

The Effect of Healthy Heart Exercise on Blood Pressure Reduction in Elderly Productive

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Abstract. Hypertension is a significant cause of premature death worldwide. One of the management of hypertension in the elderly is healthy heart exercise. This study aims to determine the effect of healthy heart exercise series one in reducing blood pressure in productive elderly 45-59 years old in the Bangka Kenda Health Center area. The research method used is pre-experiment, one group pre and post-test design—the total sample of 30 people selected by purposive sampling. The analysis data involved using the Wilcoxon test. The cardio exercise series one after six times exercise significantly affected changes in systolic and diastolic blood pressure in productive elderly (p-value 0.000 <0.05). Healthy heart exercise series one is an alternative non-pharmacological treatment to lower blood pressure in the elderly productive.

Keywords: hypertension, elderly, healthy heart exercise

1. Introduction

Hypertension is one of the non-communicable diseases that interfere with the cardiovascular system. The disease that most often affects people today is the leading cause of premature death worldwide [1]. From the last ten years before the pandemic, Indonesia experienced an epidemiological transition where there was a shift from Communicable Diseases (CD) to Non-Communicable Diseases (NCDs). As a result, Indonesia is in a situation where the number of non-communicable diseases is high, coupled with a high transmission rate of Covid-19; this condition can increase the risk of death. Since the Covid-19 pandemic, non-communicable diseases have become the main comorbidities for the severity of the Covid-19 disease [2]. This happens because people with comorbid diseases have a weaker or lower immune system than those without comorbid diseases. They are very vulnerable to viral infections such as Covid-19, so the risk of death increases.

According to the World Health Organization (WHO) data for 2021, it is estimated that people with hypertension worldwide occur in adults aged 30-79 years, of which the majority (two-thirds) are low- and middle-income. People with hypertension are generally unaware of this condition—meanwhile, less than half of adults diagnosed and treated with hypertension, around 42%. Adults who control hypertension are only a tiny proportion, approximately 1 in 5 adults (21%) [3]. In Indonesia, hypertension is one of the non-communicable diseases that ranks first in health problems, with the number of cases reaching 185,857. The 2018 Basic Health Research (Riskesdas) showed that hypertension in Indonesia in 2013 was 25.8%, up 8.3% to 34.1% in 2018. From the prevalence of 34.1%, 8.8% were diagnosed with hypertension and were diagnosed with hypertension but did not take medication, and the other

32.3% did not take medication regularly. Hypertension occurs in the age group of 31-44 years (31.6%), age 45-54 years (45.3%), and age 55-64 years (55.2%) [4]. These data indicate that the prevalence of hypertension is most common in the 55 – 64 year age group and the least in the 31-34 year age group. Based on data from the Manggarai District Health Office, hypertension is first among 17 Non-Communicable Diseases (PTM) in the Manggarai Regency. The number of people with hypertension in 2018 was 16,051, to 19,217 in 2019, an increase of 19,435 in 2020. These data show that the incidence of hypertension in Manggarai has increased yearly [5].

According to [4], for the population aged 15 years and over, the risk factor for the proportion of people who lack physical activity is 35.5%. Physical activity in the elderly influences blood pressure; the less the elderly do physical activity, the more blood pressure will increase. Lack of physical activity makes the organs, blood supply, and oxygen stagnate, thereby increasing blood pressure [6]. Hypertension management is carried out with pharmacological and non-pharmacological therapies. The Indonesian government's program to reduce the incidence of hypertension through non-pharmacological treatment is the Chronic Disease Management Program (PROLANIS). One form of this program is the healthy heart exercise series [7]. Research by Sari (2021) shows that cardio training has a very significant effect on reducing blood pressure. The benefits of healthy heart exercises include improving blood circulation, balancing energy flow in the body, and relaxing muscles [8].

His research was carried out at the Bangka Kenda Health Center, one of the health centres with hypertension increasing yearly. The incidence of hypertension in 2019 was 533 people to 641 people in 2020. Since 2020 PROLANIS activities have been carried out at an integrated healthcare point in Kaweng hamlet because the elderly with hypertension are mostly in Kaweng Hamlet. The training program is carried out once a month, but there is to be further evaluation regarding this program. Therefore, researchers want to know how healthy heart exercise series one reduces blood pressure in productive elderly aged 45-59.

2. Method

This study used a quantitative research method with a pre-experimental design in the form of a one-group pre-post-test design approach to determine the effect of heart-healthy exercise therapy on changes in blood pressure in the elderly. Hypertensive elderly of productive age (45-59 years) as a population in a study conducted in Bangka Kenda Village. Samples were selected using a purposive sampling technique taking into account the inclusion and exclusion criteria. The sample size based on the calculation results is 30 respondents.

Data collection is done by conducting interviews and direct data collection. Interviews related to respondents' demographic data and measuring blood pressure using a sphygmomanometer. This research activity was carried out for three weeks, each week consisting of two exercises with a duration of 20 minutes for each exercise. The type of healthy heart exercise used in this exercise is a series one healthy heart exercise. The principles in carrying out heart-healthy exercises are: healthy heart exercises must increase the training load so that the pulse of the heart is maintained. During exercise, the movement must be maintained. The attitude of the walking legs, such as walking in place or lifting the legs, is carried out continuously, in addition to movements of other body parts. Exercise movements are arranged by prioritizing the heart's ability, large muscle movements, joint flexibility, and efforts to enter as much oxygen as possible. The principle of the exercise begins with a warm-up, core, and cool-down exercise [9]. Data analysis was performed using univariate, bivariate methods. Bivariate analysis was performed using the Wilcoxon test.

3. Result and Discussion

3.1 Respondents' Characteristics by gender and age

Table 1. Respondents' Characteristics by gender and age in Kaweng Hamlet Working area of Bangka Kenda Health Center

Characteristic	Category	Frequent (n)	Percentage (%)
gender	Male	4	13,3
	Female	26	86,7
	Total	30	100
age	45-51	16	53,3
	52-59	14	46,7
	Total	30	100

Source: primary data 2022

Based on the frequency table for the elderly with hypertension in Kaweng Hamlet, most are female, 20 people with a percentage of 86.7%, and the least are male, namely four people with 13.3%. In addition, most of the elderly are 45-51 years old, namely 16 people, with a percentage of 53.3%. Furthermore, at least they are in the age range of 52-59 years, namely 14 people, with a percentage of 46.7%. The age of person at risk of suffering from hypertension is over 45 years of age; it is a degenerative process where the elasticity of blood vessels decreases.

Consideration of age selected productive elderly age with hypertension grade one characteristic because, at this age and category of hypertension, the degenerative process can still be prevented by regular exercise (gymnastics). Based on the theory, gender affects the incidence of hypertension because there are hormonal factors, namely the hormone estrogen. The estrogen receptor mediates the effect of the hormone estrogen. Hormone estrogen consists of 2 receptors: the estrogen receptor, which is usually called the classic receptor (ER α), and the estrogen receptor (ER β). Both receptors are located in the cell nucleus and are transcription factors active ligands. The hormone estrogen can enter cells through passive diffusion of the plasma membrane and will bind to receptors in the cell nucleus. Estrogen receptors ER α and ER β receptors influence increasing blood pressure because estrogen receptors regulate blood vessel dilation, inhibit smooth muscle cell growth (VSMC), trigger proliferation after damage, and inhibit the renin-angiotensin-aldosterone system (RAAS). The cessation of the function of these hormones can cause constriction of blood vessels, which results in increased blood pressure.

3.2 An overview of the average changes in blood pressure pre-test and post-test

Table 2 Test Results for Differences in Pre and Post-Blood Pressure Tests for Healthy Heart Exercises

	Pre-test		Post-test	
	Mean systolic (mmHg)	Mean diastolic (mmHg)	Mean systolic (mmHg)	Mean diastolic (mmHg)
2 nd exercise	149	94	140	92
4 th exercise	146	93	139	90
6 th exercise	138	89	134	89

Source: primary data 2022

Table 2 shows a difference in mean systolic and diastolic blood pressure of the elderly before and after healthy heart exercises. The results of the respondent's blood pressure examination, both systolic pre-test and diastolic pre-post-test in the 2nd exercise, the average blood pressure of the elderly are included in the category of first-degree hypertension. Meanwhile, in the second exercise, the average pre-test systolic blood pressure was still at the first degree, while the post-test systolic blood pressure had decreased to a regular high. In the sixth exercise, the mean systolic blood pressure was 138 mmHg, diastolic 89 mmHg. It decreased to 134 mmHg and 89 mmHg diastolic, indicating this value of the blood pressure of the elderly is in the high normal category.

3.3 Effect of cardio exercise on decreased blood pressure before and after exercise

Table 3. The Effect of Cardio Exercise on Blood Pressure Reduction Before and After Exercise in Elderly with Hypertension in Kaweng Hamlet

Time of Measurement	Blood Pressure							
	Sistolic <i>pre-post</i>				Diastolic <i>pre-post</i>			
	N	Mean ranks	Some of ranks	P value	N	Mean ranks	Sum of ranks	P value
1 st week (2 nd exercise)								
Negative ranks	8 ^g	5.63	45.00	.072	12 ^j	9.67	116.00	.180
Positive ranks	Two ^h	5.00	10.00		6 ^k	9.17	55.00	
Ties	20 ⁱ				12 ^l			
2 nd weeks (4 th exercise)				.000				.000
Negative ranks	30 ^s	15.50	465.00		25 ^v	13.00	325.00	
Positive ranks	0 ^t	.00	.00		0 ^w	.00	.00	
Ties	0 ^u				5 ^x			
3 rd weeks (6 th exercise)				.000				.000
Negative ranks	30 ^{ae}	15.50	465.00		30 ^{ah}	15.50	465.00	
Positive ranks	0 ^{af}	.00	.00		0 ^{ai}	.00	.00	
Ties	0 ^{ag}				0 ^{aj}			

Source: primer data 2022; Statistic Wilcoxon test

The results showed that in the first week of 2nd exercise, there had not been a significant decrease in blood pressure as an effect of cardio exercise and was still in the category one hypertension grade, which can be seen from the Wilcoxon test results where the systolic p value was 0.072 or $p > 0.05$. and the diastolic p-value of 0.180 or $p > 0.05$.

According to Meikle et al., the need for oxygen in the cells will increase as long as a person does healthy heart exercises; this is necessary for forming energy. During exercise, there is an increase in heart rate, increase in cardiac output, and stroke volume. The following effect will increase blood pressure. After rest, the blood vessels will dilate or stretch, and blood flow will temporarily decrease; at about 30-120 minutes, they will return to pre-exercise blood pressure [10]. This research is in line with Aini (2019) said that at the beginning of exercise, an individual's blood pressure tends to remain the same and even experience an

increase that occurs because at the beginning of the exercise (the heart) is still adapting. The type of exercise is done so that the heart muscle works harder to pump blood. In addition, it is influenced by other factors, such as stress and consumption of caffeinated drinks, as stated by most of the elderly [11].

In the third week of 6th exercise, the decrease in blood pressure was very significant. All respondents experienced a decrease in systolic and diastolic blood pressure and were included in the category of high normal hypertension. It is supported by the results of the Wilcoxon test analysis, where the p-value for systolic and diastolic blood pressure is 0.000 or p-value <0.05. According to [11], by exercising regularly, the walls of blood vessels become more robust against changes in blood pressure, and their elasticity can be maintained accompanied by vasodilation of the anterior part of the blood vessel structure, the number of active capillaries in the muscles being trained will be higher. So that blood pressure will be stable and blood circulation will be smooth. Thus, it can be concluded that the administration of healthy heart exercise therapy series I affect changes in blood pressure in productive elderly with hypertension.

Moderate-intensity aerobic exercise includes healthy heart exercise. Cardio exercise therapy series must be carried out regularly to lower blood pressure which lasts longer, and blood vessels will be more elastic [12]. It is in line with Alhuda et al.'s research, which said that productive age could lower blood pressure by exercising regularly and exercising a healthy heart [13]. In addition, research by [9] suggests that heart performance decreases as age increases. Thus healthy heart exercises can provide flexibility and strength and increase the work and flexibility of the muscles quickly, which will have an impact. Furthermore, the significant benefit is that it can lower blood pressure and reduce stress.

One of the causes of increased blood pressure is stress. Stressful conditions can trigger hormones that can affect the vasoconstriction of blood vessels, thereby increasing blood pressure. Increased blood pressure can be lowered by doing healthy heart exercises. The mechanism of reducing blood pressure is through relaxation so that vasodilation of blood vessels occurs during exercise. The results of this study align with those described by [14] in their research, which stated that based on the pair sample T-test, there were differences in blood pressure before and after the healthy heart exercise intervention.

4. Conclusion

The results of the study prove that age and gender are factors that can cause changes in blood pressure. When we get older, the elasticity of blood vessels decreases. Gender also affects the incidence of hypertension, where in women, there is a decrease in the hormone estrogen, which causes vasoconstriction of blood vessels. In addition to these two factors, other factors predispose to increased blood pressure in the elderly.

Healthy heart exercise series one can be a non-pharmacological therapy to reduce blood pressure. The mechanism for reducing blood pressure is carried out through a series one heart exercises regularly. The study's results prove that doing one set of cardio exercises six times for three weeks can lower blood pressure. The mechanism for reducing blood pressure occurs because blood vessels experience vasodilation during a routine exercise.

References

- [1] D. R. Karyono and A. L. Wicaksana, "Current prevalence, characteristics, and comorbidities of patients with COVID-19 in Indonesia," *J. Community Empower. Heal.*, vol. 3, no. 2, p. 77, 2020, doi: 10.22146/jcoemph.57325.
- [2] WHO, "Global Health Estimates: Life expectancy and leading causes of death and disability," 2020. <https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates>
- [3] Kementerian Kesehatan RI, "Riset Kesehatan Dasar," Jakarta, 2018. doi: 10.1177/109019817400200403.
- [4] Dinas Kesehatan Kabupaten Manggarai, "Sebaran Data Penyakit," Ruteng, 2020.
- [5] E. Makawekes, L. Suling, and V. Kallo, "Pengaruh Aktivitas Fisik Terhadap Tekanan Darah Pada Uia Lanjut 60-74 Tahun," *Keperawatan*, vol. 8, no. 1, p. 83, 2020, doi: 10.35790/jkp.v8i1.28415.
- [6] K. K. Republik Indonesia, "Hipertensi Penyakit Paling Banyak Diidap Masyarakat," 2019. <https://www.kemkes.go.id/article/view/19051700002/hipertensi-penyakit-paling-banyak-diidap-masyarakat.html>
- [7] E. Sari, "Pengaruh Senam Jantung Sehat Terhadap Tekanan Darah Lansia di Panti Tresna Werda Hargo Dedali Surabaya," *J. Keperawatan*, vol. 10, no. 1, pp. 29–39, Jun. 2021, doi: 10.47560/kep.v10i1.268.
- [8] S. Hartutik and E. D. Noorratri, "Senam Jantung Terhadap Hipertensi Pada Lansia," *Gaster*, vol. 17, no. 1, p. 86, 2019, doi: 10.30787/gaster.v17i1.344.
- [9] J. Meikle, A. Al-Sarraf, M. Li, K. Grierson, and J. Frohlich, "Exercise in a healthy heart program: A cohort study," *Clin Med Insights Cardiol*, vol. 7, pp. 145–151, 2013, doi: 10.4137/CMC.S12654.
- [10] F. A. Kristina, "Hubungan Kebiasaan Olahraga dengan Tekanan Darah pada Penderita Hipertensi Usia Produktif di Puskesmas Bergas," Fakultas Keperawatan Ngudi Waluyo, Semarang, 2019. Retrieved from <http://repository2.unw.ac.id>, Accessed on Oct. 22, 2022.
- [11] H.Y.S. Giriwojo, H.R.D. Ray, A.Alfo and D.Z. Sidik, *Kesehatan, Olahraga & Kinerja*, Jakarta: Bumi Aksana, 2022.
- [12] N. Fitria, L. Lydyana, S. Iskandar, L. Lubis, and A. Purba, "Senam Jantung Sehat Seri-I 3 kali seminggu Meningkatkan Kebugaran Jasmani Lansia," *J. Pendidik. Keperawatan Indones.*, vol. 5, no. 1, 2019, doi: 10.17509/jpki.v5i1.15741.
- [13] T. R. Alhuda, S. Prastiwi, and N. Dewi, "Hubungan Antara Pola Makan dan Gaya Hidup dengan Tingkat Hipertensi pada Middle Age 45-59 Tahun di Wilayah Kerja Puskesmas Dinoyo Kota Malang," *Nurs News*, vol. 3, no. 1, 2018.
- [14] D. A. Anggraini, N. Nadiyah, I. Jus'at, R. Nuzrina, and N. Gifari, "Efektivitas Senam Jantung Sehat dalam Menurunkan Tekanan Darah pada Lansia Hipertensi," *Indones. J. Hum. Nutr.*, vol. 8, no. 1, p. 1, Jul. 2021, doi: 10.21776/ub.ijhn.2021.008.01.1.