

THE EFFECT OF GIVING TOMATO JUICE ON REDUCING BLOOD PRESSURE IN ELDERLY HYPERTENSION SUFFERERS IN LAMME VILLAGE, JAYA DISTRICT, ACEH JAYA REGENCY

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Abstract: *Hypertension is classified as a non-communicable disease that is commonly experienced by the elderly and serves as one of the major contributing factors to the development of heart disease and stroke. The efforts to manage hypertension are not only done through pharmacological treatment, but also by complementary therapies such as consuming tomato juice, which is rich in lycopene, potassium, and antioxidants. This study was conducted to analyze the effect of tomato juice consumption on the reduction of blood pressure among elderly individuals with hypertension in Lamme Village, Jaya District, Aceh Jaya Regency. The research design employed was a pre-experimental design using the one-group pretest- posttest method. A total of 21 elderly participants were selected as the research sample through a total sampling technique. The intervention consisted of administering one glass of tomato juice daily for 14 consecutive days. Data were obtained from blood pressure measurements taken before and after the intervention and were analyzed using the Paired T-Test to determine the effect and the Shapiro- Wilk test to assess data normality. Based on the research findings, a decrease in systolic blood pressure was observed, from an average of 156.67 mmHg to 146.38 mmHg, as well as a reduction in diastolic blood pressure, from an average of 98.90 mmHg to 92.42 mmHg. Based on the results of the statistical analysis, a p-value of 0.000 was obtained for both variables, indicating a significant effect of tomato juice consumption on the reduction of blood pressure. It can be concluded that the consumption of tomato juice has been proven to effectively reduce blood pressure among elderly individuals suffering from hypertension. This approach can serve as a practical and easily applicable non-pharmacological alternative for managing hypertension, particularly for communities living in areas with limited access to healthcare facilities.*

Keywords: *Tomato juice, blood pressure, hypertension, elderly*

1. Introduction

Hypertension is a non-communicable disease that receives significant attention in public health due to its high prevalence and serious impact on the quality of life of sufferers. This disease is often dubbed a silent killer because its symptoms are often invisible, but it can lead to serious complications such as stroke, kidney failure, heart failure, and coronary heart disease. The World Health Organization (WHO) estimates that more than 1.13 billion people worldwide suffer from hypertension, and this number is projected to increase to 1.5 billion by 2025. This situation indicates that hypertension is a global problem that requires serious treatment, both through medical approaches and community-based interventions.

In Indonesia, hypertension is a non-communicable disease with a relatively high incidence. Data from the 2018 Basic Health Research (Riskesdas) showed that the prevalence of hypertension among the population aged 18 years and older reached 34.1%. This prevalence continues to increase with increasing age and changes in lifestyle. Aceh is one of

the provinces with a significant hypertension burden. Data from the Aceh Health Office in 2021 recorded 172,213 cases of hypertension, with the highest prevalence in Aceh Jaya Regency (11.5%), South Aceh (11.3%), and Banda Aceh (8.4%). This indicates that Aceh Jaya, including Lamme Village, is a region prone to high rates of hypertension, particularly among the elderly.

Risk factors for hypertension in the elderly are diverse, including non-modifiable factors such as age, gender, and genetics, as well as modifiable factors such as a high-salt diet, physical inactivity, obesity, stress, and smoking. With age, physiological changes occur, including decreased blood vessel elasticity, increased peripheral resistance, and decreased kidney function, which can exacerbate hypertension. Elderly people living in rural areas with limited access to healthcare, such as in Lamme Village, often face barriers to routine hypertension screening and treatment. This results in many cases of hypertension going undetected or poorly controlled. Hypertension treatment is generally carried out with pharmacological therapy, including the use of antihypertensive medications. However, dependence on medications has limitations, including low medication compliance, limited economic resources, and the risk of long-term side effects.

Therefore, complementary and non-pharmacological efforts are needed as alternative support for controlling blood pressure. One potential non-pharmacological approach is dietary intervention utilizing local food sources. Tomatoes (*Solanum lycopersicum*) are a horticultural commodity readily available and contain nutrients beneficial for health, particularly cardiovascular health. Tomatoes are rich in lycopene, potassium, vitamin C, vitamin K, and bioflavonoids, which function as antioxidants. Potassium acts as a vasodilator, helping to lower blood pressure, while lycopene has antioxidant properties that can protect blood vessels from free radical damage. Several previous studies have shown that regular consumption of tomato juice can lower both systolic and diastolic blood pressure in people with hypertension.

The bioactive compounds in tomatoes also work through the renin-angiotensin-aldosterone system (RAAS) by inhibiting renin secretion, thereby improving vascular function and reducing peripheral resistance. Thus, regular consumption of tomato juice can be a safe, affordable, and easily implemented complementary therapy, especially for people in rural areas with limited access to modern healthcare facilities. Based on these conditions, this study was conducted to scientifically demonstrate the effect of tomato juice on lowering blood pressure in elderly people with hypertension in Lamme Village, Jaya District, Aceh Jaya Regency. It is hoped that the results of this study will contribute to the development of community-based health interventions and provide a simple, effective, and affordable alternative for non-pharmacological treatment of hypertension.

2. Literature Review

Hypertension

Hypertension is a global health problem with a high prevalence and a significant impact on morbidity and mortality. Hypertension is defined as an increase in systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg, based on the Joint National Committee on Disease Control (JNC VII) classification. This condition is often referred to as a

silent killer because in most cases, sufferers do not experience any noticeable symptoms until serious complications develop, such as stroke, kidney failure, and coronary heart disease.

The causes of hypertension are divided into two:

a. Primary (essential) hypertension

The exact cause is unknown, but it is related to genetic factors, age, lifestyle, stress, excessive salt consumption, obesity, and lack of physical activity.

b. Secondary hypertension

Occurs as a result of another disease or medical condition, such as chronic kidney disease, endocrine disorders, or the use of certain medications.

The pathophysiology of hypertension involves complex mechanisms, including increased sympathetic nervous system activity, endothelial dysfunction, activation of the renin-angiotensin-aldosterone system (RAAS), and changes in blood vessel elasticity. If left untreated, hypertension can lead to serious, life-threatening cardiovascular complications. Therefore, managing hypertension requires a holistic approach, encompassing both pharmacological and non-pharmacological approaches.

Tomato Juice

Tomatoes (*Solanum lycopersicum*) are a readily available food and are widely consumed, both fresh and processed. Tomatoes contain highly beneficial nutrients, including vitamin C, vitamin A, vitamin K, vitamin B6, potassium, folate, and bioactive compounds such as lycopene and bioflavonoids.

- a. Potassium plays an important role in lowering blood pressure by reducing the effects of sodium, increasing sodium excretion in the urine, and acting as a vasodilator that relaxes blood vessel walls.
- b. Lycopene, the main carotenoid pigment in tomatoes, has potent antioxidant activity. Lycopene can protect blood vessels from free radical damage, improve endothelial function, and lower LDL cholesterol levels, which are associated with the risk of hypertension and heart disease.
- c. Bioflavonoids in tomatoes have anti-inflammatory effects and help improve blood vessel elasticity, reducing the risk of atherosclerosis, which can worsen hypertension.

Several previous studies have shown that regular consumption of tomato juice can lower blood pressure in people with hypertension. Kwon et al. (2020) reported that consuming tomato juice without added salt significantly reduced systolic and diastolic blood pressure after several weeks. The mechanism of blood pressure reduction through tomato juice consumption is related to the combined effects of lycopene, potassium, and other antioxidants that work to improve the cardiovascular system. Thus, tomato juice can be an effective, inexpensive, and easy-to-implement form of non-pharmacological complementary therapy.

The Elderly and Hypertension

The elderly are an age group that is particularly susceptible to hypertension. Physiologically, the aging process causes decreased elasticity of blood vessel walls, increased peripheral resistance, decreased kidney function, and hormonal changes that contribute to increased blood pressure. In addition to biological factors, unhealthy lifestyles such as a high-salt diet, lack of physical activity, and smoking can exacerbate the risk of hypertension in the elderly.

According to the Indonesian Ministry of Health (2021), the prevalence of hypertension in the elderly continues to increase annually and is a leading cause of morbidity and premature death. Elderly people living in rural areas generally face limited access to healthcare, resulting in routine blood pressure checks. This leads to many cases of uncontrolled hypertension.

Healthy dietary interventions are an important strategy for controlling blood pressure in the elderly. Consuming foods rich in potassium, fiber, and antioxidants has been shown to help maintain cardiovascular health. Tomato juice, a natural source of nutrients, can be a simple, affordable, and easily accepted dietary intervention option for the elderly.

3. Method

This study used a pre-experimental design with a one-group pretest-posttest approach. The aim was to determine the effect of tomato juice on lowering blood pressure in elderly people with hypertension. The study was conducted in Lamme Village, Jaya District, Aceh Jaya Regency, from December 2024 to April 2025. The study population was all 21 elderly people with hypertension in Lamme Village, and a total sampling technique was used to sample the entire population. The intervention consisted of one glass of fresh tomato juice (200 grams of tomatoes plus 100 ml of unsweetened water) daily for 14 days.

Blood pressure was measured using a manual sphygmomanometer both before (pretest) and after (posttest) the intervention to obtain valid data. Data analysis was then performed using the Shapiro-Wilk normality test to ensure data distribution, and a paired t-test with a significance level of 0.05 to test for differences in mean blood pressure before and after the intervention. This approach was chosen because it was in accordance with the research objectives and limited field conditions, so that it could still provide a clear picture of the effectiveness of tomato juice in lowering blood pressure in hypertensive elderly.

4. Findings and Discussion

Research Results

This study involved 21 elderly respondents with hypertension in Lamme Village, Jaya District, Aceh Jaya Regency. The respondents were predominantly aged 60–69 years (57.1%), with a higher gender distribution of women (61.9%) than men (38.1%). Most respondents had a history of hypertension for more than 5 years and had not been optimally controlled due to limited access to healthcare.

The intervention consisted of administering one glass of tomato juice (200 grams of tomatoes + 100 ml of water, without sugar or salt) daily for 14 days. Blood pressure measurements were taken before (pretest) and after (posttest) the intervention. The results of the respondents' blood pressure measurements are shown in Table 1 below:

Table 1. Average Blood Pressure of Respondents Before and After Tomato Juice Administration

Parameters	Before (Pretest)	After (Posttest)	Difference in Decrease	p-value (Paired T-Test)
Systolic blood pressure	156,67 mmHg	146,38 mmHg	-10,29 mmHg	0,000
Diastolic blood pressure	98,90 mmHg	92,42 mmHg	-6,48 mmHg	0,000

Based on the table above, there is an average decrease in systolic blood pressure of 10.29 mmHg and diastolic blood pressure of 6.48 mmHg after the tomato juice intervention. The results of the paired t-test showed a p-value of 0.000 ($p < 0.05$) for both systolic and diastolic blood pressure, indicating a significant difference between before and after the intervention. Furthermore, the distribution of respondents' blood pressure categories also showed changes. At the beginning of the study, most respondents were in the stage 1 and 2 hypertension categories, but after the intervention, the number of respondents with more controlled blood pressure increased.

Table 2. Distribution of Respondents' Blood Pressure Categories Before and After the Intervention

Blood Pressure Category (JNC VII)	Pretest (n/%)	Posttest (n/%)
Normal (<120/80 mmHg)	0 (0%)	1 (4,8%)
Prehypertensi (120–139/80–89)	2 (9,5%)	5 (23,8%)
Grade 1 Hypertension (140–159/90–99)	11 (52,4%)	12 (57,1%)
Grade 2 Hypertension ($\geq 160/\geq 100$)	8 (38,1%)	3 (14,3%)

Table 2 shows that the number of respondents with stage 2 hypertension decreased from 38.1% to 14.3%, while the number of respondents with prehypertension increased from 9.5% to 23.8% after the intervention. This indicates that regular tomato juice consumption for 14 days has a positive impact on reducing the severity of hypertension in the elderly.

Discussion

The results of this study demonstrate that administering tomato juice for 14 days significantly reduced both systolic and diastolic blood pressure in elderly people with hypertension in Lamme Village, Aceh Jaya. The average reduction of 10.29 mmHg in systolic blood pressure and 6.48 mmHg in diastolic blood pressure indicates that tomato juice can be a simple yet effective dietary intervention in controlling blood pressure. This is consistent with the theory that the bioactive compounds in tomatoes, such as potassium, lycopene, bioflavonoids, and vitamin C, play a crucial role in blood pressure regulation

a. The Role of Potassium

Potassium is an essential mineral found in high concentrations in tomatoes. One of its primary mechanisms is to help balance the effects of sodium in the body. High potassium intake can increase sodium excretion through urine (natriuresis), thereby reducing intravascular fluid volume and directly reducing blood pressure. Furthermore, potassium acts as a vasodilator by relaxing vascular smooth muscle, thereby decreasing peripheral resistance. This reduced resistance significantly contributes to reducing the workload of the heart and ultimately lowering blood pressure. This mechanism aligns with WHO recommendations (2012), which emphasize the importance of increasing potassium consumption for the prevention of hypertension.

b. The Role of Lycopene

Lycopene is a carotenoid that gives tomatoes their red color and has very strong antioxidant activity. Oxidative stress is known to be a key factor in the pathogenesis of hypertension, as it can damage the blood vessel endothelium and reduce the availability of nitric oxide (NO). Consuming lycopene neutralizes free radicals, thus preventing endothelial damage. Furthermore, improved endothelial function increases the release of NO, which acts as a natural vasodilator, thereby reducing peripheral vascular resistance. Previous epidemiological studies have shown that individuals with higher plasma lycopene levels have a lower risk of hypertension and cardiovascular disease.

c. The Role of Bioflavonoids and Vitamin C

Tomatoes are also rich in bioflavonoids and vitamin C. Bioflavonoids function as anti-inflammatories, reducing chronic inflammation in blood vessel walls. Meanwhile, vitamin C plays a role in maintaining blood vessel elasticity and increasing lycopene absorption in the body. The combination of bioflavonoids and vitamin C contributes to strengthening the cardiovascular system, reducing atherosclerosis, and lowering the risk of hypertension complications. This mechanism explains why regular consumption of tomato juice can have a synergistic effect on maintaining blood vessel health.

d. Comparison with Previous Research

The findings of this study align with those of Kwon et al. (2020), who reported that consuming tomato juice without added salt for 8 weeks can lower blood pressure in people with hypertension. Research by Septimar et al. (2020) also showed that administering tomato juice for 14 days reduced systolic and diastolic blood pressure in elderly people with hypertension. This consistency of results strengthens scientific evidence that tomato juice is an effective non-pharmacological intervention in controlling hypertension.

e. Relevance in Rural Communities

This study also provides added value in the context of public health, particularly in rural areas like Lamme Village, which have limited access to medical services. Tomatoes are a local food that is readily available, inexpensive, and can be easily processed into juice. Thus, this intervention is highly relevant for community implementation as a complementary, non-pharmacological strategy for hypertension control. In addition to its health benefits, this local food-based intervention also has the potential to raise public awareness of the importance of utilizing traditional foods for health.

Research Implications

The implications of this study are quite broad. For the community, the results emphasize that simple dietary changes, such as regularly consuming tomato juice, can help control blood pressure naturally without having to rely entirely on antihypertensive medications. For healthcare professionals, these results can serve as a basis for integrating local food-based dietary therapy into community hypertension prevention and control programs, for example through education at elderly community health posts (Posyandu) or other promotional activities. Meanwhile, for future researchers, this study can serve as a foundation for conducting follow-up studies with a randomized controlled trial (RCT) design, a larger sample size, and a longer intervention period to strengthen the evidence for the effectiveness of tomato juice in hypertension management.

5. Conclusions and Recommendations

Conclusion

This study shows that administering fresh tomato juice for 14 days was effective in significantly reducing systolic and diastolic blood pressure in elderly people with hypertension in Lamme Village, Jaya District, Aceh Jaya Regency. The average reduction in systolic blood pressure was 10.29 mmHg and diastolic blood pressure was 6.48 mmHg, with a p-value of 0.000 ($p < 0.05$). This demonstrates that tomatoes, rich in lycopene, potassium, vitamin C, and bioflavonoids, can play a role in improving vascular function, reducing oxidative stress, and promoting vasodilation, thus maintaining better blood pressure control. This local food-based intervention offers dual benefits: it serves as a preventative and control measure for hypertension and serves as a low-cost, easy-to-implement, and safe public health strategy for the elderly. Therefore, tomato juice can be considered an alternative non-pharmacological therapy for hypertension management, especially in areas with limited access to formal healthcare.

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