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Original Research

The Effect of Diabetes Mellitus Gymnastics Movement on Decreasing Current Blood Pressure Levels (GDS) in the Elderly

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Abstract

Background: Diabetes mellitus is a disease with increased levels of sugar (glucose) in the body, there is a therapy for diabetes, namely diabetes mellitus gymnastics therapy
Objective: The purpose of the study was to determine the effect of diabetes mellitus gymnastics movements on reducing blood pressure levels during (GDS) in the elderly
Methods: Research design using pre-experimental methods *with* a one-group pre-post test design *approach*
Results: The results showed an average blood sugar level when not controlled as much as 9 before being given exercise and blood sugar levels when controlled as many as 8 people after being given diabetic exercise, the results of data analysis showed a value of pValue = 0.040<0.05.
Conclusion: Conclusion there is an influence of diabetes mellitus gymnastics movements on reducing current blood gulah levels (GDS) in the elderly at the Mootilango Health Center. Advice for the elderly to remain diligent in controlling blood sugar in health facilities.
Keywords: Current Blood Pressure Level (GDS); Diabetes Mellitus Gymnastics; Elderly

Introduction

Diabetes mellitus, or known as diabetes by the wider community, is a long-term disease characterized by increased levels of sugar (glucose) in the body. This occurs due to a disorder in the body so that the body is unable to move glucose from the blood into cells, causing glucose to accumulate. Targets with good diabetes assessment standards include blood glucose 80-200 mg/dL, triglycerides < 150 mg/dL, BMI 18.5-22.9 kg/m2, and blood pressure 130/80 mmHg (EvangeLine, Jatnika, & Nurhartini, 2018).

According to the World Health Organization (2020), the global prevalence of diabetes in adults over 18 years rose from 4.7% to 8.5% in 2014. Compared to developed countries, the prevalence of diabetes is increasing faster. In 2016, 1.6 million people died directly from diabetes. The World Health Organization estimates that diabetes was the seventh leading cause of death in the world in 2016. According to the International Diabetes Federation (IDF, 2020), there were around 463 million adults (20-79 years) with diabetes, causing as many as 4.2 million deaths in 2019. In addition, the number of diabetic patients is expected to continue to increase to 700 million by 2045.

The Ministry of Health of the Republic of Indonesia (2018) reported that the prevalence of diabetes mellitus in Indonesia based on a doctor's diagnosis at age >15 increased to 2%. The highest prevalence was found in DKI Jakarta Province (3.4%), while Gorontalo Province ranked 6th out of 34 provinces with a prevalence of 2.4%. According to the Gorontalo Provincial Health Office (2020), the largest number of diabetes mellitus patients was 3,638 people. The number of people with diabetes mellitus in the working area of the Mootilango Health Center in 2021 reached 72 people (Dinas Kesehatan Gorontalo, 2022).

Diabetes mellitus gymnastics, which emphasizes rhythmic movements of muscles, joints, blood vessels, and nerves in the form of stretching and relaxation, has several goals: to lose weight, provide psychological benefits, improve musculoskeletal symptoms, and inhibit or improve risk factors for cardiovascular disease in people with diabetes mellitus. Controlling blood glucose levels can prevent complications such as diabetic ulcers (Prasetyorini, 2015).

Aerobic movements in diabetic gymnastics are deliberate movements following the rhythm of music to achieve certain goals. Diabetes exercise is better done within 45 minutes with a frequency of 3-5 times per week. During exercise, muscles contract and relax, using sugar for energy, moving sugar from the

blood into muscles, thereby lowering blood sugar. Exercise also makes insulin more sensitive, improving its function in moving sugar into cells (Tandra, 2017).

The movement of diabetes mellitus gymnastics consists of initial movement (standing posture), warm-up (to prepare joint muscles), transitional movements (to prepare before core movement), core movement (for muscle strength, agility, coordination), and cooling movement (to reduce heart rate and relax muscles) (Prasetyorini, 2015).

A preliminary study by observation at the Mootilango Health Center showed 72 elderly people with diabetes mellitus. Interviews with five elderly people revealed that treatment relied only on medication without therapy such as diabetes gymnastics. This prolongs healing and highlights the need for complementary therapies. Interviews with a health worker revealed that diabetes gymnastics was rarely used as an intervention, contributing to increased diabetes prevalence and poor blood flow management. Based on these findings, the researcher is interested in studying the effect of diabetes mellitus gymnastics movements on reducing blood glucose levels in the elderly at the Mootilango Health Center.

Methods

Study Design

The research design used in this study was pre-experimental with a one-group pre-post test design approach. The characteristic of this type of research is to use causal relationships by involving one group of subjects

Samples/Participants

State who the sample is, how many samples the author involved in this study with justification calculations. In addition, describe the sampling technique for recruiting samples. And explain the inclusion and exclusion criteria for selecting samples.

Instruments

The sampling technique used in this study is non-probality sampling type accidental sampling, which is taking cases or samples that happen to exist or are available somewhere according to the research context, the number of samples in this study was 13 elderly people

Interventions

Observations were made before and after the subjects were given the intervention. In this study, the elderly who observed initial blood glucose (pre-test), then given diabetes mellitus gymnastics intervention. After the intervention, observe blood glucose again (post-test) to determine blood glucose levels.

Data Collection

Data collection through documents such as data archives from Puskesmas Mootilango. Before the researcher conducts the study, the researcher coordinates with the doctor as the person in charge of elderly activities, namely prolanist activities to obtain information on respondents who will be sampled in the study, then the researcher explains to correspondents who meet the inclusion criteria about the research to be conducted, asks the correspondent whether he is willing to be a respondent in the study or not. As well as distributing consent sheets to become respondents in research (Informed Consent), researchers distribute questionnaires to respondents and respondents fill out questionnaires. The questionnaire was taken again 30 minutes later, observing blood sugar levels in Diabetes Mellitus patients before being given gymnastics, after the examination respondents were directed to follow gymnastics for 45 minutes after doing gymnastics researchers checked blood sugar on respondents and recorded the results, after the examination was completed the researcher contracted time with respondents to do diabetes exercises, Diabetes gymnastics is carried out for 1 week as much as 3x with an interval of 2 days.

Data Analysis

Univariate analysis is carried out to describe the variables that exist descriptively, both independent variables and dependent variables. The independent variable in this study was diabetes mellitus gymnastics. And the dependent variable in this study is changes in blood glucose levels at any time. Bivariate data analysis in this study was to analyze blood glucose levels before and after intervening using the paired t-est test with a = 0.05, if the results of data analysis obtained a probability value of $p < 0.05$ then Ho was rejected and Ha was accepted which means there is an influence of diabetes mellitus gymnastics movements on changes in blood glucose levels when in the elderly at the Mootilangp Health Center, Gorontalo Regency.

Ethical Considerations

Research ethics was obtained from the ethics committee of the Faculty of Health Sciences, University of Muhammadiyah Gorontalo Indonesia. Before the research was conducted, a consent sheet was given to become a respondent. The purpose of informed consent is for the subject to understand the purpose and purpose of the study, knowing its impact. If the respondent is willing then the respondent must sign a consent sheet. But if the respondent is not willing, then the researcher must respect the respondent's rights. The researcher applied for permission to the head of the Mootilango Health Center, Gorontalo Regency first, then after obtaining approval, the researcher conducted research.

Results

Characteristics Of Distribution Of Respondents

Table 1 it shows that the age of the elderly who are respondents in the Mootilango Health Center work area is the most age, namely 60-65 years old as many as 8 respondents (61.5%) and the least is the age of 66-70 years old as many as 5 respondents (38.5%).

Table 1 Age Frequency Distribution Of Respondents

Age	n	%
60-65 Years	8	61.5
66-70 Years	5	38.5
Total	13	100.0

Source: Data Primer, 2022

Table 2 it shows that the gender of the elderly who became the most respondents in the work area of the Mootilango Health Center was female as many as 9 respondents (69.2%) and the least was male gender as many as 4 respondents (30.8%).

Table 2 Frequency Distribution Of Respondents' Sex

Gender	n	%
Man	4	30.8
Woman	9	69.2
Total	13	100.0

Source: Data Primer, 2022

Table 3 it shows that the education of the elderly who became the respondents in the work area of the Mootilango Health Center was 7 respondents (53.8%) and the fewest was high school with 2 respondents (15.4%).

Tabel 3 Distribution of Respondents' Education Frequency

Education	n	%
SD	7	53.8
SMP	4	30.8
SMA	2	15.4
Total	13	100.0

Source: Data Primer, 2022

Frequency distribution of blood sugar levels before diabetes mellitus exercise

Table 4 it shows that blood sugar levels before being given diabetes mellitus exercises in the elderly who are respondents in the Mootilango Health Center work area have the most blood sugar levels when they are not controlled as many as 9 respondents (69.2%) with an average examination result of 201 mg/dL to 239 mg/dL and the lowest is blood sugar levels when controlled as many as 4 respondents (30.8%) with 171 examination resultsmg/dL to 189 mg/dL.

Table 4 Frequency distribution of blood sugar levels before diabetes mellitus exercise

Blood Sugar Levels During	n	%
Controlled	4	30.8
Uncontrolled	9	69.2

Total	13	100.0

Source: Primary Data, 2022

Frequency distribution of blood sugar levels after diabetes mellitus exercise

Table 5 it shows that blood sugar levels after being given diabetes mellitus exercise in the elderly who are respondents in the work area of the Mootilango Health Center have the most blood sugar levels when they are controlled, namely blood sugar levels when controlled as many as 8 respondents (61.5%) with average test results of 154 mg/dL to 198 mg/dL and the lowest is blood sugar levels when not controlled as many as 5 respondents (38.5%) with 202 test resultsmg/dL to 223 mg/dL.

Table 5 Frequency distribution of blood sugar levels after diabetes mellitus exercise

Current Blood Sugar Levels	n	%
Controlled	8	61.5
Uncontrolled	5	38.5
Total	13	100.0

Source: Primary Data, 2022

Distribution of the Effect of Diabetes Mellitus Gymnastics Movement on Decreasing Blood Pressure Levels During

Table 6 the results of the statistical test, the mean value is 3.077 which means that there is a decrease in blood sugar levels after diabetes mellitus exercise, the average decrease is 3.077. The correlation value between the 2 variables is 0.507 which means that there is an effect of reducing blood sugar levels with gymnastics, but the effect is weak. The t-value is calculated as 2.309>0.5324 which means that there is a significant influence between diabetes mellitus exercises on the decrease in blood glucose levels at any time. The value of Sig2 or Pvalue = 0.040>0.05 which means that there is a significant influence between diabetes mellitus exercises on the decrease in blood glucose levels in the elderly at the Mootilango Health Center.

Table 6 Distribution of the Effect of Diabetes Mellitus Gymnastics Movement on Decreasing Blood Pressure Levels During

Decrease in Current Blood Flow Levels (GDS)	Mean	Correlation	t	Sig	Sig. (2-tailed)	95% CI
Before- After	3.077	.507	2.309	0,077	0,040	.174 5.980

Source: Primary Data, 2022

Discussion

The The results of this study show that the average age of respondents aged 60 years and over proves that age affects blood glucose levels because aging can decrease insulin sensitivity so that it affects glucose levels in the blood cannot be metabolized optimally. Besides that, the elderly who enter the age of 60 years will experience reduced physical activity as a result of limited body ability, causing the elderly at risk of suffering from obesity so as not to close is likely to have diabetes mellitus. According to Tiurma (2021), with increasing age, intolerance to glucose also increases. Glucose intolerance in the elderly is often associated with obesity, lack of physical activity, reduced muscle mass, the presence of comorbidities and drug use. In addition, in elderly people there has been a decrease in insulin secretion and insulin resistance. The risk of developing blood sugar levels will increase with aging. Experts agree from the age of 45 years and above (Tiurma & Syahrizal, 2021).

Based on the description above, researchers assume that the age group at risk for suffering from diabetes mellitus is the age of 46-65 years because at that age there is glucose intolerance, so that the average elderly suffer from diabetes mellitus. In addition to glucose intolerance in the elderly, physical activity has been reduced so it is very vulnerable to diabetes mellitus because physical activity plays a role in controlling the body's blood sugar by converting glucose into energy. All body movements that burn calories such as sweeping, going up and down stairs, ironing, gardening, leisurely walking, and exercising are beneficial.

According to Tiurma (2021), one of the risk factors for diabetes mellitus is gender. In Nezhad's study, there was a difference in the percentage of people with diabetes mellitus between men and women.

The percentage of diabetics in men was 5.1%, while in women it was 5.8%. Various studies have found that women suffer more from diabetes mellitus than men. This is associated with physical activity, where women have less physical activity than men, especially housewives.

Blood sugar levels before diabetes mellitus exercise was given to the elderly in the work area of the Mootilango Health Center were mostly uncontrolled, namely as many as 9 respondents (69.2%) and controlled as many as 4 respondents (30.8%). Before diabetes exercise was carried out, researchers had told respondents not to take drugs, not to eat sweet foods or drinks, not to think too much, not to smoke and to eat breakfast from home. Based on the results of the interview, it is known that respondents have never done diabetes mellitus gymnastics in maintaining their blood sugar levels. All that is done is to maintain a diet and always take drugs from the doctor to regulate blood sugar before and after eating.

In this study, there were 9 respondents whose blood sugar levels were not controlled. From the interview results, it was obtained that respondents had never done diabetes mellitus gymnastics in maintaining their blood sugar levels. The actions taken to maintain blood sugar levels of respondents only regulated eating diets and consumed drugs from doctors causing respondents to become dependent on doctors' drugs. In addition, respondents rarely follow the elderly posyandu so they are less likely to receive information about keeping blood sugar levels up.

While there were 4 respondents with blood sugar levels when controlled, from the interview results obtained that although respondents had never done diabetes mellitus gymnastics in maintaining their blood sugar levels, respondents often followed the elderly posyandu so that the latest information about the prevention of rising blood sugar levels was known by respondents, such as in addition to maintaining a diet and always taking blood sugar regulating drugs before and after eating, prevention that can be done by respondents independently at home is by consuming traditional medicines and herbal medicines that have been proven to reduce blood sugar levels such as aloe vera, cinnamon, bitter melon, ginger, and ginseng. This highlights the importance of providing information to respondents about the prevention of rising blood sugar levels at any time.

Uncontrolled diabetes mellitus will cause various complications. About 20-40% of diabetic patients will develop diabetic nephropathy which is the most major cause of end-stage renal failure. One million adults in the Southeast Asia Regional region in 2015 died from kidney disease as a result of one of the causes of diabetes mellitus complications and ranks first as a cause of death due to complications (Soelistijo et al., 2019).

The results showed that after participating in diabetes exercises, blood sugar levels were controlled in as many as 8 respondents. From the interview results obtained, in addition to participating in diabetes mellitus exercises, respondents often participated in the elderly posyandu so that the latest information about preventing rising blood sugar levels was known by respondents, such as consuming traditional medicines and herbal medicines that have been proven to reduce blood sugar levels such as aloe vera, cinnamon, bitter melon, ginger, and ginseng. In addition, respondents followed the advice of doctors, namely maintaining a proper eating diet. Thus, holding diabetes mellitus gymnastics can increase respondents' knowledge in preventing rising blood sugar levels in the form of exercise or physical activity.

Diabetes mellitus is one of the chronic diseases that requires long treatment time, very expensive treatment financing. Besides that, the prevalence of diabetes mellitus also continues to increase. Lifestyle changes such as eating habits, reduced physical activity, and obesity are considered as the most important causative factors (Mustofa et al., 2022). Diabetic gymnastics is aerobic physical exercise for diabetics with a series of movements that are chosen deliberately by following the rhythm of music so as to give birth to certain rhythmic provisions, continuity, and duration to achieve certain goals. Diabetes exercise will be better done within 45 minutes with a frequency of 3-5 times per week (Sitanggang et al., 2021).

Diabetic gymnastics can cause a decrease in blood glucose. This is because when doing physical exercise, there is an increase in glucose use by muscles. Furthermore, there is an increase in blood flow which causes more capillary meshes to open, so that insulin receptors are more available and more active to lower blood glucose (Meilani et al., 2022; Milita et al., 2021). The results showed a decrease in blood sugar levels after diabetes mellitus exercises, where before gymnastics was given there were only 4 respondents with blood sugar levels when controlled and there were 8 respondents with blood sugar levels when controlled after being given gymnastics (Rosita et al., 2022; Arini et al., 2022). It can be seen that there was a decrease in blood sugar levels before and after gymnastics in 4 respondents, besides that the average blood sugar levels of respondents before participating in gymnastics were at 171 mg/dL to 189 mg/dL, after participating in gymnastics on average there was a decrease in blood sugar levels to 163 mg/dL to 153 mg/dL.

Based on the description above, researchers concluded that diabetic gymnastics is one of the most effective physical activities if done regularly. Aerobic exercise that follows a series of sequential movements will strengthen and develop muscles and all parts of the body. Regular exercise will provide

more benefits, blood sugar and blood fats are controlled, blood circulation is better, blood pressure is stable, and weight loss is achieved (Rahayu, 2023; Kurdi et al., 2021).

Conclusion

The characteristics of respondents who are in the working area of the Mootilango Health Center based on the age of the elderly, namely the age of 60-65 years, as many as 8 respondents. The highest gender of the elderly is the female gender as many as 9 respondents. The most elderly education is elementary school as many as 7 respondents. Blood sugar levels before diabetes mellitus gymnastics were given to the elderly in the work area of the Mootilango Health Center, the most were blood sugar levels when uncontrolled as many as 9 respondents and the lowest was blood sugar levels when controlled as many as 4 respondents. Blood sugar levels after being given diabetes mellitus exercises to the elderly in the work area of the Mootilango Health Center were the most blood sugar levels when controlled as many as 8 respondents and the lowest was blood sugar levels when not controlled as many as 5 respondents. There is an influence of diabetes mellitus gymnastics movement on reducing current blood gulah levels (GDS) in the elderly at the Mootilango Health Center, Gorontalo regency with a value of Pvalue = 0.040>0.05.

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