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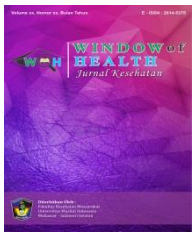

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Hydrotherapy on Reducing Blood Sugar Levels in Patients with Type II Diabetes Mellitus in Ciputat Village, South of Tangerang City

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ABSTRACT

Diabetes mellitus increases blood glucose levels (hyperglycemia) due to damage from insulin secretion and action. Diabetes mellitus is a chronic metabolic disorder characterized by high blood sugar levels. Symptoms felt in patients with Diabetes Mellitus are polydipsia, polyuria, polyphagia, as well as weight loss and tingling. Hydrotherapy is one method of treatment and healing using water to get a therapeutic effect or healing. This study aimed to determine hydrotherapy's impact on reducing blood sugar levels in patients with type II diabetes mellitus in Ciputat Village, South of Tangerang City. The research method in this study is quantitative research and has a quasi-experimental design. Sampling using a non-probability sampling technique with a sample of 68 respondents. Data analysis using the Wilcoxon test with a degree of significance $p < 0.05$. The results showed that the statistical test results for the Wilcoxon Test get a p-value of $0.00 < 0.05$. This conclusion shows hydrotherapy's effect on reducing blood sugar levels in patients with type II diabetes mellitus in Ciputat Village, South of Tangerang City.

Keywords: Hydrotherapy; Blood Sugar Levels; Diabetes Mellitus Sufferers

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INTRODUCTION

Diabetes mellitus is increased blood glucose levels (hyperglycemia) due to insulin secretion and action damage. Diabetes mellitus is a chronic metabolic disorder characterized by high blood sugar levels. Symptoms felt by Diabetes Mellitus sufferers are polydipsia, polyuria, polyphagia, as well as weight loss and tingling.(1)

Data from the World Health Organization (WHO) shows that Indonesia is the fourth country with the highest number of Diabetes Mellitus sufferers after India, China, and the United States, with a prevalence of 8.6% of the total population.(2) Primary health research data (Riskesdas) for Diabetes Mellitus sufferers has reached 9.1 million people, and Type 2 Diabetes Mellitus sufferers have reached 90%. The prevalence of diabetes is estimated to increase as the population ages 19.9% or 111.2 million people aged 66-79 years. The figure is predicted to increase, reaching 578 million in 2030 and 700 million in 2045.(3) Diabetes Mellitus has the highest number of cases compared to other diseases. In this case, there were 2,544 diabetes mellitus outpatients in South Tangerang City, which is the priority in reducing the incidence of Diabetes Mellitus in South Tangerang City.(4)

Complementary therapies used in diabetes mellitus therapy include guava, sambiloto leaves, and water therapy. One easy and cheap therapy is consuming water, which can help eliminate toxins in the body, including blood sugar.(5) Drinking water therapy (Hydrotherapy) can reduce blood sugar levels because drinking water causes a decrease in blood sugar levels, which suppresses blood clotting, thereby causing dilution of glucose in the plasma. The daily fluid requirements of Type 2 Diabetes Mellitus patients are around 50ml/kgBW/day, and elimination requirements are 1500-1600 ml/day. Water is one of six categories of food substances besides carbohydrates, proteins, fats, vitamins, and water minerals.(6,7)

Drinking water therapy (hydrotherapy) is a method of treatment and healing that uses water to obtain a therapeutic or healing effect. Warm water is consumed after waking up for 14 days using a 250 ml glass. The first-week stage is considered a therapeutic exercise in drinking water with the number of glasses to be drunk in a day adjusted to the respondent's wishes, while the second-week stage is drinking two glasses (500 ml) in the morning regularly.(8)

Based on a preliminary study at the Ciputat Community Health Center on Wednesday, 15 March 2023, there were 215 sufferers of type 2 diabetes mellitus. Of the 215 sufferers of type 2 diabetes mellitus, 81 were men and 134 women. Based on the data above, researchers were interested in researching "The Effect of Hydrotherapy on Reducing Sugar Levels Blood in Type II Diabetes Mellitus Patients in Ciputat Village, South of Tangerang City. "

METHODS

The research method used in this research is quantitative - quasi-experiment, which aims to find out between variables involving the control group and the experimental group. The research design used

was a two-group pre-test and post-test design. This research was conducted at Ciputat Village, South of Tangerang City. The population in this study were sufferers of type 2 diabetes mellitus, totaling 215 respondents. The sample used in this research was 68 respondents suffering from type 2 diabetes mellitus in Ciputat Village, South of Tangerang City. The sample size was determined using the Slovin formula. This research uses non-probability sampling with the element that will be used, namely consecutive sampling, which is carried out by selecting samples that meet the research criteria for a certain period to meet the sample size. The sample size will be divided into two groups, namely 34 respondents in the intervention group and 34 in the control group. Data collection techniques in this research include administration techniques and preparation stages.

Data analysis in this study used univariate analysis and bivariate analysis with the Wilcoxson Signed Rank Test to determine the effect of hydrotherapy on blood glucose levels in people with type 2 diabetes mellitus. This research uses tools and materials such as Glucometer, observation sheets, and SOP for hydrotherapy. The intervention is water drinking therapy, which is drinking water every morning when you wake up. The intervention carried out involved sufferers with problems with blood sugar levels. Group 1 and Group 2 did not receive treatment using water drinking therapy. This stage consists of providing treatment during the water drinking therapy process in group 1, according to the schedule agreed with the sufferer. During the first week, using a 250 ml glass of water is considered a therapeutic exercise. Meanwhile, in the second week, the sufferer drank two glasses of water regularly every morning.[9]

RESULTS

The analysis results in this study used univariate and bivariate analysis and the Wilcoxon test.

Univariate Analysis

Table 1. Frequency Distribution of Respondent Characteristics Based on Age in the Intervention & Control Group in Ciputat Village (n=68)

Age	Intervention Group		Control Group	
	(f)	(%)	(f)	(%)
35-40 years-old	22	64,7	8	23,5
41-45 years-old	12	35,3	26	76,5
Total	**34**	**100**	**34**	**100**

Based on Table 1, namely the frequency distribution of respondents based on the age of the treatment group of 34 respondents, data on respondents aged 35 - 40 years old was obtained; that is, more than half were 22 respondents (64.7%), almost half of the respondents aged 41 - 45 years-old were 12 respondents (35, 3%). Meanwhile, in the control group of 34 respondents, data was obtained from a small number of respondents aged 35-40 years old, namely eight respondents (23.5%), and more than half of the respondents aged 41-45 years old, namely 26 (76.5%).

Table 2. Frequency Distribution of Respondent Characteristics Based on Gender in the Intervention & Control Group in Ciputat Village (n=68)

Gender	Intervention Group		Control Group	
	(f)	(%)	(f)	(%)
Male	14	41,2	19	55,9
Female	20	58,8	15	44,1
Total	**34**	**100**	**34**	**100**

Based on Table 2, namely the frequency distribution of respondents based on gender in the treatment group of 34 respondents, the data shows that almost half of the respondents were male, namely 14 respondents (41.2%), more than half of the respondents were female, 20 respondents (58.8%). %). Meanwhile, in the control group of 34 respondents, data was obtained for more than half of the respondents were male, 19 (55.9%), almost half were female, 15 respondents (44.1%).

Table 3. Analysis of blood sugar levels before hydrotherapy (n=68)

Categories	Intervention Group		Control group	
	(f)	(%)	(f)	(%)
High	34	100	34	100
Total	**34**	**100**	**34**	**100**

Based on Table 3, it can be explained that the results of the analysis of blood sugar levels before (pre-test) being given hydrotherapy to Type 2 Diabetes Mellitus respondents in Ciputat Village, South of Tangerang City, were all in the High category, totaling 34 respondents, likewise with the control group with a high category of 34 respondents.

Table 4. Analysis of blood sugar levels after hydrotherapy (n=68)

Categories	Intervention Group		Control group	
	(f)	(%)	(f)	(%)
High	-	-	34	100
Normal	34	100	-	-
Total	**34**	**100**	**34**	**100**

Based on Table 4 above, it can be explained that the results of the analysis of blood sugar levels after (post-test) giving hydrotherapy to Type 2 Diabetes Mellitus respondents in Ciputat Village, South of Tangerang City have several categories; in the Intervention Group, all 34 respondents (100%) were in the normal category. Meanwhile, 34 respondents (100%) entered the high category in the control group.

Bivariate Analysis

In this study, bivariate analysis used the Wilcoxon test method to determine each group's pre-test and post-test values.

Table 5. Normality Test

		Kolmogorow-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Results	Pre_test Experiment	.208	34	.001	.921	34	.017
	Post-test Experiment	.212	34	.000	.841	34	.000
	Pre-test Control	.212	34	.000	.830	34	.000
	Post-test Control	.224	34	.000	.875	34	.001

Based on Table 5 regarding the results of the normality test using the Kalmogrov-Smirnov test pre-test and post-test, the effect of hydrotherapy on reducing blood sugar levels in people with type 2 diabetes mellitus in Ciputat Village, South of Tangerang City from 68 respondents, namely 34 intervention groups and 34 groups control results showed that the data was not normally distributed and indicated by the Sig value. 0.00, which is a smaller result than 0.05. Then, the Wilcoxon rank test will be carried out, which is part of the non-parametric statistical test and an alternative test to the Paired Sample t-test if it does not meet the normality test.

Table 6. Wilcoxon Test

	N	P-Value
Pre_Test _Control_Group Post_Test_ Control_Group	34	0,083
Pre_Test_Intervention_Group Post_Test_Intervention_Group	34	0,000

After being tested using the Wilcoxon rank test, the sig (2-tailed) value using the SPSS data processing method was 0.000 ($p<0.05$). The statistical test results show differences after the pre-test and post-test. From Table 6, we get P Value = 0.000, which means it is smaller than a = < 0.05, which means Ha is accepted, and H0 is rejected. It can be concluded that there is a decrease in blood sugar levels in people with type 2 diabetes mellitus at Ciputat Village, South of Tangerang City.

DISCUSSION

The results showed that the intervention and control groups were mostly 41-45 years old. The results of this study are in line with research conducted by Novita Sari (2019) on Physical Activity and Its Relationship with the Incidence of Diabetes Mellitus. This study's results align with research conducted by Mertien Sa'pang (2021) on the Evaluation of Diet Quality in Patients with Type II Diabetes Mellitus in West Jakarta.

Patients with Diabetes Mellitus ≥ 40 years old are still very high because over the age of 40, many vital organs are weakened, and the body begins to experience sensitivity to insulin. Even women who are older (over 40 years old) and have had menopause tend to be more insensitive to the hormone insulin. The risk of diabetes increases with age, especially at the age of more than 40 years, because at that age,

there begins to be an increase in glucose intolerance. The aging process causes a decrease in the ability of pancreatic β cells to produce insulin. In addition, in older individuals, there is a decrease in mitochondrial activity in muscle cells by 35%. This is associated with a 30% increase in muscle fat levels and triggers insulin resistance.[10–12]

The results showed that the intervention group and control group were primarily female. This study's results align with research conducted by Novita Sari (2019) on Physical Activity and Its Relationship with the Incidence of Diabetes Mellitus. The female sex is still quite high because women who have experienced menopause have a tendency to be more insensitive to the hormone insulin. The incidence of DM in women is higher than in men. Women are more at risk of developing diabetes because, physically, women have a greater chance of increasing their body mass index. Monthly cycle syndrome (premenstrual syndrome), postmenopause, which makes the distribution of body fat quickly accumulated due to the hormonal process, so women are at risk of suffering from diabetes mellitus.[10]

Patients with diabetes mellitus are prone to complications caused by insulin deficiency or insufficient insulin action and require proper disease management to reduce the risk of complications. Uncontrolled diabetes mellitus can lead to acute and chronic complications. Acute complications are caused by sudden spikes in blood sugar, while increased blood sugar levels cause chronic complications over a long period of time.[13,14]

The results showed that the average post-test score in the intervention group was higher than the average post-test score in the control group. So, it can be concluded that hydrotherapy can reduce blood sugar levels in people with type 2 diabetes mellitus. These results provide information that hydrotherapy reduces blood sugar levels in people with type 2 diabetes mellitus in Ciputat Village, South of Tangerang City.

The results of this study are also in line with Meiyana et al. (2019), who stated that hydrotherapy (drinking water therapy) can be used as an alternative therapy to lower blood sugar levels by drinking 250 ml of water when waking up before brushing your teeth and eating. This therapy is simple and can be done independently at home without causing side effects.[15]

This research is in line with research by Jahidin et al. (2019) with the title "The Effect of Drinking Water Therapy on Reducing Temporary Blood Sugar Levels (GDS) in Type II Diabetes Mellitus Patients in Bumiayu Village, Wonomulyo District, Polalui Mandar Regency" that obtained P value= 0.000 (a=<0.05) was proven using the repeated ANOVA test. Thus, H0 is rejected, meaning drinking water therapy affects decreasing instantaneous blood sugar levels (GDS) in type II diabetes mellitus patients in Bumiayu Village, Wonomulyo District, Polalui Mandar Regency.[6]

In line with research conducted in Kurniasari (2023), the Effect of Hydrotherapy on Reducing Temporary Blood Sugar (GDS) in Type II Diabetes Mellitus Patients at the Sukabumi Community Health Center, Bandar Lampung, the results of the intervention group who received hydrotherapy experienced a reduction in the average blood sugar level of 52.5 mmHg, while the control group Those who received treatment experienced a minimum average blood sugar level of 33.56. Statistical testing

produced a figure of 0.001 (P value = 0.001, where P value (0.05), indicating that hydrotherapy affected reducing temporary blood sugar levels (KGDS) in sufferers with type 2 diabetes.[16]

Hydrotherapy or water rehabilitation is a healing and treatment procedure using water. According to the theory put forward by Elmatris, drinking water therapy (Hydrotherapy) can reduce blood sugar levels because drinking water causes a decrease in blood sugar levels, which suppresses blood clotting, thereby causing dilution of glucose in the plasma.[6,7] The daily fluid requirements of Type 2 Diabetes Mellitus patients are around 50ml/kgBW/day, and elimination requirements are 1500-1600 ml/day. Water is one of six categories of food substances besides carbohydrates, proteins, fats, vitamins, and water minerals.

According to Saherna and Rezkiawan's theory (2020), drinking water therapy (Hydrotherapy) is a method of treatment and healing using water to obtain a therapeutic or healing effect. Warm water is consumed after waking up for 14 days using a 250 ml glass. The first week's stage is considered a therapeutic exercise in drinking water with the number of glasses to be drunk in a day adjusted to the respondent's wishes, while the second week's stage is drinking two glasses (500 ml) in the morning regularly. The type of water consumed requires warm water, clean, clear, odorless, and not contaminated with dangerous substances.[8]

So, drinking water regularly after waking up will increase the elimination of bodily fluids, and the kidneys will process toxins and useless waste in the body. The processes in the kidneys need water as an intermediary for elimination; destructive substances will come out through urine, including high blood sugar levels, which will decrease; therefore, drinking water therapy is highly recommended for health, especially for sufferers. Type 2 Diabetes Mellitus will result in the breakdown and dilution of sugar in the blood plasma if we consume enough water optimally and continuously, balanced with regular healthy eating and sufficient physical activity.

A study conducted by A Mooventhan and L Nivethitha (2014) reported that hydrotherapy is one of the primary methods of treatment that is widely used in natural medicine systems, which is also known as water therapy, aquatic therapy, pool therapy, and balneotherapy. Using water in different forms and temperatures can affect the body's systems. Several studies report the effects of hydrotherapy on several systems. One is the musculoskeletal, nervous, heart, digestive, and skin systems.[17]

Based on the literature, hydrotherapy is widely used to increase immunity and for the management of pain, congestive heart failure (CHF), myocardial infarction (MI), chronic obstructive pulmonary disease, asthma, Parkinson's disease (PD), ankylosing spondylitis (AS), rheumatoid arthritis (RA), osteoarthritis (OAK), fibromyalgia pain syndrome (FMS), anorectal disorders, fatigue, anxiety, obesity, hypercholesterolemia, hyperthermia, labor, etc. Hydrotherapy produces different effects on various body systems depending on the temperature of the water.

Hydrotherapy is a necessary therapy that functions internally and externally to protect the body, stay fit, and avoid complications.[18] Hydrotherapy, known as water therapy, can treat various health problems, including DM, diarrhea, tuberculosis, arthritis, high blood pressure, gout, and other

conditions.[19] Drinking mineral water regularly at least 1.5 liters of warm water every morning after waking up has excellent properties for the body.[20] The role of the nurse influences the success of therapy. Nurses motivate sufferers to increase oral fluid intake and control fluid status. It is also expected that banners and health education leaflets will be distributed to promote hydrotherapy as a more effective way to lower blood sugar levels in patients with diabetes mellitus.

In line with Siswanti (2020) research, a P value of 0.000 (α <0.05) was obtained so that there was an effect of hydrotherapy on blood glucose levels in DM patients. Health workers, especially nurses, can use the research results regarding hydrotherapy as an independent intervention.[21]

Hydrotherapy is a nursing intervention that can be given to DM patients to reduce blood glucose levels. This is based on the opinion of Lumbanraja (2006) that the most appropriate way to reduce blood sugar levels for patients with type 2 diabetes mellitus is to drink lots of warm water, exercise a lot, and reduce food portions. Drinking lots of warm water will speed up the elimination of sugar through sweat and urine. Warm water is an energy source and will be absorbed more quickly by the stomach.[22]

CONCLUSION AND RECOMMENDATIONS

Based on the results of the research and the description of the discussion regarding the effect of hydrotherapy on reducing blood sugar levels in type 2 diabetes mellitus sufferers in Ciputat Village, South of Tangerang City, it can be concluded that the majority of respondents experienced an increase in blood sugar levels in the high category before being given hydrotherapy. All respondents experienced reduced blood sugar levels to the standard category after being given hydrotherapy. In conclusion, hydrotherapy reduced blood sugar levels in people with type 2 diabetes mellitus in Ciputat Village, South of Tangerang City.

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