung Regency. Journal of Holistic Health, 8 (1), 41-46
- Salindeho, Anggelin, Mulyadi, & Rottie, Julia. (2015). Effects of Diabetes Mellitus Exercise on Blood Sugar Levels of Type 2 Diabetes Mellitus Patients in Persadia Gymnastics Studio in Gorontalo Regency ejournal Nursing (e-Kp), 4 (7).
- Sanjaya, Agus Fuji, & Huda, Miftachul. (2016). Effects of Diabetes Gymnastics Against Decreased Blood Sugar Levels in Patients with Diabetes Mellitus in the Work Area of Peterongan Jombang Public Health Center. Scientific Journal of Nursing. 2 (1)
- Setiawan, June. (2015). Differences in Blood Sugar Levels Before and After Diabetes Gymnastics. [Journal]. Oxytocin, Midwifery, 2.2.
- Sujaweni, V. Wiratna. (2014). Nursing research methodology. Yogyakarta: Gava Media.
- Smeltzer, Susan C., & Bare, Brenda G. (2013). Medical Nursing Surgery Brunner and Suddart . Jakarta: EGC.
- Sunaryo, Tri, & Sudiro. (2014). Effects of Diabetic Gymnastics on Reducing the Risk of Diabetic Foot Ulcers in Type 2 DM Patients in Diabetic Communities. Viva Medika, 3, 7.

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Suryanto. (2009). The role of Indonesian diabetes exercises for diabetics. *Medikora*, 5 (2): 173 - 184

Syamsyiah, Nur. (2017). *Make peace with diabetes*. Jakarta: Bumi Merdeka.

WHO. (2017). *Diabetes Mellitus*. Retrieved 10 January, 2017 (www.who.int)

WHO. (2018). *Diabetes Mellitus, 2018*. (www.who.int accessed on 15 February 2018)

Widianti, Anggriyana Tri, & Proverawati, Atikah. (2010). *Health Gymnastics*. Yogyakarta: Nuha Medika.