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The Effect of Garlic Extract on Reducing Blood Pressure in Hypertension Patients

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ABSTRACT
Background: Hypertension is a condition that is often found in primary health care. Basic Health Research data for 2018 show that the prevalence of hypertension in Indonesia is 34.1%. Efforts that have been made to reduce the impact of hypertension include pharmacological and non-pharmacological therapies. Herbal therapy is included in complementary therapy, one of the herbal therapies to reduce blood pressure is the consumption of garlic. Garlic contains allicin and hydrogen sulfide which dilate and make blood vessels less rigid so blood pressure will decrease.
Purpose: To determine the effect of garlic extract on reducing blood pressure in hypertensive patients.
Methods: This is a pretest-posttest pre-experimental study for the causal relationship of garlic extract with a decrease in blood pressure. The samples of this study were hypertensive patients. The statistical tests used were the friedman test to compare pre, post-1, and post-2 and the Wilcoxon test to compare two repeated observations which were analyzed using Software Program Statistics System.
Results: For systolic blood pressure, the statistical test results obtain a p-value of (0.000) <0.05, which means that there is a change in blood pressure between pre, post-1, and post-2, with a change in magnitude of 13.43. Meanwhile, for diastolic blood pressure, the statistical test results obtain a p-value of (0.000) <0.05, which means that there is a change in blood pressure between pre, post-1, and post-2, with a change in magnitude of 8.67.
Conclusion: There is an effect of garlic extract on reducing blood pressure in hypertensive patients.

Keywords: blood pressure, garlic extract, hypertensive

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BACKGROUND

Hypertension, or what is often known by the public as high blood pressure is one of the cardiovascular health diseases. Hypertension is a condition where the pressure in the blood vessels is consistently too high due to the force of the blood pushing the arteries when the heart pumps it. The prevalence of Hypertensive Patients in the world is quite large, namely 1.18 billion people (WHO, 2022). Patients often do not realize that they have hypertension. This happens because there are no symptoms at all or there are only mild symptoms. Patients know they have hypertension after complications from hypertension, namely heart disease, kidneys, peripheral blood vessels, and nervous and cerebral disorders occur (RI Ministry of Health, 2021).

Indonesia, a developing country in Southeast Asia, is the third highest country with hypertensive patients with the prevalence of cases reaching 25% of the total population. Indonesia experienced an increase in the prevalence of hypertension from 2013 to 2018 from 31.7 to 34.11 where this increase in the prevalence of hypertension occurred in almost all provinces of Indonesia. The proportion of hypertension based on measurements according to gender shows that women are more likely to be hypertensive, with a percentage of 36.85% than men. Besides, the proportion of hypertension based on measurements according to age shows people aged 65 years and over are more likely to be hypertensive, with a percentage of 69.5% than people aged >65 years. This shows that the risk of developing hypertension tends to increase with increasing age. Furthermore, the proportion of hypertension based on measurements according to educational background shows that the lower the educational background the more likely people to be hypertensive.

Efforts to reduce the prevalence of hypertension to date have not been adequate even though effective drugs are widely available. As of December 2022, data show that the prevalence of people aged >15 years with high blood pressure in South Sulawesi is 20.85%. Meanwhile, Data for Minimum Service Standards of UPTD (Regional Technical Implementation Unit) *Puskesmas* Lawawoi show health services at the age of hypertensive patients in 2020 (139 cases), 2021 (275 cases), and 2022 (260 cases) (Profile of *Puskesmas* Lawawoi, 2022).

The high prevalence of hypertension is caused by factors including gender, family history, genetics of salt-sensitivity, smoking, and alcohol consumption which can lead to complications leading to death. This can happen if hypertensive patients have a unhealthy lifestyle without awareness to take prevention from complications due to hypertension. One thing that can be done to prevent complications due to hypertension from getting worse is by implmenting self-control to live a healthy lifestyle (Sutra Eni & Wijaya, 2017).

Efforts that have been made to reduce the impact of hypertension include pharmacological and non-pharmacological therapies. Pharmacological therapy is carried out by administering medication in the form of drugs. Types of antihypertensive medications include diuretics, beta-adrenergic blockers or beta-blockers, vasodilators, calcium channel blockers, and angiotensin-converting enzyme (ACE) inhibitors (Alvita et al., 2020). In addition to pharmacological therapy, non-pharmacological therapy for Hypertensive Patients can also be performed. Non-pharmacological therapy is carried out by implementing relaxation techniques, doing physical activities, not smoking, reducing salt consumption, and adopting a healthy lifestyle (Rohmawati & Prawoto, 2020).

Lifelong treatment of hypertension is relatively expensive because it has many side effects, causing patients to often disobey therapy and turn to other alternatives, namely herbal or non-pharmacological drug therapy. The tendency to use natural ingredients as medicine is gaining popularity among the public. This is done to reduce the side effects of using synthetic

drugs. Several studies have proven non-pharmacological treatments that can be used for hypertensive patients, namely by consuming star fruit juice (Averrhoa carambola L.), noni tea, grated turmeric, watermelon (Citrullus vulgaris), and garlic (Alvita et al., 2020).

Based on the results of combination therapy with herbal medicines using garlic for 3 days, there is an average decrease in blood pressure, namely systolic by 15 mmHg and diastolic by 10 mmHg (Aviana, Cahyani & Reynaldi, 2021). This is in line with a study by Wahyuningtyas, et al. (2023) on the effect of steeped garlic water on blood pressure in elderly patients with the results showing that before consuming steeped garlic water, most of the respondents had mild blood pressure and after consuming steeped garlic water, most of the respondents had normal blood pressure. Therefore, there is an effect before and after consuming steeped garlic water on reducing the blood pressure of elderly women in the Working Area of *Puskesmas* Jati, Probolinggo.

The garlic extraction method is more efficient and effective for isolating active compounds from garlic. This can increase the quality and quantity of the extract produced compared to the boiling method. The use of new technologies such as metabolomics, proteomics or genomics analysis in garlic extract research can provide new insights into its mechanisms of action and effects at the molecular level. Garlic extract can be applied in various fields, such as alternative medicine, food supplements, or even in the cosmetics industry.

Based on the background, garlic can be used as an alternative herbal medicine to reduce blood pressure in hypertensive patients. So, the researchers were interested to conduct a study entitled "The Effect of Garlic Extract on Reducing Blood Pressure in Hypertensive Patients."

METHODS

The research was pre-experimental, pre-test, post-test for the causal relationship between garlic extract and reduced blood pressure. With the aim of seeing the effect of garlic extract on reducing blood pressure in hypertension sufferers, the population in this study was all hypertension sufferers in the Lawawoi health center working area, while the sample in this study were patients who had been diagnosed as hypertension sufferers. Sampling was carried out by purposive sampling. This research was conducted in March - April 2023 and the statistical test used was Friedman to compare pre, post 1, and post 2 while the Wilcoxon test was used to compare two repeated observations which were analyzed using the Statistical Program System (SPSS) Software version 25. Collection Tools data in the form of an observation sheet and a blood pressure measuring device and how to make garlic extract based on the article studied including: pound three cloves of garlic until smooth, squeeze to extract the water, add 1-2 tablespoons of warm water. This garlic extract can be consumed once every day for 1 week.

RESULTS

Table 1. Distribution of Respondents by Gender

No	*Characteristics*	*f*	%
1.	**Gender**		
	Male	4	26.7
	Female	1	73.3
	Total	15	100.0

Based on Table 1, the number of male respondents is 4 people (26.7%) while the number of female respondents is 11 people (73.3%).

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Table 2. Distribution of Respondents by Age

No	*Characteristics*	*f*	%
1	**Age**		
	41-50 years old	7	46.7
	51-60 years old	8	53.3
	Total	15	100.0

Based on Table 2, the number of respondents who are 41-50 years old is 7 people (46.7%) and the number of respondents who are 51-60 years old is 8 people (53.3%).

Table 3. Distribution of Respondents by Education

No	*Characteristics*	*f*	%
1	**Education**		
	Elementary School	10	66.6
	Junior High School	4	26.7
	Senior High School	1	6.7
	Total	15	100.0

Based on Table 3, the number of respondents who are elementary school graduates is 10 people (66.6%), the number of respondents who are JHS graduates is 4 people (26.7%), and the number of respondents who are SHS graduates is 1 person (6.7%).

Table 4. Distribution of Respondents by Occupation

No	*Characteristics*	*F*	%
1	**Occupation**		
	Housewife	10	66.6
	Farmer	5	33.4
	Total	15	100.0

Based on Table 4, the number of respondents who are housewives is 10 people (66.6%) and the number of respondents who are farmers is 5 people (33.4%).

Table 5. Changes in blood pressure before intervention and after measurements I and II

Blood pressure	**Pre**		**Post-I**		**Post-II**		
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**p-value**
Systole	162.67	10.33	149.33	11.63	136.67	13.97	0
Diastole	92.67	7.04	84	5.07	77.33	4.58	0

Based on Table 5, the systolic blood pressure before the intervention has a mean of 162.67 and after the first measurement has a mean of 149.33. Furthermore, the systolic blood pressure in the second measurement has a mean of 136.67 (decreased). From the statistical test results, a p-value of (0.000) <0.05 is obtained, which means that there is a difference in the systolic blood pressure between before the intervention, during the intervention and after the first measurement, and the second measurement.

Meanwhile, the diastolic blood pressure before the intervention has a mean of 92.67 and after the first measurement has a mean of 84.00. Furthermore, the diastolic blood pressure in the second measurement has a mean of 77.33 (decreased). From the statistical test results, a

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p-value of (0.000) <0.05 is obtained, which means that there is a difference in the diastolic blood pressure between before the intervention, during the intervention and after the first measurement, and the second measurement.

Table 6. Changes in Blood Pressure Before Intervention and After Measurement I

Blood pressure	Pre		Post-I		p-value
	Mean	SD	Mean	SD	
Systole	162.67	10.33	149.33	11.63	0
Diastole	92.67	7.04	84	5.07	0

Based on Table 6, the systolic blood pressure before the intervention has a mean of 162.67 and after the first measurement has a mean of 149.33. From the statistical test results, a p-value of (0.000) <0.05 is obtained, which means that there is a difference in the systolic blood pressure between before the intervention and in the first measurement.

Meanwhile, the diastolic blood pressure before the intervention has a mean of 92.67 and after the first measurement has a mean of 84.00. From the statistical test results, a p-value of (0.000) <0.05 is obtained, which means that there is a difference in the diastolic blood pressure between before the intervention and in the first measurement.

Table 7. Changes in Blood Pressure Before Intervention and After Measurement II

Blood pressure	Pre		Post II		p-value
	Mean	SD	Mean	SD	
Systole	162.67	10.33	136.67	13.97	0.000
Diastole	92.67	7.04	77.33	4.58	0.000

Based on Table 7, the systolic blood pressure before the intervention has a mean of 162.67 and in the second measurement has a mean of 136.67 (decreased). From the statistical test results, a p-value of (0.000) <0.05 is obtained, which means that there is a difference in the systolic blood pressure between before the intervention and in the second measurement.

Meanwhile, the diastolic blood pressure before the intervention has a mean of 92.67 and in the second measurement has a mean of 77.33 (decreased). From the statistical test results, a p-value of (0.000) <0.05 is obtained, which means that there is a difference in the diastolic blood pressure between before the intervention and in the second measurement.

Table 8. Changes in Blood Pressure in Measurements I and II

Blood pressure	Post-I		Post-II		p-value
	Mean	SD	Mean	SD	
Systole	149.33	11.63	136.67	13.97	0
Diastole	84	5.07	77.33	4.58	0.002

Based on Table 8, the systolic blood pressure after the first measurement has a mean of 149.33 and decrease in the second measurement to 136.67. From the statistical test results, a p-value of (0.000) <0.05 is obtained, which means that there is a difference in the systolic blood pressure between the first and second measurements.

Meanwhile, the diastolic blood pressure after the first measurement has a mean of 84.00 and decrease in the second measurement to 77.33. From the statistical test results, a p-value of (0.000) <0.05 is obtained, which means that there is a difference in the diastolic blood pressure between the first and second measurements.

DISCUSSION

The Effect of Consuming Garlic Extract on Reducing Blood Pressure in Hypertension Sufferers

Based on researchers' analysis of hypertension sufferers, the trigger factors for hypertension are the habit of eating coconut milk and fatty foods, obesity, stress, hereditary factors, age factors, fondness for drinking coffee, smoking habits, frequent consumption of foods high in salt such as salted fish and excess salt in cooking. Consuming garlic can help reduce the occurrence of complications due to hypertension because the benefits of garlic can stabilize blood pressure, so that the death rate due to hypertension can be reduced. Apart from that, processing garlic is also easy and can be done by the family themselves without medical assistance. Based on research that has been conducted, it has been proven that the blood pressure of respondents after treatment has decreased. So therapy with garlic extract is quite effective in reducing and controlling blood pressure. During conducting this research, researchers also found no side effects on respondents, so garlic is safe to use as an alternative treatment for hypertension in everyday life.

Blood Pressure before Consuming Garlic ExtracBased on research conducted on 15 respondents, the results of the analysis show that the systolic blood pressure before being given garlic extract has a mean (average) of 162.67 mmHg and the diastolic blood pressure before being given garlic extract has a mean of 92.67 mmHg.

Hypertension therapy can be carried out using pharmacological and non-pharmacological methods. Garlic is one of the herbal ingredients that can be used because it is always available and can be found on the market as a kitchen spice that is used daily by people. (Riski Hevtidayah & Kafil, 2018) Garlic has an antihypertensive effect because it contains Nitric Oxide (NO). Garlic contains active compounds such as phosphorus, protein, iron, calcium, essential oils which are very effective in treating hypertension (Suhendro et al., 2021). Garlic extract inhibits the development of CAC (coronary artery calcification), reduces IL-6, glucose levels and blood pressure in patients at increased risk of cardiovascular events (Wlosinska et al., 2023).

Age can be used as the only indicator of someone who has hypertension because as a person ages 64, the risk of developing hypertension increases. This is related to changes in the cardiovascular system that occur as a person ages. (Ida Untari, 2018) Blood pressure increases with age, in the elderly the elasticity of the arteries decreases and the arteries become stiff. This increases systolic pressure because the flexible blood vessel walls are unable to retract, so the diastolic pressure becomes higher. (Mutaqqin et al., 2023) And only taking medication when the respondent's condition is not good (increasing condition), this situation continues to worsen blood pressure. On the contrary, there are significantly more women than men. This is related to the female hormone estrogen, which decreases after menopause. (Nanda Desreza, 2023).

In line with research (Ruadya Tuzzarah Dewi, 2022), the results of the study showed that the mean systole value before intervention was 150 mmHg and the mean systole value after intervention was 121.33 mmHg. The mean diastole value before the intervention was 91.33 mmHg and the mean diastole value after the intervention was 80.33 mmHg. The results of the Wilcoxon Test statistical test obtained a p value = 0.000 < α = 0.05, H0 was rejected and Ha was accepted, meaning that there was an effect of garlic drinks on systolic blood pressure at the Telaga Dewa Community Health Center, Bengkulu City in 2022. Based on research conducted by (Desreza, Erawati & Syarifah 2023), namely the results of the analysis of the decrease in blood pressure (systole) using the paired sample T-test, which obtained a p value of 0.000< □ =0.05, while the results of the analysis of the decrease in blood pressure (diastole) used the paired sample T-test The p value obtained was 0.000 < □ = 0.05 so it could be

concluded that there was a significant difference between the reduction in respondents' blood pressure (systole and diastole) before and after administration of garlic extract (allium sativum linn).

Researchers are of the opinion that giving garlic extract water can help reduce blood pressure in respondents, based on the research results it was found that changes in blood pressure occurred before and after giving garlic extract water. However, respondents should also avoid factors such as consuming foods containing coconut milk, high salt and fat. Therefore, respondents are advised to continue living a healthy lifestyle to protect themselves from complications that can arise at home due to high blood pressure. According to research conducted (Habriel Ruslie et al. 2013), it is best to carry out interventions routinely because four days are the days when blood pressure does not drop significantly. within a month the role of garlic in hypertensive patients does not have a significant effect on reducing blood pressure but can be used as part of the diet as a hypertension management strategy. This shows that the consistency of consumption of garlic extract must always be maintained and sustainable as an alternative medicine and not only and can regulate diet by reducing salt consumption to less than 5.8 grams per day, reducing smoking, starting a healthy life, working not too hard , keep emotions stable and not stressed in order to control blood pressure and limit consumption of foods containing fat such as meat, egg yolks, potato chips, salted crackers, frozen foods (nuggets, pizza and wafers), pastries and sodium sourced from Calorie intake such as fried foods, fried rice, snacks, salty cakes, soy sauce and salad dressing and the like.

In general, it is hoped that people will be able to prevent hypertension as early as possible, especially in people who have risk factors for hypertension through improving healthy lifestyles.

There is a need for a policy to use health promotion programs in the Lawawoi Community Health Center working area, namely early detection through regular health checks and the need to know the risk factors for the incidence of hypertension considering that the incidence of hypertension continues to increase from year to year.

CONCLUSION

There is an effect of garlic extract on reducing blood pressure in hypertensive patients. Suggestions for hypertension sufferers are that they can use garlic to lower high blood pressure as an alternative medicine and not only and can regulate their diet by reducing salt consumption to less than 5.8 grams per day, reduce smoking, start a healthy life, work less weight, keep emotions stable and not stressed in order to control blood pressure.

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CONFLICTS OF INTEREST

A limitation of this study is that the research time coincided with the respondents' working days and most hypertension sufferers experienced nausea when consuming processed garlic filters. So, to overcome these limitations, the next researcher is to determine the research day according to the respondent's holiday time and the respondent can be given fruit, for example bananas, after consuming processed garlic filters to avoid nausea.

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