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Effect of Watermelon and Carrot Combination Juice on Blood Pressure Changes in Hypertension Patients at Andalas Public Health Center Padang City

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Abstract: Hypertension is one of the most prevalent non-communicable diseases and remains a major public health problem that increases the risk of cardiovascular morbidity and mortality. Dietary modification, especially increased intake of fruits and vegetables, is considered an effective non-pharmacological approach to control blood pressure. This study aims to examine the effect of giving a combination of watermelon and carrot juice on changes in blood pressure in hypertensive patients, using a pre-experimental design (one-group pretest-posttest design) with a purposive sampling technique involving 17 respondents. Data were analyzed using a dependent T-test. The results showed a significant decrease in both systolic and diastolic blood pressure after consuming the juice ($p < 0.001$). The average systolic pressure decreased from 149.00 mmHg to 133.00 mmHg, and the average diastolic pressure decreased from 93.65 mmHg to 87.47 mmHg. This study suggests that watermelon–carrot juice may serve as an affordable complementary option to support blood pressure control in hypertensive patients.

Keywords: blood pressure; hypertension; watermelon-carrot juice combination.

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INTRODUCTION

Triple burden diseases pose significant challenges to health development. Deadly diseases such as malaria and tuberculosis are re-emerging, along with changes in disease patterns that shift the dominance of infectious diseases to the dominance of Non-Communicable Diseases (NCDs). The Joint National Committee, in The Eighth Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure, states that high blood pressure (hypertension) is a condition where a person's blood pressure is ≥ 140 mmHg (Ansar et al., 2019)

Hypertension is a vascular disease that inhibits the supply of nutrients and oxygen to body tissues through blood vessels(Destiani, Isfandiari and Fajariyah, 2021). Patients with high blood pressure usually do not experience any symptoms; therefore, high blood pressure is often considered a silent killer(Laila et al., 2019). Prolonged and consistent increases in blood pressure can lead to kidney damage (kidney failure), coronary heart disease, and stroke if early detection and proper treatment are not carried out (Suprayitno & Damayanti, 2020)

The World Health Organization (WHO) states that hypertension affects 22% of the global population and 36% in Southeast Asia. It also adds to the mortality rate: 23.7% of the 1.7 million deaths in Indonesia in 2016 (Hariawan & Tatisina, 2020). Considering that hypertension is among the top ten causes of death in Indonesia (Laila et al., 2019)

In 2018, the prevalence of hypertension in West Sumatra Province was 25.1%, and in the same year, the prevalence of hypertension in Padang city was 21.75% (Badan Penelitian dan Pengembangan Kesehatan, 2019). Data from the 2019 Annual Report of the Padang City Ministry of Health also shows that the prevalence of hypertension in Andalas Public Health Center was 26.07%(Dinas Kesehatan Kota Padang, 2020). Therefore, according to the 2021 Annual Report of Andalas Public Health Center, hypertension is among the top 10 non-communicable diseases at Andalas Public Health Center (Puskesmas Andalas, 2020).

Hypertension treatment falls into two categories: pharmacological and non-pharmacological. Pharmacological treatment is based on the thought that care should be taken to maintain adherence to a particular medication and minimize side effects, while non-pharmacological treatment involves adopting a healthy lifestyle, which includes juicing. Juices are highly effective for controlling blood pressure (Adibah et al., 2020).

Juices are rich in fiber, vitamin C, calcium, chromium, and essential fats that are proven to effectively lower blood pressure. The high fiber in fruit binds excess fat and salt, which are then excreted with feces, naturally reducing the risk of high blood pressure. One fruit that can be used as an ingredient in juice therapy to control high blood pressure is watermelon (Adibah et al., 2020)

Watermelon can lower blood pressure because it contains several antihypertensive substances, such as potassium and beta-carotene. It is also very rich in water, amino acids, and L-arginine, which helps to maintain normal blood pressure. Nurleli's research (2019) on administering watermelon juice to hypertensive patients showed that giving watermelon juice resulted in significant changes in blood pressure (p-value = 0.003) (Nurleli, 2019).

Alongside watermelon, carrots are one of the vegetables that can be used to treat high blood pressure. Carrots contain potassium, which is good for lowering or controlling blood pressure. It is a

powerful diuretic that helps balance blood pressure. Research conducted by Laila et al. (2019) indicated that carrot juice has an antihypertensive effect on patients with high blood pressure (p-value < 0.001).

Researchers were interested in combining watermelon, with a high potassium content of 93.8 mg/100 g, and carrots, which contain 245 mg/100 g of potassium, due to their potential to help lower blood pressure. They combined watermelon and carrots in the form of juice, resulting in a variety of flavors. Additionally, watermelon and carrots offer the advantages of being easy to obtain and affordable.

Previous studies have reported that watermelon and carrot juices independently reduce blood pressure due to their potassium and antioxidant contents (Nurleli, 2019; Laila et al., 2019; Fitri & Awaluddin, 2021). However, studies on their combined effect are still limited. This study highlights the novelty of assessing the synergistic potential of watermelon–carrot juice in lowering blood pressure among hypertensive patients, offering an affordable dietary approach to support hypertension management.

Based on this background, researchers are interested in examining the effect of giving a combination of watermelon and carrot juice on changes in blood pressure in hypertensive patients in the Andalas Public Health Center, Padang City.

METHODS

Design, Time, and Place

The study used a pre-experimental research design (one-group pretest-posttest design) and was conducted in the work area of the Andalas Padang Health Center. The study period was from January 2022 to April 2023, covering all activities such as proposal preparation, observation, data analysis, and writing results. This study has received ethical approval from the Padang State University Health Research Ethics Committee, with the ethical eligibility number No.38.02/KEPK/UNP/IV/2023.

Population and Sample

The population in this study was all outpatient hypertension patients at Andalas Public Health Center, Padang City. The sample selection was based on a purposive sampling technique with specific inclusion criteria: willing to participate as research respondents, aged 40-59 years, with blood pressure ranging from 140/90 mmHg to 159/99 mmHg (grade I hypertension), hypertension without complications, taking the same medication, able to communicate well, and cooperative. This resulted in a sample size of 17 people.

Intervention Technique

The sample in this study was given an intervention by consuming a combination of watermelon and carrot juice, a total of 385 ml/day (watermelon 150 g, carrots 85 g). The participants consumed the juice once a day at 8:00 a.m. for five consecutive days, provided by visiting the respondent's home. Their blood pressures were measured three times: at the beginning (before the administration of watermelon-carrot juice combination), on the third day of administration, and after 5 days of administration. Blood pressure checks were carried out by a nurse using a digital

sphygmomanometer with a 95% accuracy rate. In addition, researchers also examine the respondents' food intake using the 24-hour food recall method on days 1, 3, and 6.

Data Processing and Analysis

Data analysis techniques were carried out univariate and bivariate. Univariate analysis was used to describe each variable in the study, including the distribution of respondent characteristics, respondent consumption intake, and average changes in their blood pressures. Bivariate analysis was conducted to see changes before and after the intervention and to test the research variables.

RESULTS AND DISCUSSION

The results of the descriptive analysis for respondent characteristics are presented in Table 1. Based on Table 1, the majority of respondents are female (82.4%). Most respondents are aged 50-59 years, with a percentage of 52.9%. The last education level of most respondents is high school equivalent, with a percentage of 58.8%.

Most respondents were housewives or not employed, with a percentage of 52.9%. *Overweight* was the most common nutritional status among the respondents with a percentage of 52.95%. All respondents took the same hypertension medication, namely amlodipine at a dose of 5 mg.

Table 1

Characteristics of Respondents

Characteristics of respondents	Number	%
Gender		
Male	3	17.60
Female	14	82.40
Age Group		
Age 40-49	8	47.05
Age 50-59	9	52.90
Education		
Junior high school	5	29.40
Senior high school	10	58.80
College/Academy	2	11.80
Occupation		
Private employee	1	5.90
Trader	5	29.40
Housewife	9	52.90
Other	2	11.80
Nutritional Status		
Underweight	2	11.76
Normal	6	35.29
Overweight	9	52.95
Total	17	100

Source: Personal Document.

Average Intake of Respondents

Based on the data from Table 2, it is clear that the respondents' average final potassium intake increased after consuming a combination of watermelon and carrot juice compared to their initial potassium intake. This is because the juice combination of watermelon and carrot has a high potassium content, which results in increased potassium intake in respondents

Table 2

Average Intake of Respondents

Nutritional Intake	Mean	SD	Min	Max
Energy (Kcal)	2095.7	260.3	1688	2457
Protein (g)	66.7	9.2	50	79
Fat (g)	62.2	12.1	48	85
Carbohydrate (g)	331.0	44.9	252	379
Sodium (mg)	1194.8	149.7	970	1547
Initial Potassium (mg)	1077.8	127.2	876	1296
Final Potassium (mg)	1402.2	144.7	1188	1692

Systolic Blood Pressure

The univariate analysis of the mean systolic blood pressure before and after the intervention is described in Table 3. Based on the data in Table 3, the average systolic blood pressure before consuming a combination of watermelon and carrot juice is 149.00 mmHg, and after consuming the same combination, the average systolic blood pressure drops to 133.00 mmHg.

Table 3

Average systolic blood pressure before and after intervention

Variable	Mean±SD	Min	Max
Systolic Blood Pressure			
Initial	149 ± 5.22	140	157
End	133 ± 5.14	125	144

Diastolic Blood Pressure

Univariate analysis of the average diastolic blood pressure before and after the intervention is described in Table 4. Based on the data in Table 4, the respondents' average diastolic blood pressure before the intervention was 93.65 mmHg, and after the intervention, it was 87.47 mmHg.

Table 4

Average diastolic blood pressure before and after intervention

Variable	Mean±SD	Min	Max
Diastolic Blood Pressure			
Initial	93.65 ± 2.85	90	99
End	87.47 ± 2.96	83	92

Effect of Watermelon and Carrot Juice on Blood Pressure

The results of the dependent T-test are presented in Table 5, indicating a difference in the average systolic and diastolic blood pressure before and after the intervention, with a p value < 0.001 (p value <0.05), and an average decrease in blood pressure of 16.00/6.18 mmHg. Therefore, it can be seen that giving a combination of watermelon and carrot juice significantly affects changes in the respondents' blood pressures.

The results of this study align with Nurleli's research (2019), which demonstrates that giving watermelon juice to hypertensive patients can reduce blood pressure. It is also in line with the research by Fitri and Awaluddin (2021), which shows that carrot juice can lower blood pressure in people with hypertension (N. Fitri & Awaluddin, 2021; Nurleli, 2019).

Table 5

Results of Dependent T-test

Variable	Mean± SD	P *value*
Systolic Blood Pressure		
Initial	149.00± 5.22	
End	133.00± 5.14	<0.001
Δ Difference	16.00± 4.62	
Diastolic Blood Pressure		
Initial	93.65± 2.85	
End	87.47± 2.96	<0.001
Δ Difference	6.18± 2.04	

Watermelon contains potassium, vitamin C, carbohydrates, and lycopene, which help improve heart function, and citrulline, which can increase blood flow throughout the body. It is known to have high water content, amino acids, and L-arginine, which can maintain normal blood pressure. The amino acid content in watermelon can improve arterial function and reduce blood pressure in the aorta, making watermelon a non-pharmacological treatment to reduce hypertension (Adibah et al., 2020; Arianto et al., 2020).

This study combined watermelon with carrots to make a mixed juice. Carrots can help lower blood pressure due to their high potassium content. Carrots contain 245 mg/100 g of potassium, and watermelon contains 93.8 mg/100 g of potassium. The relatively high potassium levels in watermelon and carrots function as a natural diuretic that supports heart function and lowers blood pressure (Nurdin et al., 2020). Potassium also has a vasodilating effect. It can reduce peripheral pressure and increase cardiac output, helping to manage a normal blood pressure. In addition, potassium can inhibit the release of renin, thereby changing the function of the renin-angiotensin system. It can also affect the peripheral and central nervous systems, influencing and regulating blood pressure. Potassium further inhibits the renin release, which is converted into renin-angiotensin, preventing the blood pressure rise (Nurdin et al., 2020).

Juices are rich in fiber, vitamin C, calcium, chromium, and essential fats that can effectively lower blood pressure. The high fiber content of vegetables and fruits binds excess fat and salt. They are then

eliminated from the body through feces. This process naturally reduces the risk of hypertension (Sutomo, 2016). In addition to the watermelon and carrot juice combination that can reduce blood pressure, this study also examined the respondents' food intake and its effect on blood pressure. The results showed that the final potassium intake of respondents after consuming watermelon-carrot combination juice increased compared to their initial intake.

The increase in potassium intake among respondents after consuming a combination of watermelon and carrot juice is due to its high potassium content, which can increase potassium intake and lead to lower blood pressure. High potassium levels also increase the concentration in the intracellular fluid, causing a vasodilating effect that reduces total peripheral pressure and increases cardiac output (Almatsier, 2003). This aligns with the research findings by Tonny et al. (2023), which indicated that higher potassium intake is associated with lower systolic and diastolic blood pressure in hypertensive patients.

Some respondents have a high intake of fat and sodium, which might cause a less significant decrease in their blood pressure. This is in line with the results of research by Zainuddin et al. (2017), which showed a relationship between sodium intake and hypertension. In normal amounts, the kidneys regulate sodium levels and excrete excess sodium through urine. However, when sodium intake is high, the kidneys cannot store it, leading to sodium entering the blood and causing blood sodium levels to increase (Y. Fitri et al., 2018; Zainuddin & Yunawati, 2019).

Changes in blood pressure can either increase or decrease it depending on the potassium intake (Angesti et al., 2018). Potassium works differently from sodium. Consuming plenty of potassium increases its concentration in intracellular fluid, which tends to absorb fluid from outside the cells and lower blood pressure (Amran et al., 2010). Potassium is also beneficial in triggering muscle and nerve function. High potassium will also facilitate the delivery of oxygen to the brain and help regulate fluid balance in the body. Thus, consumption of fruits rich in potassium can help keep the body refreshed (Badan Penelitian dan Pengembangan Kesehatan, 2019).

This study had several limitations. The pre-experimental one-group pretest–posttest design without a control group made it difficult to eliminate external influences on blood pressure changes. The limited sample size and short intervention period also reduced the generalizability of the results. Moreover, dietary and lifestyle factors outside the intervention were not fully controlled. Therefore, further studies with larger samples, longer intervention periods, and randomized controlled designs are needed to strengthen these findings.

CONCLUSION

The results showed that giving a combination of watermelon and carrot juice affected changes in blood pressure in hypertensive patients (p-value < 0.001). The combination of watermelon and carrot juice serves as a complementary therapy to help lower blood pressure in people with hypertension. These findings imply that incorporating fruit- and vegetable-based juices such as watermelon and carrot into daily diets may enhance non-pharmacological efforts to control hypertension and support overall cardiovascular health, especially in community-based health programs.

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Author Contribution Statement

Salma Salma: Conceptualization; Formal Analysis; Writing Original Draft. **Kasmiyetti Kasmiyetti**: Project Administration; Methodology; Review & Editing. **Irma Eva Yani:** Project Administration; Review & Editing.

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