

Research Article

Differences in the Effectiveness of Watermelon Juice and Tomato Juice in Reducing High Blood Pressure in the Elderly Age 60-70 Years in the Work Area of the Cigeulis Health Center in 2022

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Abstract. Hypertension or high blood pressure is an increase in systolic blood pressure of more than 140 mmHg and diastolic blood pressure of more than 90 mmHg in two measurements with an interval of five minutes in a state of sufficient rest/calm. Increased blood pressure that lasts for a long time (persistent) can cause damage to the kidneys (kidney failure), heart (coronary heart disease) and brain (cause stroke) if not detected early and receive adequate treatment. To find out the difference in the effectiveness of watermelon juice and tomato juice in reducing high blood pressure in the elderly aged 60-70 years in the working area of the Cigeulis Health Center in 2022. Analytical with cross sectional approach. The sample in this study were 30 elderly people at the Cigeulis Health Center in November 2022 (total sampling). There is an effect of Tomato Juice which is proven to be effective in reducing blood pressure (p value $0.000 < 0.05$), there is an effect of Watermelon Juice which is proven to be effective in reducing blood pressure (p value $0.000 < 0.05$). From the results of the study it turned out that these two variables were equally effective in reducing blood pressure because the p value was $0.000 < 0.05$. It is expected that the puskesmas will provide education on the prevention and management of hypertension. To prevent hypertension and reduce blood pressure red watermelon and tomatoes.

Keywords: *Effectiveness of Tomato and Watermelon Juice, High Blood Pressure, Elderly.*

A. INTRODUCTION

Hypertension or high blood pressure is an increase in systolic blood pressure of more than 140 mmHg and diastolic blood pressure of more than 90 mmHg in two measurements with an interval of five minutes in a state of sufficient rest/calm. Increased blood pressure that lasts for a long time (persistent) can cause damage to the kidneys (kidney failure), heart (coronary heart disease) and brain (cause stroke) if not detected early and receive adequate treatment (Data and Information Center and RI, 2018).

Data from the World Health Organization (WHO) in 2015 showed that around 1.13 billion people in the world have hypertension, meaning that 1 out of 3 people in the world is diagnosed with hypertension. The number of people with hypertension continues to increase every year, it is estimated that by 2025 there will be 1.5 billion people affected by hypertension, and it is estimated that every year 10.44 million people die from hypertension and its complications (Ministry of Health, 2019).

According to the American Heart Association (AHA), the American population aged over 20 years suffer from hypertension has reached up to 74.5 million people, but almost 90-95% of cases have no known cause. Hypertension is a silent killer where symptoms can vary from individual to individual and are almost the same as symptoms of other diseases (Artana et al., 2020; Zhu et al., 2020). The symptoms are headache / feeling of heaviness in the back of

the neck, dizziness (vertigo), heart palpitations, fatigue, blurred vision, ringing in the ears (tinnitus), and nosebleeds (Data and Information Center and RI, 2018).

Based on the Health Profile of the Province of West Java in 2019, the prevalence of hypertension based on the results of blood pressure measurements in West Java in 2019 was 41.6%, while the results of the 2018 Riskesdas were 39.6%, an increase compared to the results of the 2013 Riskesdas which was 29.4% (West Java Health Service, 2019).

The management of hypertension generally uses drugs (pharmacological), but several studies using herbs can also help lower blood pressure as a companion to pharmacological therapy besides controlling risk factors by adopting a healthy lifestyle.

Tomato fruit (*Solanum lycopersicum*) contains 4.6 mg/100g Lycopene which can lower blood pressure and is rich in 235mg/100g potassium, little sodium and fat (Kailaku, 2007; Hilares et al., 2019; Rakasiri & Khianngam, 2022). Potassium inhibits the release of renin, thus changing the activity of the renin-angiotensin system, potassium can also regulate peripheral and central nerves that affect blood pressure (Adekunte et al., 2010; Anita et al., 2017). This study aims to determine the difference in the effectiveness of watermelon juice and tomato juice in reducing high blood pressure in the elderly aged 60-70 years in the working area of the Cigeulis Health Center in 2022.

B. METHOD

The research method uses analytic with cross sectional method. Data collection was carried out using primary data, namely data obtained from the results of distributing questionnaires. The data collection instrument used was a questionnaire. The population in this study were the elderly at the Cigeulis Health Center in November 2022 as many as 30 people, the sampling technique was total sampling. The analytical method used is univariate and bivariate analysis with the chi square test.

C. RESULT AND DISUCUSSION

The following presents data on the frequency distribution of respondents before drinking tomato juice with blood pressure, frequency and percentage data:

Table 1. Frequency Distribution of Respondents Before Drinking Tomato Juice

No	Blood Pressure	Frequency	Percentage
1.	<=130/90 mmHg	10	33.3
2.	> 140/90 mmHg	20	66.7
	Amount	30	100.0

Source: data proceed

From the table above it is known that 30 respondents before consuming tomato juice had lower blood pressure equal to 130 mmHg by 10 respondents (33.3%) and blood pressure over 140 mmHg by 20 respondents (66.7%).

Table 2. Frequency Distribution of Respondents After Drinking Tomato Juice

No	Blood Pressure	Frequency	Percentage
1.	<=130/90 mmHg	23	76.7
2.	> 140/90 mmHg	7	23.3
	Amount	30	100.0

Source: data proceed

From the table above it is known that from 30 respondents after consuming tomato juice with lower blood pressure equal to 130 mmHg as many as 23 respondents (76.7%) and blood pressure more than 140 mmHg as many as 7 respondents (23.3%).

Table 3. Frequency Distribution of Respondents Before Drinking Watermelon Juice

No	Blood Pressure	Frequency	Percentage
1.	$\leq 130/90$ mmHg	11	36.7
2.	$> 140/90$ mmHg	19	63.3
	Amount	30	100.0

Source: data proceed

From the table above, it is known that 30 respondents before consuming watermelon juice had lower blood pressure equal to 130 mmHg by 11 respondents (36.7%) and blood pressure over 140 mmHg by 19 respondents (63.3%).

Table 4. Frequency Distribution of Respondents After Drinking Watermelon Juice

No	Blood Pressure	Frequency	Percentage
1.	$\leq 130/90$ mmHg	19	63.3
2.	$> 140/90$ mmHg	11	36.7
	Amount	30	100.0

Source: data proceed

From the table above it is known that from 30 respondents after consuming watermelon juice with lower blood pressure equal to 130 mmHg as many as 19 respondents (63.3%) and blood pressure more than 140 mmHg as many as 11 respondents (36.7%).

Table 5. Effect of drinking tomato juice on lowering blood pressure

Blood Pressure	Average	Normality Test	T _{count} (p value)
Before drinking tomato juice	140.33	0.056	9.965 (0.000)
After drinking tomato juice	122.33	0.067	

Source: data proceed

The test results in this study used a paired t test to determine the effect before and after drinking tomato juice on high blood pressure. In the paired t test, the data is normally distributed, the results of the normality test obtained p values for the pre-test and post-test using the Kolmogorov Smirnov test, respectively, obtaining a p-value of $0.056 > 0.05$ and $0.067 > 0.05$, so using a paired t test test. In this study, the number of respondents was 30 so that the value $df = n-1 = 30-1 = 29$ and the t table for a significance level of 5% with $df = 29$ was 2.045. The results of the t test obtained t count value (9.965) $>$ t table (2.045) or p value (0.000 $<$ 0.05) so that the research hypothesis stating that there is an effect of drinking tomato juice on reducing blood pressure is accepted, so drinking tomato juice is effective in reducing pressure blood.

Table 6. Effect of drinking watermelon juice on lowering blood pressure

Blood Pressure	Average	Normality Test	T _{count} (p value)
Before drinking watermelon juice	139.67	0.060	5.835 (0.000)
After drinking watermelon juice	130.67	0.064	

Source: data proceed

The test results in this study used a paired t test to determine the effect before and after drinking watermelon juice on high blood pressure. In the paired t test, the data is normally distributed, the results of the normality test obtained p values for the pre-test and post-test using the Kolmogorov Smirnov test, respectively, obtaining a p-value of $0.060 > 0.05$ and $0.064 > 0.05$, so using a paired t test test. In this study, the number of respondents was 30 so that the value $df = n-1 = 30-1 = 29$ and the t table for a significance level of 5% with $df = 29$ was 2.045. The results of the t test obtained t count (5.835) $>$ t table (2.045) or p value (0.000 $<$ 0.05) so that the research hypothesis stating that there is an effect of drinking watermelon juice on

reducing blood pressure is accepted, so drinking watermelon juice is effective in reducing pressure blood.

Data before the treatment of drinking tomato juice and drinking watermelon juice for reducing blood pressure is presented in the following table:

Table 7. The Effectiveness of Drinking Tomato Juice and Watermelon Juice for Reducing Blood Pressure

Blood Pressure	Average	Homogeneity Test	T _{count} (p value)
Before drinking tomato juice	140.33	0.529	.193 (0.848)
Before drinking watermelon juice	139.67		

Source: data proceed

The test results in this study used an independent t test to determine the effect of two different groups, namely the group drinking tomato juice and the group drinking watermelon juice on high blood pressure. In the independent test the t test requires homogeneous data, the results of the homogeneity test on the pre-test data, namely before being treated in both groups using the Levene`s test (homogeneity) obtained a p value of $0.529 > 0.05$, so that the data is homogeneous and the test is carried out by testing independent t test. In this study, the number of respondents for both groups was 60 respondents so that the value $df = n-2 = 60-2 = 58$ and the t table for a significance level of 5% with $df = 58$ was 2.002. The results of the t test obtained t count value (0.193) < t table (2.001) or p value ($0.848 > 0.05$) so that blood pressure data in the two groups before treatment had no difference, meaning that the two groups had the same characteristics.

The effectiveness of drinking tomato juice and watermelon juice for reducing blood pressure can be described in the results of the independent t test as follows:

Table 8. Effectiveness of drinking tomato juice and drinking watermelon juice on reducing blood pressure (Post test)

Blood pressure	Average	Homogeneity Test	T _{count} (p value)
After drinking tomato juice	122.33	0.079	-2.290 (0.026)
After drinking watermelon juice	130.67		

Source: data proceed

The test results in this study used an independent t test to determine the effect of two different groups, namely the group drinking tomato juice and the group drinking watermelon juice on blood pressure. In the independent test the t test requires homogeneous data, the results of the homogeneity test on the post test data, namely after being treated in both groups using the Levene`s test (homogeneity) obtained a p value of $0.079 > 0.05$, so that the data is homogeneous and the test is carried out with the independent t test. In this study, the number of respondents for both groups was 60 respondents so that the value $df = n-2 = 60-2 = 58$ and the t table for a significance level of 5% with $df = 58$ was 2.002. The results of the post test study obtained t count ($|-2,290| < t$ table (2,001) or p value ($0,026 < 0,05$) so that the research hypothesis was accepted, namely blood pressure data in both groups after treatment had a significant effect on the study this t count value is negative, which means that blood pressure in the comparison of the two groups found that drinking tomato juice is more effective in lowering blood pressure compared to drinking watermelon juice.

Frequency Distribution of Respondents before Drinking Tomato and Watermelon Juice

From the perspective of researchers, 30 respondents before consuming tomato and watermelon juice had lower blood pressure equal to 130 mmHg by 10 respondents (33.3%) and

blood pressure over 130 mmHg by 20 respondents (66.7%). It is known that from 30 respondents before consuming watermelon juice with lower blood pressure equal to 130 mmHg as many as 11 respondents (30.0%) and blood pressure more than 140 mmHg as many as 19 respondents (63.70%).

The results of this study are in line with Imar Agustin's conducted in the two treatment groups of red watermelon juice and tomato juice, the results showed that 13 people (65%) respondents had no family history of hypertension and 7 people (35%) had a family history of hypertension. Genetic factors in certain families will cause these families to have a risk of suffering from hypertension, individuals with hypertensive parents have twice the risk of suffering from hypertension than individuals who do not have a family history of hypertension.

The results of this study are in line with (Nisa, 2018), saying that the amino acid content of watermelon can improve arterial function and reduce blood pressure in the aorta. Watermelon can reduce high blood pressure because of lycopene which functions to increase the work of the heart and citrulline which can encourage blood flow to all parts of the body and provide an arphosidiak effect. Watermelon contains many benefits, such as lycopene which contains antioxidants which are good for the skin. Beta carotene is good for the body, vitamin B6 which can stimulate hormones in the brain to overcome anxiety, vitamin C which can boost immunity and vitamin A which can fight infection. Watermelon also contains protein, fiber, arginine and others (Artana et al., 2020).

Based on the theory, individuals who have a family history of hypertension are expected to be more careful in consuming food, often measure blood pressure and manage a healthy lifestyle so that blood pressure does not increase. Some of the risk factors for hypertension are changes in diet that contain lots of cholesterol, protein, high salt but low in dietary fiber (Ried & Fakler, 2011). Cholesterol belongs to the fat family, this substance is one of the components of fat itself. The presence of fat in the body has a function as a nutrient that is needed by the body in addition to other nutrients such as carbohydrates, protein, vitamins, and minerals (Department of Health of the Republic of Indonesia, 2018).

The researcher's assumption is that with increasing age there are changes in the structure and function of the peripheral vascular system which are responsible for changes in blood pressure that occur including loss of elasticity of connective tissue and a decrease in relaxation of blood vessels which reduces the ability to distension the tensile strength of blood vessels which causes the aorta and large arteries to reduce their ability in accommodating the blood pumped by the heart so that there is a decrease in cardiac output and an increase in peripheral resistance causing hypertension.

Frequency Distribution of Respondents after Drinking Tomato and Watermelon Juice

From the perspective of researchers, 30 respondents after consuming tomato and watermelon juice lowered blood pressure equal to 130 mmHg by 23 respondents (76.7%) and blood pressure over 130 mmHg by 7 respondents (23.3%). It is known that from 30 respondents after consuming watermelon juice with lower blood pressure equal to 130 mmHg as many as 19 respondents (63.3%) and blood pressure more than 140 mmHg as many as 11 respondents (36.7%).

The results of this study are in line with Imar Agustin's obtained mean systolic blood pressure after the red watermelon juice and tomato juice treatment were (134.00) and (149.00). The mean diastolic blood pressure after red watermelon juice and tomato juice treatment were (91.00) and (79.00). Based on these data, there was a decrease in systolic and diastolic blood pressure, so it can be concluded that there was an effect of giving red watermelon juice and tomato juice on systolic and diastolic blood pressure after treatment, but when viewed from the number of reductions in systolic blood pressure, the red watermelon juice group experienced a

greater decrease compared to the tomato juice group, whereas in the diastolic pressure the tomato juice group experienced a greater decrease compared to the red watermelon juice (Dede et al., 2007).

It can be explained the nutritional content in red watermelon, namely Lycopene 33mg/100g, vitamin A, potassium, calcium, flavonoids, magnesium and L-Citrulline (Nurleny, 2019), while tomatoes are rich in B vitamins, vitamin C, vitamin K, carotene, Lycopene 4.6 mg/100g, calcium, phosphorus and potassium (Pertanian, 2019). Red watermelon has L-Citrulline which plays a role in increasing the production of nitric oxide in the body, helping dilate arteries and blood vessels which increases blood and oxygen circulation throughout the body, this is consistent with the role of systolic, namely blood pressure that occurs during contraction of the heart muscle (Matusiak, 2016), whereas tomatoes do not contain l-citrulline. Tomatoes contain 235 mg/100g of potassium, while red watermelon contains 112 mg/100g of potassium. Potassium helps relieve tension in the walls of blood vessels, thereby lowering blood pressure, inhibiting renin release, thereby changing the activity of the renin-angiotensin system, this is in accordance with the role of diastolic blood pressure when the heart muscle is not contracting (Adrian, 2019).

According to theory (Ahmad, 2019), one of the aging processes that causes an increased risk of hypertension is aging of the cardiovascular system. This condition convinces the theory that the older the body's capacity decreases, so further treatment of hypertension in the elderly is needed.

Hypertension is related to people's lifestyles such as stress, obesity, lack of activity (exercise), smoking, foods high in fat content, high sodium intake and low potassium intake and excessive alcohol consumption (Ellis et al., 2021; Zhu et al., 2020). The results of the DASH (Dietary Approaches to Stop Hypertension) study, show that diet patterns that focus on fruits and low-fat products can significantly reduce blood pressure (Svetkey, 2010). INTERSALT research results have identified an inverse relationship between blood pressure and potassium intake through food (Katz D, 2011). 1:1 (70 mmol Na and 70 mmol K) associated with a reduction in systolic blood pressure of 3.4 mmHg (Stamler, 2008) or by increasing potassium intake by 30-45 mmol associated with a reduction in systolic blood pressure of 2-3 mmHg (Gregor, 2011).

According to the assumption of the researchers, namely the high risk of developing hypertension is caused by changes that occur during increasing age or what is called the aging process. The aging process can cause changes in body structure and function.

The Effect of Drinking Tomato Juice and Watermelon Juice on Blood Reduction Can Be Described in the Results of the Paired T-Test

In this study, the objective was to use a paired t test to determine the effect before and after drinking tomato juice on high blood pressure. In the paired t test, the data is normally distributed, the results of the normality test obtained p values for the pre-test and post-test using the Kolmogorov Smirnov test, respectively, obtaining a p-value of $0.056 > 0.05$ and $0.067 > 0.05$, so using a paired t test. In this study, the number of respondents was 30 so that the value $df = n-1 = 30-1 = 29$ and the t table for a significance level of 5% with $df = 29$ was 2.045. The results of the t test obtained t count value ($9.965 > t$ table (2.045) or p value ($0.000 < 0.05$) so that the research hypothesis stating that there is an effect of drinking tomato juice on reducing blood pressure is accepted, so drinking tomato juice is effective in reducing pressure blood.

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the Kolmogorov Smirnov test, respectively, obtaining a p-value of $0.060 > 0.05$ and $0.064 > 0.05$, so using a paired t test. In this study, the number of respondents was 30 so that the value $df = n-1 = 30-1 = 29$ and the t table for a significance level of 5% with $df = 29$ was 2.045. The results of the t test obtained t count (5.835) $>$ t table (2.045) or p value ($0.000 < 0.05$) so that the research hypothesis stating that there is an effect of drinking watermelon juice on reducing blood pressure is accepted, so drinking watermelon juice is effective in reducing pressure blood.

Hypertension is a condition that is often found in primary health care services. Watermelon and tomatoes are an alternative that can lower blood pressure. Because watermelon and tomatoes have an antioxidant compound called Lycopene, which functions as an anti-oxidant and diuretic effect (Lafarga et al., 2019).

The results of this study were in line with research (Dina Purnama Sari, Semarang Poltekes) which showed that the two groups showed differences in the mean systolic and diastolic blood pressure (p systolic value = 0.174 and p diastolic = 0.136). In the decrease in systole and diastole between the watermelon juice and tomato juice groups, the difference in the average decrease in tomato juice was greater than that of watermelon juice. Thus it can be concluded that the effectiveness of watermelon juice and tomato juice in reducing blood pressure in hypertensive patients is more effective using tomato juice in lowering blood pressure.

D. CONCLUSION

Based on research taken from 30 respondents after consuming tomato and watermelon juice with lower blood pressure equal to 130 mmHg by 23 respondents (76.7%) and blood pressure over 130 mmHg by 7 respondents (23.3%). There is an effect of Tomato Juice proven to be effective on reducing blood pressure (p value $0.000 < 0.05$), there is an effect of Watermelon Juice proven to be effective on reducing blood pressure (p value $0.000 < 0.05$). From the results of the study it turned out that these two variables were equally effective in reducing blood pressure because the p value was $0.000 < 0.05$.

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