

Fast Walk Exercise on Blood Pressure Changes in Women With Diabetes Mellitus

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Abstract: *Diabetes Mellitus (DM) is a metabolic disorder of chronic hyperglycemia, often accompanied by the onset of metabolic syndrome, namely hypertension which can trigger and exacerbate cardiovascular complications so it is necessary to implement 4 pillars of management namely education, medical nutrition therapy, physical exercise and medical therapy Nonpharmacological interventions are proven to be the best for prevention and hypertension treatment such as Aerobics (Fast Walking) which can be done for 90–150 minutes/week. The type of research used is quantitative research using the Quasi Experimental Pretest-Posttest Control Group Design. The sample size is 40 people. Brisk walking has an influence on changes in blood pressure in diabetic women so it is hoped that light sports activities will be increased as one of the therapies in non-pharmacological treatment of diabetes mellitus patients.*

Keywords: *Changes in Blood Pressure, Fast Walking, Diabetes Mellitus*

I. Introduction

Diabetes Mellitus (DM) is a chronic hyperglycemia metabolic disorder characterized by disturbances in carbohydrate, protein and fat metabolism due to absolute or relative insulin deficiency accompanied by organ system dysfunction.(Uloko et al., 2018). Is one of the diseases that is currently the main focus around the world because it is a major cause of disability and death risk(Wang et al., 2021). Hyperglycemia is often accompanied by the emergence of metabolic syndrome, namely hypertension which can trigger and exacerbate cardiovascular complications. High blood sugar will stick to the walls of blood vessels which can cause AGEs. Advanced Glycosylated Endproducts (AGEs) are substances formed from excess sugar and protein that bind to each other, causing an inflammatory reaction to occur. White blood cells (leukocytes) and blood clotting cells (thrombocytes) as well as other materials join together to form a plaque clot (plaque), which makes the walls of blood vessels hard, stiff and eventually a blockage arises which results in changes in blood pressure which is called hypertension.(Winta et al., 2018). An unreasonably increasing number of sufferers in low-income countries due to rapid lifestyle modifications, urbanization, and a slow increase in life expectancy(Bishu et al., 2019)Many people with diabetes mellitus survive to old age even though until now there is no medicine that can cure it(Darmawan & Sriwahyuni, 2019). this is a real challenge for health financing by government and non-government organizations to improve public health(Uloko et al., 2018). hypertension as one of the main risk factors for cardiovascular disease in elderly women, and preeclampsia is still the main cause of maternal death in developed countries of the world(Tatjana Tasic, Marijana Tadic, 2022)

Based on data from the International Diabetes Federation (IDF) in 2021, an estimated 537 million people suffer from diabetes, and this number is projected to reach 643 million in 2030 and 783 million in 2045.(IDF, 2021). The prevalence of diabetes in South Sulawesi in 2020 who received health services according to standards was 80,788 sufferers, with the most cases in Makassar City 18,305 people(South Sulawesi Provincial Health Office, 2021). Tamalanrea Health Center in Makassar City in 2022, shows that the number of Diabetes Mellitus patients in 2019 was 904 people, increased in 2020 by 1,206 people and increased again in 2021 by 1,396 people, while the number of patients from January to June 2022 was 410 people. In this case the need for identification of high-risk groups is very important for surveillance, and the development of community-based policies and interventions(Al-Mawali et al., 2021)to improve management in proper management to prevent complications of Diabetes Mellitus(Li et al., 2021). By implementing the 4 pillars of management namely education, medical nutrition therapy, physical exercise and medical therapy(Nurjanna et al., 2020).

Non-pharmacological interventions are proven to be the best for the prevention and treatment of hypertension such as aerobics which can be done for 90–150 minutes/week and it is recommended that 65%–75% heart rate reserve can reduce changes in blood pressure by 2/4 mmHg(Paul K. Whelton, 2017). In women with diabetes mellitus and who spend more time at home, it is highly recommended to do physical activity. Brisk walking or brisk walking is a light exercise for about 30 minutes which, if routinely done, can maintain blood sugar levels within normal limits.(Sriwahyuni et al., 2021). This sport can reduce peripheral resistance, when the muscles contract through physical activity there will be a 30-fold increase in blood flow when the contractions are carried out rhythmically due to the sufficient supply of blood, oxygen and nutrients in the cells.(Sonhaji et al., 2020). A brisk walking program with moderate intensity is effective in reducing metabolic risk factors, especially for postmenopausal women(Chan et al., 2018). recommended for all age groups(Sun et al., 2019). Because besides being easy to do, it does not require special skills, this exercise can reduce systolic blood pressure, where the average blood pressure before brisk walking exercise is 146/94 mmHg, while after brisk walking exercise is 134/84 mmHg. (Hendriati et al., 2022).

II. Research methods

The type of research used is quantitative research using the Quasi Experimental Pretest-Posttest Control Group Design method. The sample size was 40 people, of which 20 people were in the intervention group (fast walking) and 20 people in the control (no treatment). Data collection was carried out through research observation sheets used in this study containing the

characteristics of respondents, blood pressure observation sheets before and after treatment in the fast walking physical exercise group and blood pressure observation sheets before and after in the control group based on hypertension criteria based on WHO (2021), which is measured using aneroid sphygmomanometer and stethoscope.

III. Research result

1. Characteristics of Respondents

Table 5.1
Frequency Distribution of Respondents Based on Age and Length of Suffering

Characteristics of Respondents	Intervention		Control	
	n	%	n	%
Age				
46-55 years	19	95.0	18	90.0
56-65 years	1	5.0	2	10.0
Long Suffering from Hypertension				
<10 years	10	50.0	7	35.0
≥10 years	10	50.0	13	65.0
Total	20	100.0	20	100.0

Based on Table 5.1 it shows that of the 20 respondents in the intervention group, most of the respondents were aged 46-55 years as many as 19 respondents (95.0%) and duration of suffering from hypertension were the same <10 years and ≥10 years as many as 10 respondents (50%). While in the control group, most of the respondents were aged 46-55 years as many as 18 respondents (90.0%) and long suffering from hypertension ≥10 years as many as 13 respondents (65.0%).

2. Univariate analysis

Table 5.2
Frequency Distribution Respondents Based on Blood Pressure Before and After the Intervention

Blood pressure	Intervention Group				Control Group			
	Pre		Post		Pre		Post	
	n	%	N	%	n	%	n	%
Grade 1 hypertension	4	20.0	10	50.0	0	0.0	0	0.0
Grade 2 hypertension	5	25.0	9	45.0	18	90.0	0	0.0
Grade 3 hypertension	9	45.0	1	5.0	2	10.0	20	100.0
Grade 4 hypertension	2	10.0	0	0.0	0	0.0	0	0.0
Total	20	100.0	20	100.0	20	100.0	20	100.0

Based on Table 5.2 it shows that of the 20 respondents in the intervention group before the treatment was obtained 4 respondent (20.0%) who had grade 1 hypertension, 5 respondent (25.0%) who had grade 2 hypertension, 9 respondent (45.0%) who had grade 3 hypertension, and 2 respondent (10.0%) who had grade 4 hypertension. Whereas in the control group before it was obtained 0 respondent (0.0%) who had grade 1 hypertension, 18 respondent (90.0%) who

had grade 2 hypertension, 2 respondent (10.0%) who had grade 3 hypertension, and 0 respondent (0.0%) who had grade 4 hypertension.

Based on Table 5.3 it shows that of the 20 respondents in the intervention group after the treatment was obtained 10 respondent (50.0%) who had grade 1 hypertension, 9 respondent (45.0%) who had grade 2 hypertension, 1 respondent (5.0%) who had grade 3 hypertension, and 0 respondent (0.0%) who had grade 4 hypertension. Whereas in the control group after obtaining 0 respondent (0.0%) who had grade 1 hypertension, 0 respondent (0.0%) who had grade 2 hypertension, 20 respondent (100.0%) who had grade 3 hypertension, and 0 respondent (0.0%) who had grade 4 hypertension.

3. Bivariate Analysis

Table 5.4
The Effect of Physical Exercise Brisk Walking on Changes in Systolic and Diastolic Blood Pressure in Diabetic Women in the Work Area Tamalanrea Public Health Center, Makassar City

Group	Systolic Blood Pressure			Diastolic Blood Pressure			P value
	Means Pretest	Means Posttest	Average difference Means	Means Pretest	Means Posttest	Average difference Means	
Intervention	174.00	154.00	20.00	99.50	96.00	3.50	0.001
Control	165.00	192.50	-27.50	96.50	100.50	-4.00	

Based on Table 5.4 shows that the average systolic blood pressure levels respondent before in the intervention group ie 174.00 mmHg, while the average systolic blood pressure levels respondent after in the intervention group viz 154.00 mm Hg. Average systolic blood pressure level respondent before in the control group ie 165.00 mmHg, while the average systolic blood pressure levels respondent after in the intervention group viz 192.50 mm Hg. The mean change in systolic blood pressure in the intervention group decreased by 20.00 mm Hg, while in the control group it increased by 27.50 mmHg. The results of the Mann Whitney test obtained a value of $\rho=0.001 < \alpha=0.05$, so the alternative hypothesis was accepted. The interpretation is that there is an effect of fast walking physical exercise on changes in systolic blood pressure in women with diabetes in the working area of the Tamalanrea Health Center, Makassar City. diastolic blood pressure respondent before in the intervention group ie 99.50 mmHg, while the average diastolic blood pressure levels respondent after in the intervention group viz 96.00 mm Hg. Average diastolic blood pressure level respondent before in the control group ie 96.50 mmHg, while the average diastolic blood pressure levels respondent after in the intervention group viz 100.50 mm Hg. The mean change in blood pressure diastolic in the intervention group, which decreased by 3.50 mm Hg, whereas in the control group it increased by 4.00 mmHg. The results of the Mann Whitney test obtained a value of $\rho=0.001 < \alpha=0.05$, so the alternative hypothesis was accepted. The interpretation is

that there is an effect of fast walking physical exercise on changes in diastolic blood pressure in diabetic women in the working area of the Tamalanrea Health Center, Makassar City.

IV. Discussion

Based on the research results it can be seen that the average blood pressure level of the intervention group viz 174/99,5 mm Hg, after treatment changed to 154/96 mm Hg so some of the respondents were before experiencing grade 3 hypertension after treatment most of the respondents experienced grade 1 hypertension in this case showed that there was a change in blood pressure in the intervention group given brisk walking physical exercise that can increase sympathetic activity, reduce parasympathetic activity and increase skeletal muscle activity as a result of increased sympathetic activity and decreased parasympathetic activity and increase heart rate, cardiac output, and increase in blood pressure so that after regular exercise there will be a decrease vasopressin, increasing the work efficiency of the heart, and decreasing sympathetic activity which increases the work efficiency of the heart causing decreased cardiac output followed by a decrease in systolic and diastolic blood pressure. As for the control group average blood pressure levels respondent before that is 165/96.5 mm Hg, and without intervention after averaging blood pressure levels respondent that is 192.5/100.5 mm Hg indicates an increase in blood pressure levels and the presence of several respondents who experienced a change in condition to grade 3. This may be due to the respondent continuing to carry out their usual activities without pharmacological or non-pharmacological therapy if they do not experience typical complaints or symptoms of hypertension, apart from the age and duration of suffering. is also a determining factor as evidenced by the presence of a response that changes to grade 3 because the average hypertension is above > 10 years so that overall the physiology of the heart experiences hypertrophy while other organs experience shrinkage or shrinkage as in the case of blood vessels that are getting smaller due to the aging process, the heart wall thickens, the heart valves begin to thicken and stiffen, so that the pumping power of the heart muscle decreases causing an increase in blood pressure so that women tend to have risk factors for cardiovascular disorders compared to men such as central obesity, increased total cholesterol, and low HDL although on average women have lower diastolic blood pressure than men, women have higher systolic blood pressure which is very prominent in women (Ong et al., 2008). There were 9 respondents who experienced a change in hypertension to grade 2 due to the age factor, where aged > 45 years who entered the elderly stage were at risk of experiencing hypertension 9 times because in the elderly the arterial walls would experience thickening due to a buildup of collagen substances in the muscle layer which makes blood vessels blood will gradually narrow and become stiff (Elly Purnamasari, Lilis Komariah,

2020) from the results of this study the average change in blood pressure in the intervention group decreased by 20.0/3.5 mm Hg, whereas in the control group it increased by 27.5/4.0 mmHg. The results of statistical tests showed that there was an effect of brisk walking physical exercise on changes in blood pressure in women with diabetes in the working area of the Tamalanrea City Health Center Macassar. Elderly women who are female are at risk of experiencing hypertension if they have experienced menopause, while women who are not yet menopausal are protected by the hormone estrogen which plays a role in increasing levels of High Density Lipoprotein (HDL). Low HDL cholesterol levels and high LDL cholesterol (Low Density Lipoprotein) affect the occurrence of atherosclerosis and result in high blood pressure. (Fredy Akbar, Hamdan Nur, 2020). High blood pressure in particular systolic is a major modifiable risk factor for cardiovascular disease and aging-related disorders and its incidence increases markedly with age in postmenopausal women so that above normal (i.e., ≥ 120 mm Hg) is associated with vascular endothelial dysfunction, which mediated by excessive reactive oxygen species which causes oxidative stress and consequently decreases the bioavailability of nitric oxide so it is recommended to do moderate intensity aerobic exercise. (Craighead et al., 2022). Low or moderate intensity physical exercise (with an estimated 50% Vo_2max), which can significantly reduce blood pressure with a duration of 30-60 minutes/week, up to the greatest decrease in blood pressure if physical exercise is performed 61-90 minutes/week (brisk walking exercise) 4.8-6.4 km per hour for 30 minutes (Princess et al., 2021). Light exercise that can be done by people with diabetes mellitus is walking for 30 minutes and brisk walking for 20 minutes (Sriwahyuni et al., 2021). Eight out of ten adults in the United States do not meet global physical activity guidelines, so a comprehensive aerobic exercise health promotion strategy is needed to increase adherence, including older adult women, to avoid worsening health conditions. (Bennie et al., 2019).

Diabetes Mellitus which is characterized by the presence of hyperglycemia is one of the risk factors for hypertension. Hyperglycemia is often accompanied by the onset of the metabolic syndrome, namely hypertension. One of the complications of diabetic macroangiopathy can occur due to changes in blood sugar levels, high blood sugar will stick to the walls of blood vessels. After that, an oxidation process occurs where blood sugar reacts with proteins from the walls of blood vessels which causes AGEs. Advanced Glycosylated Endproducts (AGEs) are substances formed from excess sugar and protein that bind together. This situation damages the inner walls of blood vessels, and attracts saturated fat or cholesterol to stick to the walls of blood vessels, (Winta et al., 2018). Opinions vary about the vascular

disease process. Sex-specific analysis suggests that blood pressure increases more rapidly in women than in men.(Ji et al., 2020)

Brisk walking exercise is a form of aerobic exercise and a form of moderate activity exercise for hypertensive patients using fast walking techniques for 20-30 minutes with an average speed of 4-6 km/hour.(Nurbaiti & Yuliana, 2020). Brisk walking exercise is a sport that can reduce blood pressure if done regularly three times a week in the morning with a duration of 30 minutes(Nurcahyani et al., 2022). Brisk walking exercise is a sport of physical activity that is carried out such as aerobic exercise which is useful in reducing blood pressure if done regularly it is effective because it can increase the maximum capacity of the heart rate(Astuti et al., 2020). In this case aerobic exercise such as brisk walking exercise which is carried out routinely can reduce the peripheral resistance of blood vessels so that the heart contracts less to pump blood with the same volume. Increased work efficiency of the heart results in a decrease in systolic blood pressure, while a decrease in peripheral resistance results in a decrease in diastolic pressure.(Mulia et al., 2020).

*Brisk walking exercise*This can be used as a complementary therapy to lower blood pressure in primary and secondary hypertension patients. Brisk walking exercise has an impact on reducing the risk of mortality and morbidity in hypertensive patients through the mechanism of burning calories, maintaining body weight, helping the body relax and increasing beta endorphins which can reduce stress as well as the safety level of applying brisk walking exercise at all age levels of people with hypertension(Nurcahyani et al., 2022). In addition to physical activity which is considered very influential on changes in systolic blood pressure adherence to diet and physical activity using a socio-cognitive approach (eg self-efficacy and social support) can be an effective approach in understanding the management of hypertension, high self-efficacy also has better measured systolic blood pressure(Kang et al., 2020). explore cultural interactions with coping strategies and develop useful and valuable resources and support for people with Multiple Sclerosis to promote health(Stuifbergen et al., 2021). Hypertensive patients who have a history of myocardial infarction are very suitable for using a single pill combination of perindopril to achieve blood pressure and accompanied by improvement in angina symptoms and short use of active nitrates.(Kobalava et al., 2023)

V. Conclusion

Brisk Walking physical activity has an influence on changes in blood pressure in diabetic women so it is hoped that activity activities will be increased as one of the therapies in non-pharmacological treatment of diabetes mellitus patients, especially those in the working area of the Tamalanrea Health Center, Makassar City.

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