Research Paper

Watermelon (*Citrullus vulgaris schard*) and Melon (*Cucumis melo*) Effective Reduce Blood Pressure in Prehypertension Patients

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Abstract

Cases of hypertension based on the number of cases of hypertension patients in Indonesia nationally experienced an increase in hypertension in residents aged ≥18 years who experienced hypertension from 25.8% in 2013 to 2018, as many as 34.1% based on doctors' diagnoses and people taking antihypertensive drugs as many as 8.8%. Efforts that can be made to treat high blood pressure can use watermelons and melons. To determine the effect of watermelons and melons on blood pressure in people with prehypertension in Giyanten Hamlet, Temanggung Regency. The research design uses an experimental design with a pretest and post-test control group design; the sampling technique uses simple random sampling. Population aged 25-50 years, the study sample was 30 in the intervention group and 30 in the control group; data analysis used paired t-test and independent t-test. The average pretest systolic blood pressure in the intervention group given watermelon and melon fruit was 126.90 mmHg and 82.70 mmHg diastolic. After being given treatment, systolic 118.30 mmHg and diastolic 79.73 mmHg with a p-value of 0.000. In the control group, the systolic pretest blood pressure was 119.17 mmHg and 82.10 mmHg diastolic, while the post-test blood pressure in the control group was 122.93 mmHg systolic and 83.37 mmHg diastolic with a p-value of 0.000. There is an effect of the consumption of watermelons and melons on systolic and diastolic blood pressure. Patients given watermelon and melon consumption experienced an average decrease in systolic and diastolic blood pressure, while in the control group, blood pressure increased.

Keywords *watermelon, melon, prehypertension*

INTRODUCTION

Prehypertension increases high blood pressure with a systolic blood pressure of 120-139 mmHg and a diastolic of 80-89 mmHg (Ministry of Health RI, 2019). Data from WHO in 2015 shows that around 1.13 billion people worldwide have hypertension. The number of people with hypertension continues to increase yearly, and it is estimated that 9.4 million people die from it annually (WHO, 2022). Based on the number of hypertension patients in Indonesia nationally, there was an increase in hypertension in residents aged ≥18 years who had hypertension from 25.8% in 2013 to 2018, as many as 34.1% based on a doctor's diagnosis, and people taking antihypertensive drugs 8% (Kemenkes, 2018). The prevalence of hypertension aged >18 years in Central Java province in 2018 was 37.57%, with a total population of 63,191 people. Based on the number of hypertension patients in Temanggung Regency cases in 2018, there was 10.89% with a population of 1.038 who occurred in Temanggung Regency (Kemenkes, 2018). Respondents of the study used prehypertension. They have not consumed high blood pressure medications to avoid confusing the study. After all, in someone who has not taken antihypertensive drugs, non-pharmacological interventions could affect blood pressure correctly. The authors hope to treat hypertension early because if prehypertension is not treated early, it will progress to the hypertension stage.

As an alternative treatment for prehypertension, researchers use non-pharmacological therapy. Lifestyle modification can also effectively control blood pressure (American Heart

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Association, 2017). Non-pharmacological management for hypertension can use food ingredients. The results of previous studies show that fruits are effective in lowering blood pressure. Fruits include watermelon, papaya, coconut water (Fadlilah et al., 2021), tomatoes and cucumbers (Fadlilah et al., 2020). Other herbal plants, such as roselle flowers and bay leaves, are also effective in lowering blood pressure (Nugroho et al., 2022)—comparison of water content in several fruits in 100 grams. The water content in bananas, melons, and watermelon is 72.9 grams, 90.8 grams, and 92. 1 grams. Phosphorus (P) in banana, melon, and watermelon is 30 mg, 14 mg, and 12 mg. Potassium (K) content in banana, melon and watermelon is 1.9 grams, 167.0 mg, and 93.8 mg. At the same time, the fibre content in bananas, melons and watermelons are 2.6 grams, 1.0 grams, and 0.4 grams (Anindea et al., 2019). Based on the comparison of fruit content, the researchers were interested in using watermelon and melon because their water and potassium content was superior to bananas. Potassium can inhibit sodium reabsorption and potassium secretion, increasing sodium and electrolyte excretion and urine volume (Manno et al., 2016). Potassium works by altering the activity of the renin-angiotensin system and regulating peripheral and central nerves that can affect blood pressure. Meanwhile, fibre content can affect blood pressure indirectly. Fibre can help lower cholesterol levels in the blood and liver to prevent cholesterol buildup in blood vessels, so blood pressure does not increase (Anindea et al., 2019).

Based on the results of previous research, there is an effect being given watermelon juice on reducing blood pressure. Hence, the authors want to examine the impact of consuming watermelons and melons to make the results more effective because the contents of melons and watermelons have much in common and are more varied. Researchers want to develop from previous research. The author seeks to provide an intervention using pieces of watermelon and melon because, based on research, the fibre content in whole fruit is higher when compared to fruit made into juice. After all, if the fluid is made, the antioxidant content in the fruit can be damaged if not given directly (Anindea et al., 2019). Non-pharmacological therapy is essential because it can be applied for an extended period so that people can anticipate and manage the conditions for increased blood pressure experienced by people with various ingredients in watermelon and melon (Setiawati & Bafdal, 2020). Watermelon fruit is easy to obtain, and the price is quite affordable among people who work as farm labourers.

The results of a preliminary study conducted in Giyanten Hamlet, Temanggung Regency, on February 3, 2021, obtained data on the population aged 25-50 years, as many as 103 people. On February 3, 2021, by measuring blood pressure, 23 people were resting in Giyanten Hamlet, and 16 had blood pressure above average, which means they had prehypertension. Based on the background above, the researcher is interested in researching the Effect of Consumption of Watermelon Fruit (*Citrullus vulgaris schard*) and Melons (*Cucumis melo*) Against Blood Pressure in Patients with Prehypertension in Giyanten Hamlet, Temanggung Regency.

LITERATURE REVIEW

Watermelon belongs to the Cucurbitaceae family, the Citrullus genus, and the lanatus species (Schaefer, 2012). The morphology of the watermelon is that of a vine that grows with long stems and produces large, fleshy red or yellow fruits. The leaves are oval with a smooth surface, and the flowers are yellow or pale green (Solmaz, 2017). Habitat Watermelon grows well in tropical and subtropical regions, especially in places with warm temperatures and high humidity. This plant requires loose soil and many suns (Solmaz, 2017). Melon fruit belongs to the Cucurbitaceae family, the Cucumis genus, and the Melo species (Lutz, 2019). Morphology Melons are vines with long stems that produce fleshy fruits of various sizes, shapes, and colours. The leaves are oval and leathery, and the flowers are yellow or pale green (King, 2018). Habitat Melon grows well in subtropical and tropical areas, especially in places with warm temperatures and high humidity. This

plant requires loose soil, lots of sun, and protection from strong winds and heavy rain (King, 2018). Watermelon is a fruit with a diuretic effect because it contains water and potassium, inhibiting sodium reabsorption and potassium secretion, resulting in increased excretion of sodium and electrolytes and increasing urine volume (Manno et al., 2016). Watermelon has benefits in lowering blood pressure because potassium is one of the inhibitors of renin release in the kidneys. Potassium indirectly helps stimulate the sympathetic nerves in inhibiting sodium retention, thereby reducing blood pressure (Ninsih et al., 2018). Consuming flavonoids found in foods and drinks such as watermelon will reduce the risk of coronary heart disease because flavonoids also have antithrombotic and anti-inflammatory effects, so that they can reduce the risk of heart disease. One of the contents of melon fruit that plays a role in regulating blood pressure is potassium. Potassium works by altering the activity of the renin-angiotensin system and controlling peripheral and central nerves that can affect blood pressure. Meanwhile, fibre content can affect blood pressure indirectly. Fibre can help lower cholesterol levels in the blood and liver to prevent cholesterol buildup in blood vessels, so blood pressure does not increase (Anindea et al., 2019).

RESEARCH METHOD

This study used a quasi-experimental design with a pretest-posttest control group. This research was conducted in Giyanten Hamlet, Kandangan District, Temanggung Regency, Central Java Province, and was carried out on April 12-21, 2021. The population in this study was prehypertensive patients aged 25-50 years. The number of respondents was 60 people, divided into 30 people, each in the control and intervention groups. The inclusion criteria of this study are 1) prehypertensive patients aged 25-50 years, 2) systolic blood pressure 120-139 mmHg, and diastolic 80-89 mmHg, 3) liked watermelon and melon, 4) did not take antihypertensive drugs and decongestant drugs, 5) did not suffer from heart failure, kidney failure, obesity, diabetes mellitus, stroke, and were not in pregnancy. Conducting ethical tests for the ethics commission at Respati University, Yogyakarta. The researcher conducted a research ethics presentation exam on March 26, 2021. On April 8, 2021, a research ethics letter with letter 049. 3/FIKES/PL/III/2021 and a research permit issued on February 15, 2021, with letter number 305. 2 /FIKES/PL/II/2021.

The data collection technique used simple random sampling. The research instrument used a digital sphygmomanometer, observation sheets, digital fruit scales, body weight scales, and midline to measure body mass index. Prepost-blood pressure data for the intervention and control groups were carried out door to door at each respondent's house. The intervention group was given 125 grams of watermelon and 125 grams of melon seven times a week from 17.40-18.00 WIB. In the intervention and control groups, post-test blood pressure was measured, and the respondents were rewarded.

FINDINGS AND DISCUSSION

Univariate analysis

Table 1. Descriptive Analysis of The Characteristics Of Respondents

Variable	Intervention Group		Control Group	
	F	(%)	F	(%)
Gender				
Man	16	53,3%	11	36,7%
Woman	14	46,7%	19	63,7%
Total	**30**	**100%**	**30**	**100%**
Age Category				
Early adulthood	17	56,7%	12	40,0%
Late adulthood	5	16,7%	15	50,0%
Early Seniors	8	26,7%	3	10,0%

Total	**30**	**100%**	**30**	**100%**
Associated disease				
There aren't any	30	100%	30	100%
Total	**30**	**100%**	**30**	**100%**
Body mass index				
Light skinny	1	3,3%	1	3,3%
Normal	29	96,7%	29	96,7%
Total	**30**	**100%**	**30**	**100%**

Table 2. Descriptive Analysis of Blood Pressure Before and After Being Given Watermelon and Melon

Variable	Intervention Group		
	Mean (mmHg)	SD	Min-Max
Pretest Blood Pressure			
systolic	126,90	6,155	116-139
Diastolic	82,70	3,476	75-90
Postest Blood Pressure			
systolic	118,30	6,238	107-135
Diastolic	79,73	3,423	70-86

Table 3. Descriptive analyses of blood pressure before and after in the control group

Variable	Control Group		
	Mean (mmHg)	SD	Min-Max
Pretest Blood Pressure			
systolic	119,17	7,013	104-132
Diastolic	82,10	2,578	77-88
Postest Blood Pressure			
systolic	122,93	6,544	110-138
Diastolic	83,37	2,593	79-88

Bivariate Analysis

Table 4. Descriptive analysis of differences in pretest systolic and diastolic blood pressure in the intervention group and the control group

Variable	Blood pressure	N	Mean	Mean Difference	*P-Value*
intervention group	systolic	30	126,87	7,000	0,000
control group	systolic	30	119,17		
intervention group	Diastolic	30	82,70	0,600	0,451
control group	Diastolic	30	82,10		

Table 5. Descriptive analysis of differences in post-test systolic and diastolic blood pressure in the intervention group and the control group

Variable	Blood pressure	N	Mean	Mean Difference	P-Value
intervention group	systolic	30	118,30	-4,633	0,028
control group	systolic	30	122,93		
intervention group	Diastolic	30	79,73	-3,633	0,041
control group	Diastolic	30	83,37		

1. **Characteristics of Respondents**

Based on Table 1 from the results of the data analysis, most of the intervention group was male, with a total of 16 people (53.3%) out of 30 people. In contrast, in the control group, the majority were female, with 19 people (63.7%) out of 30. Most males gender is more at risk of developing cardiovascular disease compared to women (Lestari, 2020). This research is corroborated that most men suffer from hypertension compared to women (Ainurrafiq et al., 2019). However, this differs from the results of other studies where most hypertension sufferers are female (Lutfiasari et al., 2017).

In this study, the age category of respondents was early adulthood, with as many as 17 people (56.7%). At the same time, most of the control group belonged to the late adult category, with several respondents, as many as 15 people (50.0%). This study's results follow the theory that hypertension is closely related to age. As a person gets older, the function of the body's organs will decrease and can affect the elasticity or flexibility of the arteries (Miller, 2012). Risk factors for hypertension in young adults aged 20-40 (Sarumaha & Diana, 2018). However, it differs from other studies in that the characteristics of respondents with hypertension are highest at the age of 40-59 years (Wulandari & Abriani, 2020). It can be seen that the majority of respondents, both the intervention group and the control group, did not have comorbidities, as many as 60 people (100%). It can be seen from the analysis of the respondent's data that they are included in the primary hypertension category because, based on the causal factors, the occurrence of hypertension is not related to comorbidities (Kemenkes, 2018).

2. Pressure blood in the intervention group and the control group

Table 2 shows that the average blood pressure of the intervention group before being given watermelon and melon was 126.90 mmHg systolic and 82.70 mmHg diastolic. The respondent's blood pressure is prehypertension because the systolic blood pressure is 120-139 mmHg while the diastolic is 80-99 mmHg. Blood pressure is based on two phases of the heart rate systolic which shows the phase of the blood being pumped by the heart, and diastolic, which shows that blood is returning to the heart (Ministry of Health RI, 2019). While the average blood pressure after being given watermelon and melon fruit in the intervention group was 118.30 mmHg systolic and 79.73 mmHg diastolic, the respondent's blood pressure was categorized as usual because systolic blood pressure was <120 mmHg and diastolic <80 mmHg.

Table 3 shows that the mean pretest blood pressure in the systolic control group was 119.17 mmHg, and the average value of the respondents' diastolic blood pressure was 82.10 mmHg. The average respondent's diastolic blood pressure is categorized as prehypertension because it ranges from 80-90 mmHg. After all, the systolic blood pressure was 120-139 mmHg while the diastolic was 80-99 mmHg (Ministry of Health RI, 2019). Meanwhile, the control group's average post-test systolic blood pressure was 122.93 mmHg with an SD of 7.013 and moderate diastolic blood pressure of 83.37 with an SD of 2.593. The respondent's blood pressure is categorized as prehypertension because the systolic blood pressure is 120-139 mmHg and the diastolic is 80-99 mmHg. According to the researchers' assumptions, blood pressure in the intervention group experienced a change in the blood pressure category after being given the watermelon and melon fruit intervention from the prehypertension category to normal. There was no change in the control group's blood pressure category, so the blood pressure category in the control group remained prehypertension.

3. The average blood pressure of respondents before and after being given watermelon and melon

Based on Table 4, the results of the data analysis of the intervention group at the time of

the post-test used the parametric test t-test paired. The difference in pretest and post-test systolic blood pressure was obtained in the systolic intervention group of 8.600 and 2.967 diastolic. These results indicate that the pretest blood pressure is higher than the post-test, with a p-value of 0.000. The effect of consuming red watermelon for four days can have an impact on reducing blood pressure. The results of this study were corroborated by the outcome of the administration of watermelon and melon on lowering blood pressure in menopausal women. Melon and watermelon contain potassium, inhibiting sodium reabsorption in the proximal tubule. That can suppress renin-angiotensin secretion and maintain the elasticity of blood vessel walls so that it can lower blood pressure. Calcium is a regulator of heart rhythm, so it is more regular and prevents smooth muscle contractions. Fibre plays an indirect role in blood pressure because fibre plays a role in helping to lower blood cholesterol levels and cholesterol levels in the liver so that it can prevent cholesterol buildup in blood vessels (Anindea et al., 2019).

Table 5 shows the mean difference in the control group's pretest and post-test blood pressure. These results indicate that post-test blood pressure is higher than pretest blood pressure with a p-value of 0.000. The average blood pressure of the intervention group decreased compared to the control group, which experienced an increase in blood pressure; the decrease in moderate blood pressure between treatments or types of fasting performed showed no significant difference. This study stated that fasting was more appropriate for treating hypertension than being a preventive measure (Tamburian et al., 2020).

Researchers assume that the results of this study influenced watermelons and melons. This is because several ingredients in watermelons and melons can lower blood pressure, including potassium which functions to inhibit sodium reabsorption and renin-angiotensin secretion and maintain the elasticity of blood vessel walls so that it can reduce blood pressure. Potassium functions to regulate heart rhythm so that it is regular and prevents smooth muscle contractions, and fibre functions to reduce cholesterol levels and cholesterol buildup in the walls of blood vessels. Several factors can affect blood pressure, including physical activity, excess sodium consumption and stress.

4. Differences in post-test blood pressure in the intervention group and the control group

Based on table 5, the pretest post-test systolic-diastolic blood pressure results in the intervention and control groups showed a difference between the control and intervention groups with a p-value of 0.000. In contrast, in diastolic blood pressure, the mean difference is 0.600. These results indicate that diastolic blood pressure in the intervention group is higher than in the control group, with a p-value of 0.451. This study's results align with previous research that the control group experienced increased systolic blood pressure ($p>0.05$). At the same time, there was a difference in diastolic blood pressure ($p<0.05$) (Anindea et al., 2019). According to the researchers' assumptions, the results of this study showed a significant difference in pretest systolic blood pressure between the intervention group and the control group. At the same time, there was no significant difference in diastolic blood pressure between the intervention group and the control group. This is caused by several factors that cannot be controlled in the form of genetics, physical activity, potassium, sodium, calcium, and fibre intake consumed by each respondent.

Based on Table 5, the analysis of the differences in the post-test systolic-diastolic mean of the intervention and control groups was -4.633 and -3.633. The systolic-diastolic blood pressure value of the intervention group was lower than the control with a p-value <0.05. The results

of this study are in line with the results of previous studies, namely that there is an effect of giving watermelon juice on changes in blood pressure in people with hypertension (Ninsih et al., 2018).

According to the researchers' assumption that there was a difference in the average systolic and diastolic blood pressure values in the intervention group was lower than the control group with a p-value <0.05. The significant difference between the intervention and control groups was because the intervention group regularly consumed 250 grams of watermelon (*Citrullus vulgaris schard*) and melon (*Cucumis melo*) every day for seven days, while the control group was not given any treatment.

CONCLUSIONS

The mean systolic-diastolic blood pressure in the pretest-posttest intervention group was 126.90; 82.70 mmHg and 118.30 mmHg; 79.73mmHg. The mean pre-test-post-test control systolic blood pressure was 119.17 mmHg; 82.10 mmHg, and 122.93 mmHg; 83.37mmHg. There were differences in pre-test-post-test systolic blood pressure in the intervention group. There were differences in pre-test and post-test blood pressure between the intervention and control groups. For respondents, the results of this study are expected to be a reference in increasing the knowledge of respondents, to independently anticipate the increase in blood pressure experienced by respondents by using alternative watermelons and melons. For future researchers, the results of this study are expected to be a reference material as initial data in conducting further research using different variables, time, and place about the management of prehypertension.

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