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THE INFLUENCE OF A COMBINATION OF WALKING THERAPY AND HYDROTHERAPY TO DECREASE BLOOD GLUCOSE LEVELS IN PATIENTS WITH DIABETES MELLITUS TYPE II

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ABSTRACT

Introduction. Diabetes mellitus (DM) has become a health problem in the world, and if not treated, many of the body's systems can be damaged, especially the nerves and blood vessels. This research aims to explain the influence of walking and drinking water hydrotherapy to decrease random blood sugar levels in patients with type 2 diabetes.

Method. This research designed in this study was Quasi-Experimental, with the Control Group Pre-Post Test Design. The sampling method used purposive sampling. The sample of this research were 32 respondents in Sumbergede Village. The independent variable was walking therapy and drinking water hydrotherapy, while the dependent variable was random blood sugar levels in patients with type 2 diabetes mellitus. The instruments used walking SOP, hydrotherapy SOP and glucose meter. The data analysis technique used Wilcoxon Sign Rank Test.

Result and Analysis. This study random blood sugar level in the treatment and control groups before intervention was hyperglycemia category and after intervention in the treatment group was mostly euglycemia while in the control group the majority hyperglycemia. The results of the Wilcoxon Sign Rank Test were $\rho = 0.001$ ($\rho < 0.05$), meaning that there is a significant influence of a combination of walking therapy and hydrotherapy against random blood sugar reduction in patients with type 2 diabetes. The results of the Mann Whitney statistical test showed that the value of $\rho = 0.001$ ($\rho < 0.05$), so that there was a significant difference in decreasing random blood sugar levels between the treatment group and the control group.

Discussion. Walking therapy can increase blood glucose usage in active muscles. While drinking water hydrotherapy causes the breakdown of blood glucose, the combination of walking therapy and drinking water hydrotherapy can cause random blood sugar level to decrease. This study was expected to make one of the anti-diabetes medication companion therapies in reducing random blood sugar level in patients with type 2 DM.

Keywords: Blood Glucose Level, DM type 2, Hydrotherapy, Walking Therapy.

INTRODUCTION

Diabetes mellitus (DM) has become a health problem in the world. The incidence and prevalence of this disease continues to increase, especially in developing countries and countries that have entered into a culture of industrialization. Type 2 diabetes usually attacks people who lead an unhealthy lifestyle, so people who are affected by type 2 diabetes are required to control their blood glucose levels. If glucose levels are too high (hyperglycemia) and left untreated, many of the body's systems

can be damaged, especially nerves and blood vessels. This can lead to eye damage, kidney damage and an increased risk of heart attack, stroke or lower leg amputation (Puspitasari, 2017). Results of a preliminary study on 26 November 2018 at the Puskesmas Kesamben Kulon, Wringinom, Gresik, it is known that most DM sufferers do not seek regular treatment so that random blood sugar (blood glucose level) is not controlled. The results of a preliminary study in the village Ponkesdes Sumbergede, it was found that there were 20 patients who detected DM and routinely checked at the Ponkesdes, and most of the DM patients were not able to control blood glucose level well. The intervention provided by the Kesamben Kulon Health Center to control blood glucose level was the provision of Anti-Diabetes Drugs (anti diabetes medication) at the time of the visit and there were no other interventions, but there are still many people with type 2 diabetes who are not able to control blood glucose level levels properly and regularly. However, the effect of walking therapy and hydrotherapy with water on reducing blood glucose level in people with Diabetes Mellitus type 2 cannot be explained. According to the International of Diabetic Federation (IDF, 2015), the global prevalence rate of diabetes mellitus sufferers in Southeast Asia in 2014 was 8.3%. According to the results of the Basic Health Research (Riskesdas) in 2018, the proportion of Indonesian population ≥15 years with DM is 6.9%. The prevalence of DM in East Java has increased from 2013 by 1.8% to 2.5% in 2018. Data from the Gresik Regency health office in 2015 shows the number of DM sufferers in Gresik Regency was 6,842 people, while in 2016 it increased to 18,521 people. According to the results of a preliminary study conducted by researchers on November 26 2018 at the Kesamben Kulon Public Health Center, Wringinom, Gresik, 50 people suffered from DM.

Type 2 diabetes mellitus, known as non-insulin dependent diabetes mellitus (NIDDM) occurs due to decreased sensitivity to insulin or due to a decrease in the amount of insulin production caused by poor insulin receptors. The main factor causing it is obesity (obesity) which can be overcome with diet and exercise (Bare, 2008). DM patients tend to experience hyperglycemia which will cause complications, complications that can be caused by microvascular complications (nephropathy and retinopathy) and macrovascular (myocardial infarction, heart disease, stroke, hypertension, neuropathy, and peripheral vascular disease) (Bare, 2008). Impaired metabolic response to insulin action is called insulin resistance. This situation can be caused by disruption of receptors, pre receptors and post receptors so that more insulin is needed than usual to maintain normal blood glucose levels. Insulin sensitivity to lower blood glucose by stimulating glucose consumption in muscle and fat tissue and suppressing glucose production by the liver decreases. The decrease in sensitivity also causes insulin resistance so that high blood glucose levels (Prabawati, 2012). Control of blood sugar can be done by exercising. The benefits of exercise for diabetes are lowering blood sugar levels, improving blood sugar circulation, losing weight and reducing the occurrence of complications (Sutedjo, 2010). According to the 2009 American College of Sports Medicine (ACSM), walking is a recommended form of daily physical activity. This exercise helps the muscles absorb blood sugar, and prevents it from accumulating in the bloodstream, and also helps regulate weight. During physical exercise, blood flow will increase. This results in more open capillary nets so that more insulin receptors are available and active (Sudoyo, Setyohadi and Alwi, 2009). In addition to exercise, hyperglycemia

management that nurses can do in nursing activities to overcome hyperglycemia problems is to encourage patients to increase oral fluid intake and monitor the patient's fluid status (Puspitasari, 2017). Consumption of water helps the process of breaking down sugar (Puspitasari, 2017). Consumption of water (hydrotherapy) helps the process of eliminating all toxins in the body, including excess sugar (Puspitasari, 2017). This is reinforced by research by James (Esther van Dam, Lucie A.G. van Leeuwen, 2020) that drinking water causes the breakdown of sugar. Factors that help remove chemical substances such as glucose and other substances through the kidneys and the process of cleaning the body's organs, a large amount of fluid is needed in one administration in the morning. The results of research by (MacAulay and Zeuthen, 2010) say that fluids can cause an osmotic increase, leading to a dilution of glucose in the plasma

Based on the above problems, the researchers are interested in conducting research on the effect of walking therapy and hydrotherapy to drink water on the reduction of random blood sugar levels in people with Type 2 Diabetes Mellitus in Sumbergede Village, the working area of Puskesmas Kesamben Kulon, Wringinom.

METHOD AND ANALYSIS

This study used a Quasi-Experimental research method with a Control Group Pre-Post Test Design. The characteristic of this study is to use a causal relationship by involving the subject group and the control group. The subject group was observed before the intervention was carried out, then it was observed again after the intervention and the control group was observed without intervention (Nursalam, 2015). Data collection used a demographic data observation sheet at the Ponkesdes Desa Sumbergede Gresik on April 13 - May 4 2019.

The population in this study were 50 people who experienced type 2 diabetes mellitus in Ponkesdes, Sumbergede Village, Wringinom District, Gresik Regency. This study used a purposive sampling type Non-Probability technique, namely selecting a sample among the population according to what the researcher wanted (based on inclusion and exclusion criteria), namely 32 respondents. The independent variables in this study were walking therapy and drinking water hydrotherapy. The dependent variable in this study is the level of blood glucose level in patients with type 2 diabetes. The instruments in this study were the Standard Operational Procedure (SOP) for walking and SOP for hydrotherapy to drink water according to Puspita (Puspitasari, 2017) for the independent variable, an instrument that used are glucose meter (Easy Touch), lancet needle, alcohol swaps, observation sheet for random blood sugar level assessment.

In this study, the process of data collection and collection was obtained through:

1. Get permission from Gresik University
2. Get permission from UPT. Puskesmas Kesamben Kulon and Ponkesdes Desa Sumbergede.
3. Looking for data on DM sufferers in Ponkesdes, Sumbergede Village, Wringinom District, Gresik Regency by asking for data from Ponkesdes.
4. Respondents were gathered at the Ponkesdes and given an explanation of the benefits and objectives of the study to obtain respondents' approval.
5. Respondents were given an informed consent sheet to sign their consent to become respondents.
6. Respondents were divided into 2 groups, group 1 was given walking intervention and hydrotherapy with water and group 2 became a control group who only received intervention according to the Ponkesdes.

7. Conducting blood glucose level observations (pretest) before being given treatment to respondents in groups 1 and 2 at the beginning of the first week.
8. Explain not to take the drug during the study in the treatment group.
9. Providing walking intervention to the treatment group for 3-4 times with a duration of 30 minutes in 3 weeks and given hydrotherapy with water with a minimum limit of 50 ml / kg / day and adjusted for elimination needs 1500-1600 ml / day plus IWL / 24 hours (500 cc / 24 hours), and the control group was given intervention according to the Ponkesdes. The therapy will be given in Sumbergede Village, Wringinom District.
10. Conducted a posttest in each group at the end of the 3rd week

RESULT

1. The blood glucose level levels of respondents in the treatment group before and after giving walking therapy and drinking water hydrotherapy.

Blood glucose level	Pre-test	Post-Test
	%	%
Hipoglikemia	0	0
Hiperglikemia	100	31.25
Euglikemia	0	68.75
Total	100	100
Meann	2,00	2.69
Std. Deviation	0,00	0.479
The difference in average levels blood glucose level was	17.6 mg/dl	
wilcoxon Signed Rank test	ρ=0.001	

Table 1 explains that before the intervention, the random blood sugar levels of all respondents were included in the hyperglycemia category (201 mg / dl-250 mg / dl) as many as 16 people (100%), after the intervention, most of the respondents' random blood sugar levels decreased to the Euglycemia category (101 mg / dl. -200 mg / dl) of 11 people (68.75%) and a small portion of the respondents' random blood sugar values remained in the hyperglycemia category as many as 5 people (31.25%). The decrease in random blood sugar levels of respondents after treatment was an average of 17.6 mg / dl. The Wilcoxon test results showed the value of ρ value = 0.001 (<0.05), therefore H1 was accepted, which means that there was an effect of walking therapy and water hydrotherapy on reducing random blood sugar levels in patients with type 2 diabetes.

2. The random blood sugar levels of respondents in the control group before and after therapy were carried out according to the Ponkesdes

Blood glucose level	Pre-test	Post-Test
	%	%
Hipoglikemia	0	0
Hiperglikemia	100	87.5
Euglikemia	0	12.5
Total	100	100
Meann	2	2.13
Std. Deviation	0	0.342
The difference in average levels blood glucose level was	14 mg/dl	
Wilcoxon Signed Rank test	ρ = 0.157	

The results of the Wilcoxon sign rank test statistical test showed the value of ρ = 0.001 (ρ <0.05), so that there was a significant effect before and after walking therapy and hydrotherapy to drink water on the decrease in random blood sugar in patients with type 2 diabetes.

The results of the Wilcoxon sign rank test statistical test showed the value

of ρ = 0.157 (ρ <0.05), so that there was no significant effect before and after the intervention according to Ponkesdes on the decrease in random blood sugar levels in patients with type 2 diabetes.

The results of the Mann Whitney statistical test showed that the value of ρ = 0.001 (ρ <0.05), so that there was a significant difference in decreasing random blood sugar levels between the treatment group and the control group.

DISCUSSION

1. The blood glucose level levels of respondents in the treatment group before and after giving walking therapy and drinking water hydrotherapy.

Based on Respondents in the treatment group were given 30 minutes of walking intervention 3-4 times / week for 3 weeks and hydrotherapy to drink water according to body weight (at least 50 ml / kgBB / day and adjusted for elimination needs 1500-1600 ml / day plus IWL / 24 hours (500 cc / 24 hours) is given every day for 3 weeks. Walking therapy can increase the use of glucose in muscles so that glucose in muscles decreases and random blood sugar levels decrease, while hydrotherapy drinking water can help the process of breaking blood sugar (Puspitasari, 2017), and replacing lost body fluids due to physical exercise on foot, for that people with type 2 diabetes who are doing physical exercise on foot must be balanced with hydrotherapy drinking water to prevent dehydration while doing physical exercise walking. So that walking therapy and water hydrotherapy can reduce random blood sugar levels in people with type 2 diabetes.

Based on interviews with respondents who do walking therapy, respondents feel very happy because when walking is done in groups and respondents can chat with other respondents every morning, so that they do walking therapy with a happy heart, this can reduce stress levels on respondents who can affect the level of random blood sugar levels. The higher a person's stress level, the higher a person's blood sugar value, conversely the lower a person's stress level, the lower his blood sugar value. Stress can increase the blood glucose content because stress stimulates the endocrine organs to release ephinephrine, ephinephrine has a very strong effect in causing the glyconeogenesis process in the liver so that it will release a large amount of glucose into the blood within minutes (Naim, 2016).

2. The random blood sugar levels of respondents in the control group before and after therapy were carried out according to the Ponkesdes

In the control group therapy was given according to the Ponkesdes, namely the provision of anti-diabetes medication type glibenclamide. Glibenclamide, including the sulfonylurea class, is the drug of choice (drug of hoice) for new adult diabetics of normal weight. The mechanism of action of glibenclamide is by stimulating the secretion of the hormone insulin (Rehmaita, Mudatsir and Tahlil, 2017).

The hormone insulin functions to regulate glucose levels in the blood. Although Ponkesdes has provided anti diabetes medication intervention, there are still respondents who do not routinely take drugs and physical activity such as exercise is rarely done by respondents and they do not want to control their diet because they are used to eating according to their wishes and are lazy to exercise, so most of the respondents' random blood sugar remains in the category hyperglycemia. However, a small number of respondents as many as 2 people (12.5%) who experienced a decrease in the value of random blood sugar into the Euglycemia category (101-200 mmHg) because the two respondents based on the

length of suffering from diabetes <1 year. Patients who have just been diagnosed with DM are more adherent in carrying out treatment with patients diagnosed with type 2 diabetes for longer. Patients who have a longer duration of the disease will feel bored and don't follow the treatment program they have to run.

3. The difference in random blood sugar levels before and after giving therapy to the treatment group and the control group.

According to a source from the Ministry of Health in 2008, physical exercise on walking in DM sufferers can lead to increased use of blood glucose by active muscles so that physical exercise on foot can directly reduce body fat levels, control blood glucose levels, improve insulin sensitivity, reduce stress.

When a person does physical exercise on foot, the body will have an increase in fuel needs by active muscles and there will also be complex body reactions including circulation, metabolism, and autonomic nervous system functions, in which glucose is stored in the muscles and liver as glycogen, will be quickly accessed to be used as a source of energy in physical exercise on foot, especially at some or the beginning of physical exercise on foot. After doing physical exercise for walking for 10 minutes, there will be an increase in glucose 15 times the usual need, after 60 minutes, will increase up to 35 times.

This study is in accordance with the results of Widiya's (Widiya, Jatmiko and Widyatmoko, 2015) study which showed different statistical tests of glucose checks before and after walking sports activities obtained p <0.001, which indicates that sports activities can reduce blood glucose levels in diabetes mellitus patients. The results of the research by Rehmaita et al. (2017) also stated that there was a significant effect of walking interventions on reducing blood sugar levels with p <0.001. Good, correct, regular and measurable exercise activities can be considered to stabilize blood sugar levels in patients with type II diabetes mellitus.

Consumption of water (hydrotherapy), helps the process of eliminating all toxins in the body, including excess sugar. This is reinforced by research by (Esther van Dam, Lucie A.G. van Leeuwen, 2020) that drinking water causes the breakdown of sugar. The process of removing chemical substances such as glucose and substances through the kidneys and the process of cleaning the body's organs requires a large amount of fluid in one administration in the morning. According to Zeuthen (MacAulay and Zeuthen, 2010) fluids can cause an increase in osmosis, which causes a dilution of glucose in the plasma. Daily fluid requirements are 50 ml / kg / day, and the need for elimination is 1500-1600 ml / day. Water is one of the six categories of food substances besides carbohydrates, proteins, fats, vitamins and minerals. Water is a very important component in the body and acts as a food destroyer. Hydrotherapy can help the process of eliminating all toxins in the body, including excess sugar. In accordance with the statement that by consuming good water, namely in sufficient quantities and it is carried out in the morning after waking up every day because in that condition the stomach is empty so that the stomach wall is able to absorb water more quickly, then the water is flowed into the blood to dilute the buildup of sugar levels, then the blood will send water to the kidneys and the water will be absorbed and excreted to get rid of excess substances that will be excreted by the urine. In addition, adjusting the intake of water and minerals can control the situation and high blood sugar levels resulting in a decrease in blood sugar levels (Hamad, 2017). The type of water that can be used for hydrotherapy is bottled drinking water

which generally has a pH of 8.0. According to (Siswantoro, Edy, Purwanto, 2017), it was found that consumption of alkaline water (pH 8.0) for a period of 14 days was not effective in reducing random blood sugar in people with type 2 diabetes mellitus with a difference in the mean random blood sugar of 2.6. Alkaline water (pH 8.0) is a type of water that can be consumed by humans to keep the body fit and healthy. Alkaline water with a pH of 8.0 is perfect for regular consumption by anyone who wants to stay in optimal condition. Alkaline water pH 8.0 is more easily absorbed by body cells. The higher the number of water molecules that can be absorbed by the body, the higher the opportunity for the human body to meet the needs of water molecules it needs every day. From the results of observations made to respondents using interview techniques, as many as 5 respondents did not regularly consume alkaline water according to the instructions given by the researcher. The respondent cannot fulfill the sufficient amount of water that must be consumed every day. The amount of water consumed by respondents may be one of the factors affecting the effectiveness of consuming alkaline water with a pH of 8.0 to reduce random blood sugar (Siswantoro, Edy, Purwanto, 2017) This makes it easier for respondents to drink bottled water of various types of brands because they almost have the same pH.

The results of this study are in accordance with the results of (Puspitasari, 2017) which shows that hydrotherapy intervention to drink water has a significant effect on reducing random blood sugar levels compared to taking medication without hydrotherapy. The decrease in blood sugar levels in Type 2 Diabetes Mellitus patients with hydrotherapy intervention drank water was higher ($p = 0.003$) compared to taking medication without hydrotherapy drinking water ($p = 0.084$). There was a significant difference with $p = 0.018$ ($p < 0.05$) of the mean time blood sugar levels between the intervention group and the control group.

In the treatment group after the intervention, there were 5 respondents who were still in the hyperglycemia category. Four of the 5 respondents experienced a decrease in random blood sugar but the decrease was still in the hyperglycemia category and 1 respondent had an increase due to being exposed to type 2 diabetes for <5 years. According to Romadhona (Ramadona, 2011) patients who have suffered from diabetes for a long time have a slight change in attitude, this is because they have not felt serious enough complications that are detrimental to them, or they do not want to control their diet because they are used to eating according to their wishes and are lazy to exercise, or because they have also surrendered to the disease because of the very long treatment. In addition, the respondent is 55 years old. According to Wicaksono (Wicaksono, 2011) someone aged ≥45 years has an increased risk of developing DM and glucose intolerance due to degenerative factors, namely decreased body function to metabolize glucose.

In the control group, the results showed that there was no significant effect on the pre-test and post-test, but in the results of this study the control group experienced a decrease in random blood sugar by an average of 14 mg / dl but was still included in the hyperglycemia category, this was because respondents complained that they were bored to take the drug, sometimes forgetting to take medicine. According to Octariana (Waspadi, S. and K., Octariana, 2014) someone who is affected by DM will experience burnout or boredom and consume both food, medication or way of life, if there is no support from the closest person, what happens that person will experience a stressful condition, if this stress is allowed it will worsen the condition of this individual so that the disease is getting worse.

CONCLUSION

Random blood sugar levels in the treatment group before being given the intervention, were included in the hyperglycemia category and after being given the intervention, random blood sugar levels mostly decreased to the euglycemia category.

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