

Effectiveness of 30 Minutes Walking Exercise on Blood Glucose Levels of Menopausal Women with Diabetes Mellitus in the Work Area of the Pekanbaru City Health Center

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ABSTRACT

Hormonal changes during menopause affect blood sugar levels and make it difficult for some women to control DM. The study aims to analyze and prove the difference in quality of life of menopausal women with DM before and after walking exercise 30 minutes.

The research design used quasi-experimental. The subjects of the study amounted to 86 people divided into 2 groups, namely 43 groups of walking exercise 30 minutes intervention, 43 control groups in menopausal women. Data were collected using the Standard Operating Procedure Walking Exercise instrument, demographic data questionnaire, Menopause Quality Of Life. Paired and unpaired t-test with a significant value of $p < 0.05$. And data using the Wilcoxon Sign Rank test and Mann Whitney U Test. Data processing with the help of statistical software. The results of the analysis showed that there was a significant difference between before and after walking exercise 30 minutes on improving the quality of life of menopausal women with DM ($t = 16.729$; $p = 0.000$). The results of this study are expected to be a reference and a reference in making programs, especially Puskesmas in improving the quality of life of Menopause patients.

Keywords: Blood Sugar, Diabetes Mellitus, Menopause, walking exercise 30 minutes

INTRODUCTION

Women are one of the most important foundations in families and communities who have the most important stage in their lives, namely menopause (Nikpour & Haghani, 2014). Menopause is part of the aging process that occurs when women no longer menstruate for 12 months caused by a decrease in estrogen hormone production and usually occurs between the ages of 45 and 55 years (Diabetes United Kingdom, 2023; WHO, 2022).

The number of elderly people aged over 65 years in the world in 2050 is estimated to be 1.5 billion people and half of them are women. This number has increased significantly compared to the number of elderly people in 2010, which was 531 million people (International Federation of Gynecology and Obstetrics, 2023). In 2021, 34% of women in East and Southeast Asia were over 50 years old or 8% higher than the global average and an increase of 19% from the previous 30 years (Nikkei Asia, 2024).

Based on data from the Central Statistics Agency (2023), there are 52.28% elderly women in Indonesia with a proportion of 18.59% aged 45-59 years, 61.89% aged 60-69 years, 28.38% aged 70-79 years, and 9.72% aged ≥ 80 years. However, there is no data showing the proportion of women experiencing menopause in Indonesia. Meanwhile, the proportion of elderly women is 49.08% of the total elderly in Riau Province.

DM represents a major health concern for older women. In the United States, it ranks as the sixth leading cause of death among women aged 45–54 and the fourth for those aged 55–64. DM also significantly increases the likelihood of developing cardiovascular diseases, strokes, and severe complications including vision loss, kidney failure, nerve disorders, and other serious health conditions (North American Menopause Society, 2024). A multi-country study in Europe involving 119,613 elderly women reported that 75% were diagnosed with DM (Mohile et al., 2023). In Indonesia, DM ranked fifth globally in 2021, with 19.5 million recorded cases, and this number is expected to rise to 28.6 million by 2045 (Central Bureau of Statistics, 2023).

Increasing age is associated with decreased organ function, including the pancreas, which contributes to insulin resistance (Enikuomehin et al., 2020). In

addition, a decline in estrogen and parathyroid hormone function, along with increased FSH and LH levels, leads to changes in the vascular system that can result in various diseases such as coronary heart disease, stroke, and diabetes mellitus (DM) (Laksono et al., 2022; Madormo, 2022). Hormonal changes during menopause also affect blood sugar levels, making it more difficult for some women to manage DM (Diabetes UK, 2023). Furthermore, reduced physical activity in elderly women increases the risk of developing DM (Brevetti et al., 2008; Norman et al., 2006).

DM is a condition that occurs when the body is unable to properly absorb glucose, leading to elevated blood sugar levels (hyperglycemia). This persistent increase in blood sugar can result in the development of diabetes and contribute to various health complications (Permana, Kamillah dan Wisnusakti, 2021). The risk of complications can be prevented by controlling blood glucose levels. In addition, controlling blood glucose levels can also improve the quality of life of DM patients, prevent and inhibit the progression of microangiopathy and macroangiopathy complications, and reduce morbidity and mortality of DM (Istiqomah & Yuliyana, 2022).

One of the management strategies in DM patients is to do physical activity by walking for 30 minutes 5 times a week (Lakhdar et al., 2020; Sherr & Lipman, 2015). Regular exercise (at least 150 minutes per week) is recommended for adults with and without DM to maintain a balanced and healthy lifestyle by improving fitness, cardiorespiratory, muscle strength, mental health and quality of life (Bull et al., 2020; Momeni et al., 2021; Schroeder et al., 2019).

Walking Exercise is a form of simple physical activity that is highly recommended for people with diabetes mellitus (Ministry of Health of the Republic of Indonesia, 2018). Walking exercise according to the Caribbean Public Health Agency (CPHA) (2019) is a simple physical activity that can be done in a structured and planned manner to maintain or improve health with walking movements and swinging arms according to the rhythm of the road, free movement of the whole body as a sign and functioning of movement to stimulate various organs and body systems (Rondhianto, et al, 2021). Walking can increase insulin binding to receptors on muscle cell membranes. Where insulin is actually a modulator of glucose transport during exercise and exercise that increases its effects. When there is a change in insulin and

glucogan concentration, this is what prevents a decrease in blood glucose levels during exercise, initially by stimulating liver glycogenolysis and then by increasing hepatic gluconeogenesis.

The results of a preliminary study conducted by researchers at the Rejosari Health Center showed that the number of DM patients from January to April 2024 was 349 people with 87 elderly women who had experienced menopause. The results of interviews conducted by researchers with 10 menopausal women with DM, obtained results as many as 6 people said they had experienced menopause for more than 10 years and had suffered from DM for a long time and rarely did physical activities such as walking, as many as 3 people occasionally did physical activities such as walking every morning and 1 person almost every day did a morning walk for 1 hour and often participated in prolans gymnastics. This illustrates that as many as 9 menopausal women rarely did physical activities at home.

Walking exercise is one of the physical exercise options and an alternative for sufferers to do physical activities independently at home. Based on the background above, researchers are interested in conducting a study entitled the effectiveness of walking exercise 30 minutes on improving the quality of life of menopausal women with diabetes mellitus in the Pekanbaru City Health Center work area.

METHODS

The type of research used is quantitative research or quantitative design with a quasi-experimental design approach (Polit & Beck, 2012). The research was conducted from July 2024 to April 2025 after previously obtaining approval from the Health Research Ethics Commission of Prima Indonesia University. This study was conducted at the Pekanbaru City Health Center for the intervention group and control group. The study population was all menopausal women who experienced DM at the Pekanbaru Health Center. The sample size in this study was determined using power analysis. Based on previous studies, it was determined that the level of significance (α) = 0.05, power ($1-\beta$) = 0.80 and the estimated effect size (γ) was set at 0.50, then in the power analysis table in Polit and Beck (2003) the sample was set at 43 respondents for each group, namely the 30-minute walking exercise intervention group and the control group in menopausal women. So the total sample was 86

respondents. Data collection was carried out using the Standard Operating Procedure for implementing walking exercises and questionnaire used in this study was demographic data (age, education, occupation, BMI, duration of menopause and number of children) and Menopause Quality Of Life (MENQOL). The data analysis methods used include data processing and data analysis by testing the difference of 2 means (pretest and posttest) in each group, such as the difference in group means before and after walking exercise 30 minutes or the difference in group means before and after unstructured activities using statistical analysis dependent t-test (paired t test), if the results of the data normality test are not normally distributed then the Wilcoxon sign rank test is used. Meanwhile, to test the difference of 2 means in different groups between the walking exercise 30 minutes group and unstructured activities using the independent statistical test t-test, but if the data is not normally distributed then the Mann U Whitney test is used. While the normality test in this study uses the Shapiro Wilk test.

RESULTS

The characteristics of the subjects who participated in this study can be seen in the table below.

Table 1 Characteristics of Menopausal Women with DM

No	Respondent Characteristics	Intervention Group		Control Group	
		f	%	f	%
1	Age				
	Late Adulthood	4	9,3	1	2,3
	Early Elderly	19	44,2	16	37,2
	Late Elderly	18	41,9	25	58,1
	Seniors >65 tahun	2	4,7	1	2,3
	Mean±sd	55,30±6,770		57,14±5,714	
2	IMT				
	Very Thin	2	4,7	0	0
	Thin	2	4,7	0	0
	Normal	23	53,5	30	69,8
	<i>Overweight</i>	8	18,6	8	18,6
	Obesity	8	18,6	5	11,6
	Total	43	100	43	100

Based on table above, it can be seen that of the 43 respondents in the intervention group, most 19 (44.2%) respondents were in early elderly age and most 23 (53.5%) respondents had BMI in the normal category. Of the 43 respondents in the

control group, most 25 (58.1%) respondents were in late elderly age and most 30 (69.8%) respondents had BMI in the normal category.

Table 2 Distribution of the Number and Percentage of Research Subjects Based on Initial and Final Data on Blood Glucose Levels in Menopausal Women with DM

No	Blood Glucose Levels	Intervention				Control			
		Pre		Post		Pre		Post	
		f	%	f	%	f	%	f	%
1	Normal	10	23,3	33	76,7	5	11,6	10	23,3
2	Diabetes	33	76,7	10	23,3	38	88,4	33	76,7
Total		43	100	43	100	43	100	43	100

Based on table above, it can be seen that of the 43 respondents in the intervention group, before the 30-minute walking exercise, most 33 (76.7%) respondents experienced high glucose levels (diabetes) and after the 30-minute walking exercise, most 33 (76.7%) respondents experienced normal glucose levels. Of the 43 respondents in the control group, before the unstructured activity, most 38 (88.4%) respondents experienced high glucose levels (diabetes) and after the unstructured activity, most 33 (76.7%) respondents also experienced high glucose levels (diabetes).

Table 3 Average Blood Glucose Levels in Menopausal Women with DM

Group	Blood Glucose Levels	Mean	SD
Intervention	Pre	224,40	42,738
	Post	175,21	33,665
Control	Pre	263,28	52,209
	Post	234,49	48,354

Based on table, the results show that the average blood glucose level in the intervention group, before walking exercise for 30 minutes was 224.40 (SD = 42.738) and after walking exercise for 30 minutes there was a decrease in blood glucose levels of 175.21 (SD = 33.665). Meanwhile, the average blood glucose level in the control group, before unstructured activities were 263.28 (SD = 52.209) and after unstructured activities there was a decrease in blood glucose levels of 234.49 (SD = 48.354). However, the decrease in glucose levels after unstructured activities was not very significant.

Table 4 Normality Test of Blood Glucose Levels in Menopausal Women with DM

Group	Blood Glucose Levels	n	Saphiro Wilk
Intervention	Pre	43	0,077
	Post	43	0,436
Control	Pre	43	0,394

<i>Post</i>	43	0,722
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Based on table, the results of the data normality test show that in the intervention group, before and after the 30-minute walking exercise, blood glucose levels were normally distributed with p values of 0.077 and 0.436. While in the control group, before and after the unstructured activity, blood glucose levels were also normally distributed with p values of 0.394 and 0.722 because they were greater than the α value of 0.05. Thus, the bivariate analysis in this study used a paired t-test to assess the differences in pre and post values in each group. Meanwhile, to determine the most effective intervention between the 30-minute walking exercise group and unstructured activities to lower blood glucose levels using the independent t-test.

Reporting Research Results

Table 5 Differences in Blood Glucose Levels in Menopausal Women with DM

Group	Blood Glucose Levels	Mean	SD	t	p-value
Intervensi	<i>Pre</i>	224,40	42,738	16,729	0,000
	<i>Post</i>	175,21	33,665		
Kontrol	<i>Pre</i>	263,28	52,209	11,820	0,000
	<i>Post</i>	234,49	48,354		

The results of the analysis using the paired t-test showed that in the intervention group there was a significant difference between before and after 30 minutes of walking exercise on increasing blood glucose levels in menopausal women with DM ($t = 16.729$; $p = 0.000$). While in the control group, a significant difference was also found between before and after unstructured activities on blood glucose levels in menopausal women with DM ($t = 11.820$; $p = 0.000$).

Table 6 Differences in Blood Glucose Levels between the Intervention and Control Groups

No	Blood Glucose Levels	Mean	SD	t	p-value
1	Intervensi	175,21	33,665	10,943	0,000
2	Kontrol	234,49	48,354		

The effectiveness of walking exercise 30 minutes on reducing glucose levels in menopausal women with DM by comparing the final glucose levels between the intervention and control groups using independent t-test statistical analysis. Based on

the analysis, it was found that there was a significant difference in blood glucose levels between the intervention and control groups ($t = 10.943$; $p = 0.000$). This means that the walking exercise 30 minutes group is better at reducing blood glucose levels when compared to the unstructured activity group as seen from the difference in the average glucose reduction where the intervention group had an average glucose reduction of 175.21 ± 33.665 compared to the average glucose reduction in the control group of 234.49 ± 48.354 .

DISCUSSION

1. Blood Glucose Levels Of Menopausal Women With Dm Before And After Walking Exercise 30 Minutes

The results of the study showed that in the intervention group of 43 respondents before the 30-minute walking exercise, most 76.7% of respondents had high blood sugar levels (diabetes) with an average of 224.40 (SD = 42.738) and after the 30-minute walking exercise, most 76.7% of respondents had blood sugar levels within normal limits with an average of 175.21 (SD = 33.665).

The results of this study are in line with research conducted by Arman (2024) which showed that there was an effect of walking exercise on blood glucose levels in type 2 diabetes patients with a p value of 0.000 ($p < 0.005$). Eprianti et al. (2022) in his study also stated that doing walking exercise regularly is highly recommended to increase the stability of blood glucose levels, namely by doing walking exercise for 30 minutes in 1 day has shown a decrease in the average value of blood glucose levels in type 2 diabetes mellitus patients with a p value of 0.001 ($p < 0.005$).

Based on the discussion above, this study is in accordance with the research of Utama et al. (2023), which showed a significant decrease in blood glucose levels in patients with type 2 diabetes with a p-value of 0.001. This study is also in accordance with the study by Yuliastuti et al. (2022), where walking exercise was carried out in the morning 2 to 3 times a week with a duration of 30 minutes per day, significant decrease in blood glucose levels in patients with type 2 diabetes with a p value of 0.001.

The decrease in blood glucose levels occurs because when the body is actively moving during walking exercise, the muscles used to move the body also use more

glucose than muscles that are resting. So, muscle cells can receive glucose better so that blood glucose levels decrease (Subiyanto, 2019). According to Huzaifah et al. (2019), walking can burn calories and the more calories burned, the more blood glucose levels will decrease. When diabetic patients walk, the heart rate will increase and the muscles in the body will also need more glucose contained in the blood and will make insulin in the body work better.

Insulin resistance is the underlying cause of type 2 diabetes mellitus, where insulin-induced glucose absorption is disrupted. This is caused by damage to the insulin signaling pathway, namely the Insulin Receptor Substrate (IRS) and Phosphatidylinositol 3-kinase (P13K) pathways so that the translocation of a GLUT-4 transmembrane molecule to the cell membrane fails. This damage affects the failure of GLUT-4 translocation and reduces glucose uptake by cells so that levels increase in the blood or hyperglycemia (Sukarno, 2021).

According to Sukarno (2021), in skeletal muscle cells, insulin stimulates glucose transport into cells, thereby increasing glucose metabolism and glycogen synthesis, and increasing amino acid uptake to stimulate protein synthesis. The effect of insulin on skeletal muscle cells begins with insulin binding to the membrane receptor protein and will activate the receptor, resulting in metabolic effects on carbohydrates, fats and proteins. Insulin receptors will stimulate glucose transport through GLUT-4 translocation to the plasma membrane of skeletal muscle cells. Expression of GLUT-4 on the skeletal muscle cell membrane will cause increased glucose uptake, glycogen synthesis, and protein synthesis. Open capillary networks occur due to vasodilation stimulus through nitric oxide (NO), which is an active gas found in almost all tissues that diffuses easily through cell membranes, so that it can increase glucose uptake by cells, especially in muscle cells (Ridwan & Gotera, 2019).

Based on this study, researchers assume that changes in blood glucose levels in menopausal women with DM after walking exercise can also be caused by good self-management factors of diabetes patients, including glucose management, diet control, physical activity and health care. The decrease in blood glucose levels in this study varies in each patient which can be caused by the characteristics and self-management of each patient.

2. Blood Glucose Levels In Menopausal Women With Dm Before And After Unstructured Activity

The results of the study showed that in the control group, before carrying out unstructured activities, most 88.4% of respondents experienced high blood sugar levels (diabetes) with an average of 263.28 (SD=52.209) and after carrying out unstructured activities, most 76.7% of respondents also experienced high blood sugar levels (diabetes) with an average of 234.49 (SD=48.354).

The results of this study are in line with research conducted by Permatasari et al (2024) which shows that daily physical activity can maintain blood glucose levels such as washing and sweeping. Other studies also show that there is a significant effect of physical activity as one of the DM management on blood sugar levels in DM patients. Physical activity can increase insulin sensitivity, reduce HbA1C levels, and improve lipid profiles. However, the phenomenon of problems that occur socially, DM sufferers experience several obstacles related to limited activities due to complications that arise (Efendi et al., 2022).

Physical activity helps to increase glucose utilization by muscles, thus causing a decrease in blood glucose levels in the body. Lack of physical activity will cause uncontrolled blood sugar levels (Nurman et al., 2020). Physical activity can control sugar levels with the right duration, which is 30 minutes and twice a week. The types of physical activities carried out are also routine and in a light rhythm such as walking, cycling, gymnastics, and jogging (Barnes et al., 2020).

Lack of physical activity has an impact on increasing blood glucose levels. Lack of physical activity causes muscles to not work optimally so that excess energy in the body will be converted into visceral fat. When physical activity occurs, muscles will affect controlled blood sugar levels. Muscles will use glucose stored in the form of glycogen so that stored blood glucose will decrease. DM sufferers who do not do physical activity optimally will affect the burning of food substances. Food substances that are not burned optimally will be stored in the body in the form of sugar and fat. The accumulation of sugar will continue to increase if insulin is not sufficient to convert glucose into energy (Mayawati & Isnaeni, 2017). As one of the pillars of DM management, physical activity can improve insulin sensitivity, so that it can control blood glucose levels (Adi, 2019).

According to the researcher's assumption, a person's physical activity affects their blood sugar. When someone does intense physical activity, the muscle's need for glucose increases. This happens because the body must add glucose that is produced naturally to maintain blood sugar balance.

3. Differences In Blood Sugar Levels In Menopausal Women With Dm Between The Intervention Group And The Control Group

The effectiveness of walking exercise 30 minutes on reducing glucose levels in menopausal women with DM by comparing the final glucose levels between the intervention and control groups using independent t-test statistical analysis. Based on the analysis, it was found that there was a significant difference in blood glucose levels between the intervention and control groups ($t = 10.943$; $p = 0.000$). This means that the walking exercise 30 minutes group is better at reducing blood glucose levels when compared to the unstructured activity group as seen from the difference in the average glucose reduction where the intervention group had an average glucose reduction of 175.21 ± 33.665 compared to the average glucose reduction in the control group of 234.49 ± 48.354 .

Walking exercise is classified as a light sport or activity easily because it can be done indoors or outdoors, especially at home and does not require a long time, only about 20-30 minutes, which is useful for avoiding injuries and helping to smooth blood circulation in the legs (Yulia et al., 2023). Walking exercise is most recommended for people with type 2 diabetes which can be done at a certain speed to increase heart rate and is also an aerobic activity (K. Safira, 2022).

During physical exercise such as walking exercise, insulin will lower blood glucose, fatty acid, and amino acid levels and help store them in the body. Insulin begins its work by binding to receptors located on the surface of target cells found in all muscle cells and adipose tissue. The breakdown of insulin in the blood is very important because it will affect glucose regulation (Guyton & Hall, 2014). The results of Arman's (2024) study showed that there was an effect of walking exercise on blood glucose levels in patients with type 2 diabetes mellitus at the Lubuk Buaya Health Center, Padang City in 2024 with a p value of 0.000 or ($p < 0.05$).

Meanwhile, general physical activity tends to be unstructured and does not have a measurable intensity or duration, so the body does not get enough metabolic

stimulus to effectively improve glucose control. In addition, this type of activity is often done with long breaks or is not continuous. This is in accordance with the findings of Yang et al. (2022), which showed that only physical activity that reaches moderate intensity and is carried out in a structured manner has a significant impact on glycemic control in elderly women with type 2 diabetes.

Respondents who did general physical activities such as cleaning the house, walking occasionally, going up and down stairs, or gardening also experienced a decrease in blood sugar levels, but the decrease was smaller and inconsistent. According to the researcher's assumption, walking exercise 30 minutes is better at lowering blood sugar levels because walking exercise is a structured exercise that is more effective in lowering blood sugar levels than general physical activity.

CONCLUSION

There was a significant difference in blood glucose levels between the intervention and control groups ($t=10.943$; $p=0.000$). where the 30-minute walking exercise group was better at lowering blood glucose levels when compared to the unstructured activity group.

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to all those who supported the completion of this research titled "*effectiveness of 30 minutes walking exercise on blood glucose levels of menopausal women with diabetes mellitus in the work area of the pekanbaru city health center.*" Special thanks to my supervisor, the pekanbaru health center staff, and all participants for their valuable contributions. I also thank my family and peers for their constant encouragement.

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