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EFFECTIVENESS OF PHYSICAL EXERCISE PROGRAM ON REDUCING BLOOD PRESSURE IN HYPERTENSION PATIENTS

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ABSTRACT
Hypertension is a chronic disease, called the silent killer. WHO data shows that the number of people with hypertension continues to increase. In Riau Province, the prevalence of hypertension increased from 20.9% (2013) to 29.1% (2018). Hypertension will cause various complications such as encephalopathy, heart disease, hemorrhagic stroke, kidney failure, heart failure, and others. Action needs to be taken to reduce the increasing number of hypertension cases. Objective: This study examines the effectiveness of a physical exercise program in reducing blood pressure in hypertension patients at the Pangkalan Kuras II Health Center. Method: It used a pre-test and post-test experimental design involving 101 hypertensive patients, primarily aged 46-64 years (85.1%) and mostly female (86.14%). The program included walking three times a week and exercising twice a week for three weeks. Blood pressure was measured using a manual device. The majority of participants had grade II hypertension. Result: The Wilcoxon Signed Rank Test showed significant reductions in both systolic (4.72 mmHg) and diastolic (3.13 mmHg) blood pressure, with a p-value of 0.000. Conclusions: This numbers indicates that regular physical exercise, such as walking and exercise, effectively lowers blood pressure in hypertensive patients.

Keywords: hypertension; physical exercise; patients

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INTRODUCTION

Along with the development of science and technology in the health sector, it has an impact on people's mindsets and behavior, resulting in changes in global disease patterns from infectious diseases to non-communicable diseases. In the 1990s, infectious diseases such as Upper Respiratory Tract Infections (URTIs), diarrhea, and others were the main causes of death and morbidity. (Dwicahya, 2023). However, since 2010, Non-Communicable Diseases (NCDs) such as stroke, heart disease, hypertension, and diabetes have now become the main causes of morbidity and death. NCDs not only attack the elderly, but also begin to occur at a young age, and affect various levels of society, both rich and poor, in urban and rural areas (Ministry of Health of the Republic of Indonesia, 2020). High blood pressure or hypertension is one of the chronic non-communicable diseases (NCDs) that is lifelong, very common and very easy to detect in the community (Wulandari & Puspita, 2019). Hypertension is nicknamed "the silent killer" because it often appears without symptoms (Bustamam, Fauziah, & Savitri, 2022). Hypertension is also one of the non-communicable diseases with a very high prevalence (Aditya, 2023).

WHO data shows that the number of people with hypertension continues to increase. In Riau Province, the prevalence of hypertension increased from 20.9% (2013) to 29.1% (2018). The results of the basic health research (Riskesdas) also recorded the same thing. In 2018, the prevalence of hypertension was ranked first among non-communicable diseases with the number of cases reaching 34.11% of the population in Indonesia. This data increased sharply by 25.8% in 2013. Hypertension can cause serious complications, such as stroke and kidney

failure, if not managed properly.Hypertension sufferers in Riau Province aged over 15 years are estimated at 2,160,935 people, where there was an increase in 2013 by 20.9% to 29.1% in 2018 (Ministry of Health of the Republic of Indonesia, 2018). The Pelalawan Regency Health Office noted that the prevalence of NCDs that ranked highest in 14 health center work areas was hypertension, namely 20,004 people, of which 8,080 were men and 11,924 were women (Pelalawan Regency Health Office, 2022). Hypertension will cause various complications such as encephalopathy, heart disease, hemorrhagic stroke, kidney failure, heart failure, peripheral vascular disease and damage to the retinal blood vessels which can result in visual impairment (Susanti, Triana, & Nurwiyeni, 2021). Complications can be more dangerous if not treated immediately and managed properly and even cause death (Kartika, Subakir, & Mirsiyanto, 2021).

Deaths due to hypertension in the world are eight million people every year (WHO, 2021). In Indonesia, deaths due to hypertension are 427,218 out of 63,309,620 (Ministry of Health of the Republic of Indonesia, 2018). In Riau Province, sufferers of non-communicable diseases include hypertension 63.5%, DM 57%, stroke 4.4%, kidney failure 0.8% (Ministry of Health of the Republic of Indonesia, 2018).Efforts to treat hypertension are carried out through pharmacological (drug) and non-pharmacological (lifestyle modification, physical exercise) methods. Physical exercise, such as walking and gymnastics, has been shown to be effective in lowering blood pressure. Several studies have shown that exercises such as hypertension gymnastics and regular walking can help lower blood pressure significantly.Pangkalan Kuras II Health Center is one of the health centers under the auspices of Pelalawan Regency. There are many complaints of pre-elderly and elderly with hypertension in the sub-district. Hypertension is a non-communicable disease with the most sufferers, namely 522 people with details of 218 men and 304 women (Pangkalan Kuras II Health Center, 2022).

Pharmacological and non-pharmacological treatment in the form of gymnastics has been carried out but has not been carried out routinely, structured and scheduled, so it has no impact on controlling blood pressure in hypertension sufferers in the work area of Pangkalan Kuras II Health Center. In addition, physical exercise, namely gymnastics or walking, is sometimes only during elderly healthcare activities. Therefore, researchers feel it is important to carry out a routine, structured and scheduled physical exercise program according to the conditions and characteristics of hypertension sufferers in the work area of Pangkalan Kuras II Health Center.The achievement of the objectives of the physical exercise program implemented is to achieve a decrease in blood pressure in people with hypertension. Based on this description, researchers are interested in examining the effectiveness of physical exercise on reducing blood pressure in hypertension sufferers in the work area of Pangkalan Kuras II Health Center, Pelalawan Regency.

METHOD

This study aims to test whether there is an effect of implementing a physical exercise program on reducing blood pressure in patients with hypertension in the work area of the Pangkalan Kuras II Health Center.The location of the study was carried out in three villages in the work area of the Pangkalan Kuras II Health Center, namely Kemang Village, Meranti Village and Harapan Jaya Village. Referring to the results of observations carried out in early 2022 which showed that in the three villages the most people with hypertension and the Village Heads of Kemang, Harapan Jaya, and Meranti as well as local midwives and cadres support the physical exercise program that will be implemented by researchers.Data is the most important part of every study and research (Herlina, 2019). To answer the research, the data needed is extracted by obtaining information directly from patients who are carrying out the physical exercise program. The data sources used are primary data and secondary data. Primary data

comes from patients directly, namely by measuring blood pressure before and after blood pressure measurements using an intervention table. The tool used by researchers in carrying out blood pressure measurements in physical exercise programs is an aneroid sphygmomanometer. While the secondary data used are observations of the implementation of physical exercise programs in three working areas of the Pangkalan Kuras II Health Center and other documents related to the study. The population in this study were all hypertension sufferers in three villages in the working area of the Pangkalan Kuras II Health Center, totaling 135 people. The sampling technique was carried out purposively. Sampling with the purposive technique was carried out intentionally from a participant because he had met the requirements of the predetermined sample. The samples taken in this study were subjects who had inclusion and exclusion criteria. The number of samples based on the Slovin formula from a total population of 135 people, using the Slovin formula. It is estimated that a sample of 101 people is needed. Then a proportional sampling technique is carried out to obtain samples per village. In this approach, each strata sample size is directly proportional to the population size of the entire strata population (Firmansyah & Dede, 2022).

Table 1.
Sample Calculation

No	Village	Number of people	Number of participating respondents
1	Kemang	45	34
2	Meranti	49	37
3	Harapan Jaya	40	30

After the sample has been determined, the next step is to do physical exercise. The schedule for implementing the physical exercise program is determined in each class for three weeks where hypertension gymnastics is carried out twice a week, walking is carried out three times a week. Hypertension participants must be present for every physical exercise for three weeks. Researchers measure blood pressure using a tensiometer before and after carrying out physical exercise.

RESULT

After three weeks, the data was collected and tested for differences in the average before and after the implementation of physical exercise. Before testing the difference in the average, a normality test was first performed on the data.

Table 2.
Normality Test

Experimental Group	*p-value*
Pre-test	0.000
Pre-test Diastole	0.000
Post-test Systole	0.000
Post-test Diastole	0.000

Based on the table above, it is known that the p-value of the pre-test and post-test in systole and diastole is less than 0.05, so it can be concluded that the data is not normally distributed. Because the pressure data is not normally distributed, it cannot use a paired sample t-test. So the solution is to use the Non-Parametric Statistical Analysis Approach. The test used is the Wilcoxon Signed Rank Test. Because it does not meet the assumption of normality, the test used is the Wilcoxon Signed Rank Test. The following are the test results.

Table 3.
Blood Pressure Test Results of Physical Exercise Implementation in Kemang Village

Physical Exercise		*p-value* I	*p-value* II	*p-value* III
Walking	Systole	0.000	0.000	0.000
	Diastole	0.000	0.000	0.000
Exercise	Systole	0.000	0.000	0.000
	Diastole	0.000	0.000	0.000

Based on the table of results from the Wilcoxon Signed Rank Test calculation, it can be seen that the p-value of systole is 0.000 and for the p-value of diastole is 0.000 where this value is less than the critical limit of the study, which is 0.05. Thus, the decision of the hypothesis taken is to accept H1, meaning that there is a difference between the pre-test and post-test groups of systole walking and gymnastics for three weeks in Kemang Village.

Table 4.
Blood Pressure Test Results of Physical Exercise Implementation in Meranti Village

Physical Exercise		*p-value* I	*p-value* II	*p-value* III
Walking	Systole	0.000	0.000	0.000
	Diastole	0.000	0.000	0.000
Exercise	Systole	0,987	0.000	0.000
	Diastole	0,056	0.000	0.000

Based on the table of results from the Wilcoxon Signed Rank Test calculation, it can be seen that the p-value of systole is 0.00 and for the p-value of diastole is 0.000 where this value is less than the critical limit of the study, which is 0.05. Thus, the decision of the hypothesis taken is to accept H1, meaning that there is a difference between the pre-test and post-test groups of systole walking implementation for three weeks in Meranti Village. However, in the implementation of gymnastics in week I, it can be seen that the p-value is greater than the critical limit, which means that there is no difference between the pre-test and post-test groups of diastole implementation of gymnastics in week I in Meranti Village.

Table 5.
Blood Pressure Test Results of Physical Exercise Implementation in Harapan Jaya Village

Physical Exercise		*p-value* I	*p-value* II	*p-value* III
Walking	Systole	0.000	0.000	0.000
	Diastole	0.000	0.000	0.000
Exercise	Systole	0.000	0.000	0.000
	Diastole	0.000	0.000	0.000

Based on the table of results from the Wilcoxon Signed Rank Test calculation, it can be seen that the p-value of systole is 0.000 and for the p-value of diastole is 0.000 where this value is less than the critical limit of the study, which is 0.05. Thus, the decision of the hypothesis taken is to accept H1, meaning that there is a difference between the pre-test and post-test groups of systole of walking and gymnastics for three weeks in Harapan Jaya Village. After testing whether there was a decrease in blood pressure before and after walking and gymnastics, the researcher wanted to see whether blood pressure decreased from week I, week II to week III. Due to the non-normal distribution of data, the test used was the Friedman Test. The Friedman Test is a non-parametric test used in statistics to test a number (k) of paired samples, where the number of samples tested is more than two, with a minimum data scale in ordinal form (Kolassa, 2021).

Table 6.
Rank of Effectiveness of Physical Exercise Implementation in Kemang Village

Week I	2.95	2.76	2.85	2.45
Week II	1.92	2.06	2.04	2.43
Week III	1.13	1.18	1.10	1.13

Based on the table above, it can be seen that both walking and exercise have an effect on reducing blood pressure in hypertensive patients. However, when viewed from the rank, exercise is more effective in reducing blood pressure in Kemang Village.

Table 7.
Rank of Effectiveness of Physical Exercise Implementation in Meranti Village

Meranti Village	Rank			
	Walking		Exercise	
	Systole	Diastole	Systole	Diastole
Week I	2.88	2.51	2.96	2.80
Week II	2.05	2.32	1.91	1.98
Week III	1.08	1.16	1.14	1.22

Based on the table above, it can be seen that both walking and exercise have an effect on reducing blood pressure in hypertensive patients. However, when viewed from the rank, walking is more effective in reducing blood pressure in Meranti Village.

Table 8.
Rank of Effectiveness of Physical Exercise Implementation in Harapan Jaya Village

Harapan Jaya Village	Rank			
	Walking		Exercise	
	Systole	Diastole	Systole	Diastole
Week I	2.92	2.56	2.95	2.67
Week II	2.03	2.31	1.99	2.17
Week III	1.05	1.13	1.06	1.17

Based on the table above, it can be seen that both walking and exercise have an effect on reducing blood pressure in hypertensive patients. However, when viewed from the rank, exercise is more effective in reducing blood pressure in Harapan Jaya Village.

DISCUSSION

In the study conducted, researchers tested whether there was an effect of implementing a physical exercise program on reducing blood pressure in hypertension sufferers in the work area of the Pangkalan Kuras II Health Center. The independent variables in this study were physical exercise such as walking and gymnastics, while the dependent variable was blood pressure. Walking was carried out three times a week with a duration of twenty minutes. Gymnastics was carried out twice a week with a duration of twenty minutes. This physical exercise was carried out for three weeks in three villages in the work area of the Pangkalan Kuras II Health Center. Researchers measured blood pressure before carrying out physical exercise such as walking and gymnastics, carrying out physical exercise activities for twenty minutes, and then measuring the blood pressure of the physical exercise participants again. From the results of testing with the Wilcoxon Signed Rank Test, it can be seen that there wa a decrease in overall blood pressure. In Kemang Village, the implementation of walking and gymnastics every week decreased. In Meranti Village, every week the blood pressure of hypertension sufferers decreased after walking. However, for the implementation of gymnastics, the first week did not experience a decrease in blood pressure, but in the second and third weeks blood pressure did. In Harapan Jaya Village, the implementation of walking and gymnastics every week decreased.

From the results of the Friedman Test, the implementation of gymnastics is more effective than walking in Kemang Village. Meanwhile, in Meranti Village and Harapan Jaya Village, the implementation of walking is more effective than gymnastics. The effectiveness of walking and gymnastics is seen from the rank results obtained after testing. The walking rank value is lower than the gymnastics rank value in Kemang Village in the third week. This indicates that blood pressure after doing gymnastics is lower than after walking, therefore it can be concluded that walking is more effective in lowering blood pressure in Kemang Village. Meanwhile, in Meranti Village and Harapan Jaya Village, the walking rank value is lower than gymnastics. This indicates that blood pressure after walking is lower than after doing gymnastics, therefore it can be concluded that gymnastics is more effective in lowering blood pressure in Meranti Village and Harapan Jaya Village. From the results of tests conducted in three villages in the working area of the Pangkalan Kuras II Health Center, it can be concluded that the implementation of physical exercise walking in lowering blood pressure in hypertension sufferers. This is in line with research by Makawekes (2020) which states that doing regular physical activity can cause a decrease in atherosclerosis. Atherosclerosis is a condition in which there is thickening or hardening of the blood vessels due to plaque buildup in the inner lining of the arteries. This condition is one of the causes of hypertension. In addition, doing regular physical activity has been shown to reduce systolic pressure by up to 10 mmHg and diastolic pressure by up to 7.5 mmHg.

According to Makawekes (2020), walking is also effective in increasing the maximum capacity of the heart, stimulating muscle contractions, increasing glycogen breakdown, and increasing oxygen supply to tissues (Makawekes, Suling, & Kallo, 2020). Research by Sari and Wulandari (2022) concluded that there was a significant difference in blood pressure in respondents with hypertension at the UPTD PSLU Tresna Whreda Natar, South Lampung, before and after doing structured walking, with a p-value of 0.001 which is smaller than the significance level $\alpha = 0.05$. From the results of the study conducted in three villages in the working area of the Pangkalan Kuras II Health Center, it can be seen that the implementation of gymnastics in three villages in the working area of the Pangkalan Kuras II Health Center, twice a week for three weeks with a duration of 30 minutes, is effective in lowering blood pressure. Doing gymnastics increases the need for oxygen in cells for the energy formation process, which causes an increase in heart rate, cardiac output, and stroke volume. This increase has the potential to lower blood pressure. This is in line with research conducted by Alhaq (2023) activities in the form of hypertension gymnastics in the elderly with hypertension with a frequency of 30 minutes, 2 times a week for 3 weeks showed changes in blood pressure reduction in elderly with hypertension (Alhaq, 2023). The results of the physical exercise research conducted by researchers are not in line with the research conducted by Arisandi and Mardiah (2022). From the results of the research conducted, the results of the statistical test showed a p-value of 0.26, which is greater than the significance value of $\alpha = 0.05$. This indicates that there is no significant effect of gymnastics on reducing blood pressure in the Work Area of the X Palembang Health Center (Arisandi & Mardiah, 2022).

CONCLUSION

Based on the results of this study, it shows that there is an effectiveness of physical exercise programs on reducing blood pressure in patients with hypertension who tend to experience a decrease in blood pressure after following a physical exercise program of walking three times a week and gymnastics twice a week. The results of this study show the advantages and benefits that can be provided by physical exercise programs to reduce blood pressure in patients with hypertension. In general, practical implications show that promotional efforts for physical exercise are one of the preventive measures against complications caused by

hypertension so that the mortality rate will decrease in the coming year.

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