



The education and jogging physical activities towards blood sugar levels in patients type 2 diabetes mellitus

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ABSTRACT

Background

Diabetes mellitus (DM) is a disease of glucose metabolism which is characterized by an increase in blood glucose or commonly referred to as hyperglycemia caused by defects in insulin secretion, insulin work, or both. Diabetes mellitus is known as the silent killer so that diabetes mellitus is often not realized by the sufferer. Efforts to handle diabetes mellitus in a non-pharmacological way through a four-pillar approach to handling diabetes mellitus. The management of diabetes mellitus has a goal so that glucose levels in the blood remain at the limit of normal values, by referring to the four pillars of diabetes management, some of which are education and sports or physical activity.

Method

The type of research used is research Quasy Experimental with a pre test - post test with control group design. This study arranged three groups, namely a combination group and 2 control groups. Technique Non probability sampling with purposive sampling method was used to get 36 respondents divided into 3 groups.

Results

Test results Manova post hoc benferroni games howell shows p value 0.001, which means that the combination of education and physical activity of jogging is effective in significantly reducing blood sugar levels when between combination and control groups.

Conclusion

The results of the study after being given treatment decreased blood sugar levels when patients who received a combination of education and physical jogging activities compared to patients who were only given education or physical activity, so that the combination was effectively implemented for patients who experienced increased blood sugar levels, especially those who experienced Type 2 diabetes mellitus.

Keywords: Education, Physical Activities of Jogging, Blood Sugar Levels When, Type 2 Diabetes Mellitus.

INTRODUCTION

Diabetes mellitus (DM) is a heterogeneous disorder or disease of glucose metabolism

characterized by increased glucose blood or commonly referred to as hyperglycemia caused by defects in insulin secretion, insulin action, or both. [1-4] Diabetes mellitus (DM) also referred to as

chronic or chronic disease is characterized by blood sugar levels more than the normal limits and impaired metabolism of fats, proteins and carbohydrates caused by a lack of insulin hormones both in absolute and relative terms. [5] Diabetes mellitus is a threat to many people because it attacks secretly or is known as the silent killer so that diabetes mellitus is often not realized by the sufferer. [2]

Diabetes mellitus is characterized by an increase in blood sugar levels or what is called hyperglycemia. In patients with diabetes mellitus will be found with several symptoms that often appear such as polyuria (frequent urination), polydipsia (frequent drinking), and polyphagia (frequent eating) accompanied by weight loss. Diabetes mellitus is an endocrine disease that can cause metabolic disorders resulting in macrovascular and microvascular pathological disorders. [6, 7]

The latest survey results show that around 422 million people worldwide suffer from diabetes mellitus and by 2030 diabetes will be the 7th leading cause of human death. [8] Indonesia is in fourth place with the largest number of diabetes mellitus sufferers in the world with the United States, India, China, Brazil, Mexico and Russia. According to the World Health Organization (WHO). In 2003 there were 194 million sufferers of diabetes mellitus, in 2005 there was an increase in prevalence to 200 million people, in 2010 the number of patients with diabetes mellitus increased to 210 million people, in 2015 to 415 million people, and in 2025 the number of people with diabetes mellitus was predicted to 334 million, and in 2040 it is estimated to be 642 million according to the IDF (International Diabetes Federation). [9]

In Indonesia, based on the prevalence of diabetes mellitus is ranked 4th in chronic disease. The prevalence of diabetes mellitus in Indonesia in 2018 increased by 2.0% compared to the previous period for the national average. The highest prevalence occurred in DKI Jakarta Province at 3.4% and the lowest in NTT Province by 0.9%.¹⁰ Data obtained from the results (Risksdas) in 2013 stated that the national prevalence of diabetes mellitus was 2.1%, which increased when compared to 2007 prevalence of 1.1%. When viewed in terms of age, the prevalence is at most in the age range of 56-64 years. [11]

In West Nusa Tenggara Province in 2007 the incidence of diabetes mellitus was 1.4% according to the results of the research of the Health Research and Development Department of the Indonesian Ministry of Health based on the results of diagnosis by health workers or with signs and symptoms. The highest incidence in Kabupaten Bima is 5.9%. [12] The incidence in 2013 according to the results of the Riskesdas of West Nusa Tenggara Province decreased to 1.3% with Kabupaten Bima which was still the highest prevalence of 2.5%. [13] Data on the visits of patients with diabetes mellitus in January 2019 in the prolanis program were 47 people. In the Community Health Center itself there is a Chronic Disease Management Program (Prolanis) that handles chronic diseases such as diabetes mellitus, but the implementation is only once a month so diabetes mellitus sufferers lack physical activity or exercise, while diabetic patients to control their blood sugar levels require regular and continuous physical activity.

Diabetes that is not properly controlled can have an acute or chronic impact or complication according to PERKENI. The impact or complications of diabetes mellitus can be divided into two categories, namely: acute complications and chronic complications, acute complications in it: hypoglycemia, hyperglycemia, while chronic complications include: macrovascular complications and microvascular complications. Diabetes mellitus can often have an impact such as kidney failure, heart disease, stroke, nephropathy, neuropathy, gangrene and even amputation. [2]

In type 2 diabetes mellitus there are several conditions that play a role, namely: B cell dysfunction and insulin retention. Type 2 diabetes mellitus is not caused by reduced secretion of the hormone insulin from the pancreas, but because the cells that are targeted by the insulin hormone are unable or fail to respond to the insulin hormone normally. Insulin resistance is caused by obesity or obesity, lack of physical activity, and aging. Patients with type 2 diabetes mellitus also have hepatic glucose production but there is no autoimmune damage to langerhans B cells. Early in the development of type 2 diabetes mellitus, B cells showed impaired insulin secretion. If it is not handled properly, the next phase will damage the pancreatic B cells. [2]

As the spearhead of health services nurses have the role of counselors and educators to increase

independence in patients. In carrying out its role, a nurse identifies causes, signs and symptoms and must be able to provide counseling or education to patients with diabetes mellitus so that the incidence of more severe hypoglycemia can be prevented. The role of nurses can be done with nursing interventions in the form of health education and carried out in three stages, namely: initial management, home management, and increasing knowledge and abilities of people with diabetes mellitus to monitor blood sugar levels independently. Health education in an effort to improve the knowledge and ability and independence of patients in monitoring blood sugar levels independently includes: how to use the tool, and how to interpret the results of monitoring and record the results of monitoring, health education since the first diagnosis of diabetes mellitus must be given. [14]

In addition to handling pharmacologically, patients with diabetes mellitus can be done with non-pharmacological therapy. Efforts to handle diabetes mellitus in a non-pharmacological way through a four-pillar approach to handling diabetes mellitus, namely by providing diabetic education, exercise, diet planning, and anti-diabetic drugs (pharmacological therapy). [7, 15] Exercise, diet, and lifestyle changes are the factors that cause insulin hormone retention. [16] The management of diabetes mellitus has a goal so that glucose levels in the blood remain at the limit of normal values, by referring to the four pillars of diabetes management, some of which are education and sports or physical activity. [17]

Health education is very important in the management of diabetes mellitus because it is a primary prevention that must be done in groups at high risk of developing diabetes mellitus, secondary health education to groups of patients with diabetes mellitus, while tertiary health education to groups of patients with chronic diabetes mellitus. [2] Some of the things that become material in providing education are about how to monitor blood glucose levels independently, signs and symptoms of hypoglycemia and how to overcome them, and the importance of physical activity in controlling blood glucose levels, as well as the ways and physical activities that diabetics will do mellitus. [18]

Research conducted by Mulyani at the Polytechnic of Endocrine Clinics at RSUD dr.

Zanoel Abidin Banda Aceh with a sample of 32 respondents said that there was a significant effect between nutritional consultation on blood sugar levels in patients with type 2 diabetes mellitus seen from the mean pre-intervention 291.97 and the mean post intervention 166.19 with a difference in mean value of 125.78. This means that nutritional consultation is affected by blood sugar levels, a significant value ($p = 0,000$, $\alpha = 0,05$), the value is effect size 2,216192 (strong). [19]

Physical activity is all body movements that need energy to do it such as running, walking, dancing, farming and so on. In patients with diabetes mellitus has an important role to control blood sugar levels, besides that exercise or physical activity can reduce weight, improve respiratory function, cardiovascular, increase HDL, reduce LDL, and blood pressure if done correctly and regularly.^{16, 20} Physical activity will require energy known as ATP which is needed by the body and comes from the metabolism of sugar in the blood then produces lactic acid, pyruvic acid and acetylcoenzyme A as intermediate compounds, energy mostly functions of cells and tissues derived from blood sugar. [17]

Empirical evidence can be seen from Herwanto's research conducted in the KONI Manado field with a sample of 30 respondents saying there was an effect of physical activity on blood sugar changes before running and after running seen from the mean pre intervention 111.4 and the mean post intervention 96.9 with difference in mean value 14.5. Physical activity has an effect on blood sugar levels, a significant value ($p = 0.001 < 0.05$, $\alpha = 0.05$), the effect size is 1.376103 (strong). [17]

The relationship of physical activity with diabetes mellitus is in the four pillars of handling diabetes mellitus in which physical activity plays a role in regulating blood glucose levels resulting from a lack of response from insulin receptors (insulin resistance), because of this interference insulin cannot help transfer sugar into cells. Muscle contractions have properties like insulin (insulin like effect). During exercise, muscle cells use more glucose and other nutrient fuels to carry out physical activity. The rate of transport of glucose into the muscle that is on the move increases more than 10 times during moderate to severe activity. During physical activity insulin resistance decreases, whereas insulin sensitivity increases,

this results in reduced insulin requirements in patients with diabetes mellitus. This response only occurs every time physical activity, is not an effect that persists or lasts a long time, so physical activity must continue to be carried out regularly. [5]

Jogging physical activity is one form of exercise or exercise with jogging and is quite easy to do in daily life when compared to physical activity or other sports such as gymnastics, cycling, and swimming. [21] Jogging is also a sport that has high aerobic value after swimming, because jogging is an aerobic activity so it is useful to improve health and fitness so that the benefits are very great for the health of the body. [22]

Based on several previous studies described above have shown the effectiveness of education and physical activity on blood sugar levels but prospective researchers have not found data or studies that combine independent variables between education and physical activity in a population and simultaneously examined the dependent variables of blood sugar levels in patients Type 2 diabetes mellitus. The purpose of combining education and physical activity is to complement each other and maximize both interventions, education is cognitive while physical activity is in the motorized state so that they can complement each other. Based on the description above, the researchers wanted to examine the effectiveness of a combination of education and physical activity jogging on blood sugar levels when in patients with type 2 diabetes mellitus.

METHODS

This type of research uses research Quasy Experimental with a pre-test - post test with control group. The researcher arranged three groups, namely the combination group that was given educational measures with physical jogging activities and two control groups were only given educational measures and physical jogging activities. Educational actions and physical activity of jogging are carried out 3 times a week for 4 weeks. Measuring blood sugar levels when the respondent was conducted at the UPT Puskesmas Puskesmas laboratory before and after the action was taken.

The population in this study were all patients with type 2 diabetes mellitus in the Wera UPT Health Center working area who visited the Wera Health Center UPT in January 2019. Determination of the minimum number of samples using a technique sampling non probability with purposive sampling method and based on inclusion and exclusion criteria as many as 36 respondents divided into 3 groups with 12 respondents each in the combination group and the control group.

In this study researchers conducted data collection by observing, identifying, interviewing and filling out the questionnaire. The collected data was analyzed through the IBM SPSS program version 24.0, and continued with a different test namely parametric test (Paired t test and Independent t test). The processed data is used as the basis for discussing problem statements, which are then presented in table form so conclusions can be drawn.

RESULTS

Table 1 Frequency distribution of respondents based on group, age, sex, education, and occupation.

Category	Group Respondents						P
	Combination		Physical Activity		Education		
	N	%	n	%	n	%	
Age (mean ± SD)	55.50±8.274		58.25±6.497		57.17±8.200		0.663
Gender							0.643
Male	3	25.0	3	25.0	4	33.3	
Female	9	75.0	9	75.0	8	66.7	
Total	12	100	12	100	100		
Education							0.580
Primary	1	8.3	1	8.3	2	16.7	
High	2	16.7	2	16.7	2	16.7	
School Middle School	6	50.0	6	50.0	5	41.7	
Higher Education	3	25.0	3	25.0	3	25.0	
Total	12	100	12	100	12	100	

Work						0.966
Farmers	2	16.7	1	8.3	3	25.0
IRT	7	58.3	7	58.3	6	50.0
PNS	3	25.0	4	33.3	3	25.0
Total	12	100	12	100	12	100

Table 1 respondents characteristic frequency distribution data are shown in table 1 above, the average age of the respondents in the combination group was $55.50 \pm 8,274$ and the physical activity control group was 58.25 ± 6.497 and in the education control group it was 57.17 ± 8.200 and there was no difference between the three groups with avalue $p= 0.663$. The sex of the most respondents is women as many as 26 (72.22%) people and male respondents as many as 10

(27.78%) people and there is no difference between the three groups with avalue $p= 0.643$. Respondents with the highest number of education were as high as 17 (47.22%) and the lowest was SD 4 (11.11%) and there was no difference between the three groups with a value of $p= 0.580$. Respondents with the highest number of jobs were as many as 20 (55.56%) and respondents with the lowest number of jobs were 6 farmers (16.67) and there were no differences between the three groups with $p= 0.966$

Table 2 Differences in blood sugar levels before and after treatment in the combination group and control group

Blood Sugar Levels	Mean ± SD Pre	Mean ± SD Post		
Educational Control	296.08 ± 42.352	195.67 ± 37.354	-100.42	0.001
Physical Activity Control	305.83 ± 26.454	195.50 ± 21.245	-110.33	0.001
Combination	263.25 ± 26.581	147.33 ± 25.090	-115.92	0.001

*Paired t test Test

From the table above, the results of the study show the average blood sugar levels when before and after giving education and physical activity on all groups had differences in average blood sugar

levels when with a significant value $p= 0.001$ ($p<0.05$) which means that there were significant differences in blood sugar levels before and after administration of treatment.

Table 3 Analysis of differences in average blood sugar levels after being given an educational intervention and physical activity jogging in the combination group, giving education to the control group and giving physical activity to jogging in the control group.

Variable	Measurement	Group	Mean±SD	P	
When Blood Sugar	Pre	Combination	263.25±26.581	0.008	
		Physical Activity	305.83±26.454		
		Education	296.08±42.352		
	Post		Combination vs Physical Activity		0.009
			Combination vs. Education		0.058
			Physical Activity vs. Education		1.000
			Combination	147.33±25.090	0.001
	Physical Activity	195.50±21.245			
	Education	195.67±37.354			
	Delta		Combination vs Physical activity		0.001
Combination vs Education				0.001	
Physical activity vs. Education				1.000	
Combination			-115.92±21.798	0.129	
Physical Activity	-110.33±15.541				
Education	-100.42±17.381				
		Combination vs. Physical Activity		1.000	

Combination vs. Education	0.142
Physical activity vs. Education	0.590

* Post hoc bonferronic anova test

Table 3 above, can be seen from the results of the pre-test statistical test between the combination groups, educational control groups and physical activity control groups using test Post hoc bonferroni anova showed that in variable blood sugar levels when there were differences between groups with a significant value $p= 0.008$ ($p<0.05$), while the statistical test post test showed that there were differences between groups on variable blood

sugar levels when with a significant value $p= 0.001$ ($p<0.05$). Whereas the difference of influence between combination groups, educational control group and control group of physical activity delta value (difference between pre value and post value) so that results obtained on variable blood sugar levels when there were no differences in influence between combination groups and control groups with a significant value $p= 0.129$ ($p> 0.05$).

Table 4 Analysis of effectiveness combination of education and physical activity jogging against blood sugar levels in patients with type 2 diabetes mellitus

Group	Mean	p value	Confident 95% Interval	
			Lower bound	Upper bound
Combination	-115.917	0.001	-129.767	-102.067
Educational Control	-100.417	0.001	-111.460	-89.374
Physical Activity Control	-110.333	0.001	-120.207	-100.459

*test manova post hoc benferroni games howell

Table 4 above, can be seen from the results of statistical tests showing that the effectiveness of the combination of educational jogging physical activity is effective against decreasing blood sugar levels when with a significant value $p= 0.001$ ($p<0.05$). The same results showed that the provision of effective education on decreasing blood sugar levels when with a significant value $p= 0.001$ ($p<0.05$) and jogging physical activity with a significant value $p= 0.001$ ($p<0.05$).

DISCUSSION

Differences Blood Sugar Levels Before and After Education in Control Groups, Jogging Physical Activity in Control Groups of Physical Activity and Interventions Educational and Physical Activity in Combination Groups

Results of paired t-test in the educational control group obtained significant values of blood sugar levels when $p= 0.001$ ($p<0.05$), the physical activity control group $p= 0.001$ ($p<0.05$) and the combination group $p= 0.001$ ($p<0.05$). So it can be concluded that H_0 is rejected and H_a is accepted, which means there is an influence of education on blood sugar levels while in three groups.

Providing education can increase knowledge or co-cognitiveness in patients with diabetes mellitus

so that patients with diabetes mellitus can change their mindset and decision-making to change their lifestyle from those initially patterned to unhealthy living to be patterned to healthy life, especially in changing nutritional patterns and determining choices related to handling and prevention of diabetes mellitus he suffered. These educational efforts need to be supported by therapeutic lifestyle changes so that they have a good effect on improving the quality of life of these patients.

The results of this study are in line with previous researchers who said that there was a relationship between the implementation of education by nurses with blood sugar levels with patients with diabetes mellitus with a significant value of $p= 0.044$ ($p<0.05$). Providing education can increase the knowledge of people with diabetes mellitus about efforts to control blood sugar levels and a healthy lifestyle. Health behavior is basically all activities of a person's activities, both observable and unobservable related to the improvement and maintenance of health. To be able to control blood sugar levels requires compliance and discipline of people with diabetes mellitus to manage diabetes through counseling, diet, physical activity and treatment. [23]

Regular physical activity or exercise for people with type 2 diabetes mellitus. Many benefits can be

obtained from physical activity or sports that are useful for improving health and physical fitness in patients with type 2 diabetes mellitus. Regular and regular physical activity can increase the sensitivity of insulin receptors. so glucose can be used in cells for metabolism so that glucose does not accumulate in the blood. Lack of physical activity in people with diabetes mellitus has a negative influence on the sensitivity of insulin receptors resulting in glucose not being metabolized in cells so that glucose is only accumulated in the blood which results in an increase in blood sugar levels.

The results of this study are in line with previous studies which stated that yoga exercise affects blood sugar levels and cholesterol levels in patients with diabetes mellitus with a significant value of $p= 0.000$ ($p<0.05$). Physical activity or exercise is a necessity for everyone, especially people who suffer from type 2 diabetes mellitus. Sports that are recommended for people with diabetes are low impact and rhythmic aerobics such as riding a bicycle, gymnastics, swimming and jogging because in the implementation using large muscles, heart and Respiratory. Aerobic exercise using large muscles is carried out continuously can increase the sensitivity of insulin receptors and metabolize fat into energy. [24]

The results of other studies said that there were differences in blood sugar levels before and after doing diabetes exercise with a significant value of $p= 0.005$ ($p<0.05$). Physical activity or exercise in people with diabetes mellitus have a role in controlling blood sugar levels. The main problem in people with type 2 diabetes mellitus is the lack of insulin receptor response resulting in insulin not being able to enter the cells of the body and the muscles that contract actively. The benefits of physical activity for people with diabetes mellitus can increase the sensitivity of insulin receptors so that insulin can enter the cells and muscles. [25-26]

Analysis Differences in the Effects of Educational Interventions and Jogging Physical Activity on Combination Groups, Giving Education to Control Groups of Jogging Physical Activity Education and Giving in Physical Activity Control Groups on Blood Sugar Levels When

The statistic test results post hoc bonferroni pre value on variable blood sugar levels when there was a difference between the combination group and the two control groups with a significant value

of $p= 0.008$ ($p<0.05$) with the group that had differences ie between the combination group and the physical activity group with a significant value $p= 0.009$ ($p<0.05$), group there was no difference in the combination with the education group with a significant value of $p= 0.058$ ($p> 0.05$) and the physical activity group with education there was no difference with a significant value of $p= 1,000$ ($p> 0.05$).statistical test results ANOVA post hoc post-test scores on variable blood sugar levels there were differences between the combination group and the two control groups with a significant value of $p= 0.001$ ($p<0.05$) with the group that had differences between the combination group with the physical activity group with a significant value $p= 0.001$ ($p<0.05$), the combination group with the combination group with education there is a difference with a significant value $p= 0.001$ ($p> 0.05$) and the physical activity group with education there is no difference with a significant value $p= 1,000$ ($p> 0, 05$).

Statistic test results of Post hoc bonferroni delta values on variable blood sugar levels when it can be concluded that H_0 is accepted and H_a is rejected, which means there is no difference between the combination groups with the two control groups.

One of the benefits of education is that it can improve patient compliance and increase knowledge so as to change the behavior of these patients. Possible causes of educational failure are complications of other diseases and patient noncompliance with treatment. In order to get a normal glucose metabolism process in addition to the mechanism and dynamics of normal secretions needed, normal insulin action is also needed. The problem is not the amount of insulin production, but the low sensitivity of the insulin receptor which is one of the factors causing diabetes mellitus. Muscles contract to increase blood glucose uptake, even though blood glucose levels are usually maintained through liver glycogenolysis and gluconeogenesis and alternative fuel mobilization such as free fatty acids.

The results of this study are in line with previous studies which said that the provision of education had an effect on glycemic control with a significant value of $p= 0,000$ ($p<0.05$). Education can support the success of behavior so that it helps control blood sugar individually. This change in behavior will determine the attitude associated with

blood sugar control.²⁷ The results of other studies say that there is an effect of diabetes exercise on blood sugar levels with a significant value of $p=0.001$ ($p<0.05$).

Gymnastics for diabetes mellitus is a exercise that emphasizes the rhythmic nature of muscles, nerve and vascular joints in the form of relaxation and stretching. Good and regular exercise and continuously will increase the flow to the muscles by opening the capillaries (small blood vessels) so that it will reduce the pressure which in turn will increase the supply in the muscle tissue itself, thereby reducing the disruption of carbohydrate metabolism in people with diabetes mellitus and reducing sugar levels his blood.²⁸

Combination Analysis of Educational Effectiveness and Physical Activity of Jogging on Blood Sugar Levels in Patients with Type 2 Diabetes Mellitus

The results of the study revealed that after administering educational treatment in the education control group, the physical activity of jogging in the control group of physical activity and the combination of educational interventions with jogging physical activity in the combination group had similarly decreased results. To be able to find out the effectiveness of the combination of education and physical activity interventions on blood sugar levels when the test was carried out post hoc benzronron games howell the delta values in the combination group for each dependent variable were obtained at variable blood sugar levels when significant values were obtained $p=0.001$ ($p<0.05$), in the educational control group a significant value was $p=0.001$ ($p<0.05$) and in the physical activity control group a significant value was $p=0.001$ ($p<0.05$).

From the results of this study, it can be said that all interventions in each group are effective against decreasing blood sugar levels when, but the largest group that gives a decrease in effect is a combination group, so that the results of this study can be concluded that H_0 is rejected and H_a is accepted which means an educational combination and physical activity is effective against decreasing blood sugar levels when.

Contracting muscles require insulin to enter glucose into the cell because in active muscles the sensitivity of insulin receptors increases. The energy needed when jogging comes from glucose and free fatty acids, at the beginning of the jogging

activity the two ingredients are the main source, but the use of glucose at this stage is faster. The energy at the start of jogging comes from the ATP-PC muscle reserves, after that it is obtained from the muscle glycogen reserves, then glucose is used. When jogging continues, energy is obtained from glucose obtained from the breakdown of liver glycogen deposits (glycogenesis). If jogging lasts more than 30 minutes, the main energy source is free fatty acids, derived from adipose tissue lipolysis (glucose sparing).

Education and physical activity is one of the non-pharmacological therapies that can help control blood sugar levels where education provides knowledge or enhances a person's cognitive functions so that he can realize his condition with the illness and then change his life behavior from the unhealthy to the healthy lifestyle.²⁹ In line with previous studies which say that education can affect the decrease in blood sugar levels with a significant value of $p=0.000$.³⁰ Whereas physical activity has an influence on the body to carry out glucose metabolic processes in cells so that there is an increase in the sensitivity of insulin receptors and an increase in the number of insulin receptors that are active during physical activity or exercise. [30]

Other studies say that there is a significant effect of physical activity on jogging on decreasing blood sugar levels with a significant value of $p=0.000$. Jogging exercises play a major role in regulating blood sugar levels, insulin production is generally not disturbed, the main problem is the lack of insulin receptors to insulin so that they cannot enter the body's cells except the brain. [21]

CONCLUSION

Based on the results of research on the effectiveness of a combination of education and physical activity on blood sugar levels in patients with type 2 diabetes mellitus, conclusions can be drawn:

1. There were differences in blood sugar levels when before and after giving education in the education control group in patients with type 2 diabetes mellitus.
2. There were differences in blood sugar levels when before and after administration of physical activity in the control group of

- physical activity in patients with type 2 diabetes mellitus.
3. There are differences in blood sugar levels when before and after giving a combination of education and physical activity in the combination group
 4. There are differences in the influence of blood sugar levels when before and after giving education and physical activity in the combination group and control group
 5. The combination of education and physical activity is effective against decreasing blood sugar levels when in patients with type 2 diabetes mellitus.
The administration of a combination of education and physical activity interventions has been proven effective against certain levels of blood sugar when.

REFERENCE

- [1]. Gao Y, Wang Y, Zhai X, et al. Publication trends of research on diabetes mellitus and T cells (1997–2016): A 20-year bibliometric study. PLoS ONE. 12, 2017, 1-13.
- [2]. Fatimah RN. Diabetes melitus tipe 2. Jurnal Majority. 4, 2015.
- [3]. Dwikayana IM, Subawa AAN and Yasa IWPS. Gambaran HbA1c pasien diabetes melitus tipe 2 dengan komplikasi ulkus kaki diabetik di poliklinik penyakit dalam RSUP Sanglah Denpasar periode. E-Jurnal Medika Udayana., 2014, 2016.
- [4]. Prasetya G, Suryani M and Supriyono M. Perbedaan intensitas nyeri pada pasien perawatan luka ulkus diabetik sebelum dan sesudah diberikan teknik relaksasi nafas dalam di RSUD Tugurejo Semarang. Jurnal Ilmu Keperawatan dan Kebidanan. 2012.
- [5]. Wijonarko B, Anies A and Mardiono M. Efektivitas Topikal Salep Ekstrak Binahong(*Anredera Cordifolia* (Tenore) Steenis) terhadap Proses Penyembuhan Luka Ulkus Diabetik pada Tikus Wistar (*Rattus Novergicus*). Jurnal Ilmiah Kesehatan (JIK). 2016.
- [6]. Putri NHK and Isfandiari MA. Hubungan Empat Pilar Pengendalian DM Tipe 2 dengan Rerata Kadar Gula Darah. Jurnal Berkala Epidemiologi, I (2), 2013, 234-43.
- [7]. Suwarno ML and Sianturi SR. Efektifitas Latihan Fisik Yoga terhadap Kadar Gula Darah Sewaktu pada Diabetes Mellitus Tipe 2 di Kramat Jakarta. Jurnal Keperawatan Soedirman. 12, 2017, 102-8.
- [8]. Sohail MU, Althani A, Anwar H, Rizzi R and Marei HE. Role of the Gastrointestinal Tract Microbiome in the Pathophysiology of Diabetes Mellitus. Journal of Diabetes Research. 2017, 1-9.
- [9]. International Diabetes Federation. IDF Diabetes Atlas Seventh Edition 2015. 2015.
- [10]. Kementerian Kesehatan RI. Riset Kesehatan Dasar (Riskesdas 2018). Kementerian Kesehatan RI, 2018.
- [11]. Kementerian Kesehatan RI. Riset Kesehatan Dasar (Riskesdas 2013). Jakarta: Kementerian Kesehatan RI, 2013.
- [12]. Badan Penelitian dan Pengembangan Kesehatan Departemen Kesehatan RI. Riset Kesehatan Dasar (RISKESDAS) Nusa Tenggara Barat Tahun 2007. Desember 2008 ed. Jakarta: BAPELKES DEPKES RI, 2008, 1-261.
- [13]. Ristrini, Andarwati P, Hanafi F, et al. Riskesdas 2013 Provinsi Nusa Tenggara Barat. Jakarta: Lembaga Penerbitan Badan Penelitian dan Pengembangan Kesehatan Kementerian Kesehatan RI, 2013, 300.
- [14]. Fahra RU, Widayati N and Jon Hafan Sutawardana. Hubungan Peran Perawat Sebagai Edukator Dengan Perawatan Diri Pasien Diabetes Melitus Tipe 2 Di Poli Penyakit Dalam Rumah Sakit Bina Sehat Jember. Jember: NurseLine Journal, 2017.
- [15]. Tasman. Pengaruh Latihan Fisik Jalan Kaki Terhadap Penurunan Kadar Gula Darah Pada Pasien Diabetes Mellitus Tipe Ii Di Kota Padang. Menara Ilmu. 11, 2017.
- [16]. Indriyani P, Supriyatno H and Santoso A. Pengaruh latihan fisik; senam aerobik terhadap penurunan kadar gula darah pada penderita DM tipe 2 di wilayah Puskesmas Bukateja Purbalingga. Nurse Media Journal of Nursing. 1, 2010.
- [17]. Herwanto ME, Lintong F and Rumampuk JF. Pengaruh aktivitas fisik terhadap kadar gula darah pada pria dewasa. Jurnal e-Biomedik. 4, 2016.
- [18]. Rahma AS. Pengaruh Edukasi Gizi Terhadap Aktifitas Fisik Pasien Dm Tipe 2. Al-Sihah: The Public Health Science Journal. 6, 2014.

- [19]. Nunung Sri Mulyani. Pengaruh Konsultasi Gizi Terhadap Asupan Karbohidrat dan Kadar Gula Darah Pasien Diabetes Mellitus Tipe II di Poliklinik Endokrin Rumah Sakit Umum Daerah dr. Zainoel Abidin Banda Aceh. Aceh: Jurnal Kesehatan Ilmiah Nasuwakes, 2015, 144-51.
- [20]. Fitri Y, Mulyani NS, Fitriyaningsih E and Suryana S. Pengaruh Pemberian Aktifitas Fisik (Aerobic Exercise) terhadap Tekanan Darah, IMT dan RLPP pada Wanita Obesitas. Aceh Nutrition Journal. 1, 2016, 105-10.
- [21]. Rusnoto R and Karyati S. Penurunan kadar gula darah pada penderita diabetes mellitus (dm) dengan jogging. Jurnal Ilmu Keperawatan dan Kebidanan. 7, 2016.
- [22]. Sugeng Purwanto. Perbedaan Pengaruh Antara Latihan Joging Dan Jalan Cepat Terhadap Tingkat Kesegaran Jasmani.
- [23]. Jasmani J and Rihiantoro T. Edukasi dan Kadar Glukosa Darah pada Pasien Diabetes. Jurnal Ilmiah Keperawatan Sai Betik. 12, 2017, 140-8.
- [24]. Irmawati I. Pengaruh latihan senam yoga terhadap kadar glukosa darah dan kolesterol pada penderita diabetes mellitus tipe 2. Jendela Olahraga. 2, 2017.
- [25]. Nugraha A, Kusnadi E and Subagja S. Kadar gula darah sebelum dan sesudah melaksanakan senam diabetes pada pasien diabetes melitus tipe II. Jurnal ilmiah kesehatan. 9, 2016.
- [26]. Ningsih R, Fatmasari D and Tri Johan Agus Yuswanto. Combination of diabetic self management education (DSME) with diabetic foot exercises on blood sugar level in type II diabetes patients International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR), 2018.
- [27]. Wahyuni KI, Prayitno AA and Wibowo YI. Efektivitas Edukasi Pasien Diabetes Mellitus Tipe 2 Terhadap Pengetahuan dan Kontrol Glikemik Rawat Jalan di RS Anwar Medika. Jurnal Pharmascience. 6, 2019, 1-9.
- [28]. Salindeho A, Mulyadi N and Rottie J. Pengaruh Senam Diabetes Melitus Terhadap Kadar Gula Darah Penderita Diabetes Melitus Tipe 2 Di Sanggar Senam Persadia Kabupaten Gorontalo. JURNAL KEPERAWATAN. 4, 2016.
- [29]. Nuradhayani N, Arman A and Sudirman S. Pengaruh Diabetes Self Management Education (DSME) terhadap kadar gula darah pasien diabetes type II di Balai Besar Laboratorium Kesehatan Makassar. Jurnal Ilmiah Kesehatan Diagnosis. 11, 2017, 393-9.
- [30]. Soegondo S, Soewondo P and Subekti I. Penatalaksanaan diabetes melitus terpadu. Jakarta: Balai Penerbit FKUI. 2009.

How to cite this article: Amirul Kadafi, Tri Johan Agus Yuswanto, Diyah Fatmasari The education and jogging physical activities towards blood sugar levels in patients type 2 diabetes mellitus. Int J of Allied Med Sci and Clin Res 2019; 7(3): 638-647.

Source of Support: Nil. **Conflict of Interest:** None declared.