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The effect of diabetic foot exercise on the effectiveness of blood sugar levels in type 2 diabetes mellitus patients at The Tamalanrea Jaya Health Center Makassar City

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ABSTRACT

Diabetes mellitus (DM) which we call diabetes is a series of symptoms, both absolute and relative, caused by an increase in blood sugar (glucose) levels due to insulin deficiency. DM is a chronic degenerative disease whose number continues to increase from year to year. If this is allowed to continue without therapy can cause complications, to prevent this, one of the pillars of diabetes management is physical exercise or exercise, namely diabetic foot exercise. The purpose of the study was to determine the effect of diabetic foot exercises on the effectiveness of blood sugar levels of type 2 diabetes mellitus patients in the work area of the Tamalanrea Jaya health center, Makassar City. The research design used is pre-experimental with one group pretest post test design. The sampling technique was carried out with a total of 32 samples. The results of the study using the t-test paired samples test obtained a p value = 0.000 < α = 0.05. The conclusion of the research results shows the influence of diabetic foot exercises on the effectiveness of sugar levels in type 2 diabetes mellitus patients in the work area of the Tamalanrea Jaya health center, Makassar City. This is in accordance with research conducted by Nuraeni & Arjita in 2019, showing that diabetic foot exercises are very easy to do (can be indoors or outdoors) and do not require a long time (only about 15-30 minutes) and do not require complicated equipment (chairs and a piece of old newspaper). At least foot gymnastics movements are done 3 times a week, but it would be better if they were done every day. Doing regular foot exercises can help a diabetes mellitus patient regulate his blood glucose levels within a normal and stable range.

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INTRODUCTION

Non-communicable diseases are the leading cause of death and physical disability in Indonesia and the world. According to the World Health Organization, the global mortality rate from non-communicable diseases (NCDs) is expected to continue to rise, with the largest increases occurring in middle and poor countries. More than two-thirds (70%) of the global population will die from non-communicable diseases such as cancer, diabetes, heart disease and stroke. (Sari & Savitri, 2018). Diabetes mellitus (DM) which we call diabetes is a series of symptoms, both absolute and relative, caused by an increase in blood sugar (glucose) levels due to insulin deficiency. DM is a chronic degenerative disease whose number continues to increase from year to year (Haskas et al., 2022).

According to the World Health Organization (WHO), diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin. Insulin is a hormone that regulates blood sugar levels. Over time, hyperglycemia is often an uncontrolled diabetes that can cause serious damage to many body systems, especially nerves and blood vessels. By definition, the number of diabetics increased from 108 million in 1980 to 422 million in 2014. Prevalence rates are growing faster in low- and middle-income countries than in high-income countries. From 2000 to 2016, premature deaths from diabetes increased by 5%. In 2019, an estimated 1.5 million people died from diabetes. Another 2.2 million deaths due to high blood sugar in 2021 (WHO, 2021).

In 2019, according to the International Diabetes Federation (IDF), the global prevalence of diabetes is estimated at 9.3% (463 million people) in 2019, rising to 1.02 (578 million) in 2030 and 10.9% (700 million) in 2019. 2045. Prevalence is higher in cities (10.8%) than in rural areas (7.2%) and higher in high-income areas (10.4%) than in low-income countries (4.0%) (IDF, 2019).
According to the prevalence of the American Diabetes Association (ADA) in 2018, 34.2 million Americans or 10.5% of the population had diabetes, and nearly 1.6 million Americans had diabetes, including about 187.00 children and adolescents. Of the 34.2 million adults with diabetes, 26.8 million were diagnosed and 7.3 were undiagnosed. Americans are diagnosed with 1.5 million new cases each year. In 2015, 88 million Americans were diagnosed with diabetes each year. DM is the seventh cause of death in the U.S., with diabetes listed as the cause of death with 270,702 certifications (ADA, 2018)

This increase in the number of diabetics is a very serious feud globally, especially for developing countries such as Indonesia. The prevalence of people with diabetes mellitus who have been diagnosed by doctors based on Basic Health Research data in 2018 is 1.5%. The prevalence of people with diabetes mellitus who have been diagnosed by doctors based on Basic Health Research data in 2018 is 1.5%. The highest prevalence was found in the provinces of DKI Jakarta (two.6%), Yogyakarta (2.4%), East Kalimantan (two.3%), and North Sulawesi (2.3%) while the lowest was found in East Nusa Tenggara Province (0.6%) (Ministry of Health, 2019).

The prevalence of Diabetes Mellitus in South Sulawesi is 1.6 percent. Diabetes Mellitus diagnosed by a doctor or according to signs was 3.4 percent. The highest prevalence of diabetes diagnosed by doctors was in Pinrang Regency (2.8%), Makassar City (2.5%), North Toraja Regency (2.3%) and Palopo City (2.1%). Based on data from the Non-Communicable Diseases Survey in the P2PL Field of the South Sulawesi Provincial Health Office in 2017 there were Diabetes Mellitus 27,470 new cases, 66,780 old problems with 747 deaths (Dinkes Prov. South Sulawesi, 2017).

Sports activities are one of the pillars of diabetes mellitus management in addition to nutritional therapy (diet), physical exercise, monitoring, pharmacological therapy and education. In patients with type 2 DM, physical exercise has a major role in regulating blood glucose levels. In people with type 2 diabetes mellitus, insulin production is not disturbed, but because the receptor response in cells to insulin (resistance) is still lacking, insulin cannot help the transfer of glucose into cells. At the time of exercise, the state of permeability of the membrane to glucose increases in the contracting muscles so that insulin resistance decreases. Exercise (physical activity) is a very important way to be done by people with diabetes mellitus, especially in dealing with the increase in glucose in the blood (Ruben et al., 2016).

Diabetic foot exercise is a form of physical exercise for people with diabetes Mellitus at all ages to avoid injuries so that blood circulation in the legs can be carried out. one way to overcome DM disease is diabetic foot gymnastics in overcoming limited joint movement, abnormalities in the shape of the legs, increasing the strength of small muscles of the legs, thighs, calves, improving blood circulation (Sanjaya et al., 2019).

The results of research conducted by (Nuraeni & Arjita, 2019), show that diabetic foot exercises are very easy to do (can be indoors or outdoors) and do not require a long time (only about 15-30 minutes) and do not require complicated equipment (chairs and a piece of old newspaper). At least foot gymnastics movements are done 3 times a week, but it would be better if they were done every day. Doing regular foot exercises can help patients with diabetes mellitus regulate their blood glucose levels within a normal and stable range (Megawati et al., 2020).

Based on data from the Registration Book of the Tamalanrea Jaya Health Center in Makassar City, it shows that the number of diabetes mellitus patients in 2019 was 232 patients. In 2020 there were 149 patients, in 2021 the number of diabetes mellitus patients was 579 patients. In the month (January-September 2022) the number of patients with type 2 diabetes mellitus was 253 patients.

RESEARCH METHOD

This research is a type of quantitative research with a research design, namely pseudo-experimentation (quasi-experiment), using a pretest-postest control group design approach. Respondents were divided into 2 groups, namely the intervention group and the control group. In this draft, the experimental group was given treatment while the control group was not given treatment. Respondents were observed before the intervention, then re-observed after the intervention (Hidayat, 2017). Researchers gave foot exercises according to the procedure to the intervention group at the Tamalanrea Jaya Health Center for 3 times a week. Before the treatment, researchers reviewed respondents' demographic data and measured blood sugar levels using a glucometer first in both the experimental group and the control group, then the researchers again measured respondents' blood sugar levels a week later after foot exercises.

This research was conducted in the working area of the Tamalanrea Jaya Health Center on December 12, 2022.

The population of this study was all diabetes mellitus patients who were in the working area of the Tamalanrea Jaya Health Center. Based on data from the Tamalanrea Jaya Health Center, patient visits in (January-September 2022) of type 2 diabetes mellitus amounted to 253 patients. With a sample size measured of 32.

The sampling technique used in this study is to use non-probability sampling, namely purposive sampling, which is a sampling method by determining subjects who meet the inclusion and exclusion criteria until they meet the required amount (Hidayat, 2017).

Bivariate analysis is performed to prove or test hypotheses. Before determining the type of bivariate analysis used, a statistical normality test is first carried out to determine the next test. If the normality test obtained a value of P>0.05, then it is said to be normal and the test used is the Paired Sample T Test, while if it is p<0.05, it is said to be abnormal and the alternative test used is the Wilcoxon test. Statistical test decision making is carried out by comparing p (p value) with α value (0.05). The results of this study are said to be meaningful if the p< value is 0.05 (Dahlan, 2014).

RESULTS AND DISCUSSIONS

Characteristics of respondents

Table 1. Characteristics of respondents based on

Age	n	%
45 – 50	5	15,6
51 – 55	12	37,5

Age	n	%
56 - 60	9	28,1
61 - 65	6	18,7
Total	32	100

From table 1, it can be seen that the majority of respondents are at most aged 51-55 years with a total of 12 respondents (37.5%), aged 56-60 years as many as 9 respondents (28.1%), aged 61-65 years with a total of 6 respondents (18.7% and aged 45-50 years as many as 5 respondents (15.6%).

Table 2. Characteristics of respondents by Gender

Age	n	%
Perempuan	23	71,9
Laki Laki	9	28,1
Total	32	100

From table 2, it can be seen that the majority of respondents are the female sex with 23 respondents (71.9%), the male sex with 9 respondents (28.1%). The results of this study are in accordance with the theory presented by Lueckenotte (2004) in Endryanto (2012) that the incidence of DM is higher in women than men, especially in type 2 DM. This is due to a decrease in the hormone estrogen due to menopause.

Univariate Analysis

Table 3. Blood sugar characteristics of respondents before doing foot exercises

Blood Sugar Foot Gymnastics	n	%
150-199 mg/dl	0	0
➢ 200	32	100
Total	32	100

From table 3, it can be seen that the blood sugar level of all respondents before doing foot exercises was ≥200 mg / dl. This relatively high blood sugar level is influenced by several factors including dietary patterns and activities, according to the theory put forward by Tandra (2008) that the triggering factor for the increase in blood sugar levels is the result of the wrong lifestyle and lack of physical activity.

Table 4. Respondents' blood sugar characteristics after doing foot exercises

Blood Sugar Foot Gymnastics	n	%
150-199 mg/dl	26	81,2
➢ 200	6	18,8
Total	32	100

From table 4, it is known that the majority of respondents' blood sugar levels after doing foot exercises of 150-199 mg/dl amounted to 26 respondents (81.2%) and blood sugar levels ≥ 200 mg/dl amounted to 6 respondents (18.8%). This illustrates that the 32 respondents who performed foot exercises well and correctly on a regular basis had relatively blood sugar levels of <200 mg/dl. This lower or lower blood sugar level value describes an improvement in blood sugar level values after doing foot exercises. In accordance with the opinion expressed by Yanuar (2011) in Yudono (2012) that during exercise (gymnastics) energy needs increase so that muscles become more active and there is an increase in glucose use so that there is a decrease in blood sugar levels, This is also motivated by the factor of continuity or regularity of the patient in following gymnastics so that there is a decrease in blood sugar levels. Exercise or physical exercise is an inseparable part of the treatment of people with diabetes mellitus in addition to adhering to diet (medical nutrition therapy), and the use of drugs both people with type 1, and type 2 diabetes. 6 other respondents whose sugar content is still ≥ 200mg/dl, 3 respondents of which the sugar content has decreased but

still >200 mg/dl, while the other 1 respondent the sugar content still does not rise or fall. This is due to factors of age, dietary patterns, and motivation.

Bivariate Analysis

Table 5. Analysis of the effect of diabetic foot gymnastics on changes in blood sugar levels in patients with type 2 diabetes mellitus

Blood Sugar Darah		*Mean*	*Standar Deviasi*	*P - Value*	n
Pre	2.00	0.000		0.000	32
Post	1.25	0.327			32

Based on the results of the Paired Sample t- test, a p value = 0.00 was obtained, which means that the p value = 0.00 is smaller than the α value = 0.05, then Ho was rejected which means that there is an influence of diabetic foot exercises on the effectiveness of blood sugar levels in type 2 diabetes mellitus patients in the tamalanrea health center work area. This study is in line with research that has been conducted by Pryanto (2012), from the results of the study there are significant differences in blood sugar levels before and after being given foot gymnastics interventions with P value = 0.02. According to him, activities or gymnastics that are carried out seriously, shown until the release of sweat will be able to smooth the pancreas in producing insulin in suppressing blood glucose.

In this study, researchers argued that Foot exercises in people with DM had a significant influence on the effectiveness of blood glucose levels. The patient's activity can prevent an increase in blood sugar.

Based on the research conducted, sufferers can understand the importance of exercise or foot activity. Blood sugar control efforts are not only effective with medications. Because in diabetics, the pancreas is damaged when producing insulin, where insulin regulates blood sugar. To support the role of the damaged pancreas, another supporting factor that performs the same function is needed, that is, that which affects the production of blood sugar. Another important factor is diet and exercise. Diet is about choosing and following foods that contain recommended blood sugar levels. Especially foods that are low in sugar. While the recommended exercise is an activity that can help lower blood sugar, such as walking, physical exercise and foot exercise, depending on needs and abilities.

The results of this study showed that people with DM experienced a decrease in blood sugar. This shows that foot exercises affect the effectiveness of blood glucose levels. The effectiveness of blood sugar levels is an indicator of improvement experienced by diabetics. Therefore, foot exercises are an effective way to treat diabetes.

CONCLUSION

There is an influence of foot exercises on the effectiveness of blood sugar levels in the work area of the Tamalanrea Jaya Health Center in Makassar

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