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The Effect of Ambon Banana Juice (Musa paradisiaca var. Sapientum Linn) and Sweet Starfruit Juice (Averrhoa carambola L) on Changes in Blood Pressure in the Elderly Men in the Community Health Center Work Area Tarus, Kupang Regency

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ABSTRACT

Background: Hypertension is a health problem that often occurs in society. Uncontrolled hypertension can trigger degenerative diseases such as heart disease and kidney failure. One of the therapies used to lower blood pressure is Ambon banana and sweet star fruit therapy.
Subjects and Method: Research on elderly men suffering from hypertension in the Tarus Community Health Center working area used a Quasi-Experimental pretest–posttest with a Control Group research design. The number of samples in this study was 20 elderly men using a simple random sampling method. The dependent variable in this study was blood pressure, while the independent variable was the administration of Ambon banana juice, sweet star fruit juice, and a combination of Ambon banana juice and sweet star fruit juice. The measuring instrument used in this research is a questionnaire. The data analysis used in this research is Anova and Post hoc.
Results: The average blood pressure in the elderly decreased after being given Ambon Banana Juice, Sweet Starfruit Juice, and a combination of Juices. The greatest reduction in blood pressure occurred in the group given Ambon banana juice (Mean= 140 mmHg; p=0.002), compared to sweet starfruit juice (Mean= 148 mmHg; p= 0.036), and these results were statistically significant. The juice combination also reduced the average blood pressure, but the results were not statistically significant (Mean= 156 mmHg; p= 0.454).
Conclusion: The average blood pressure in the elderly decreased after being given Ambon Banana Juice, Sweet Starfruit Juice, and a combination of Juices.

Keywords: hypertension, Ambon banana juice, sweet star fruit juice

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BACKGROUND

Hypertension is a health problem that often occurs in society. Uncontrolled hypertension can trigger degenerative diseases such as congestive heart failure, kidney failure, and vascular disease. Hypertension is called

the "silent killer" because it is asymptomatic and after a few years causes fatal strokes or heart disease. According to the World Health Organization (WHO), hypertension is a condition where the blood vessels have persistent systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg (WHO, 2013).

Uncontrolled hypertension will cause various health complications in elderly people over 60 years old, such as stroke, heart disease, kidney disease and other vascular diseases. Hypertension is considered a serious disease because the impacts it causes are very broad, and can even result in death. Physiological impacts include decreased daily activities, feeling tired, weak, poor neuromuscular coordination, slow healing process, decreased body endurance, and instability of vital signs, while psychological impacts include depression, anxiety, lack of concentration, ineffective coping (Widyastuti, 2019).

Hypertension kills 9.4 million people worldwide every year. The World Health Organization (WHO) estimates that the number of hypertension sufferers will continue to increase along with the increasing population. In 2025, it is projected that around 29% of the world's population will suffer from hypertension. The percentage of hypertension sufferers is 40% in developing economic countries, including Indonesia, while in developed countries it is only 35%.

The results of basic health research (RISKESDAS) in 2018 showed that the prevalence of hypertension in Indonesia in elderly aged 55-64 years was 53.7%, aged 65-74 years was 63.5%, and in elderly people aged 75 years and over was 73.5%. Indicator survey National Health Services (Sirkesnas) shows that the prevalence of hypertension has increased to 32.4%. This is an increase of around 7%, the number of hypertension continues to increase due to risk factors, including the community's habit of smoking, salt consumption, to minimal consumption of fruit and vegetables, apart from food, it can also be due to physical activity and stress (Ministry of Health, 2018).

In NTT, based on the results of blood pressure measurements, the prevalence of hypertension in the population aged 18 years and over in 2018 was 31.7%. The results of data collection from the Kupang City Health Service and from the Kupang City Central Statistics Agency obtained through a recording and reporting system show that of the top 10 most common diseases in Kupang City, hypertension is in third place with a total of 28,701 cases (Provincial Health Office, 2018).

Hypertension treatment can be done in two ways, namely, pharmacological and non-pharmacological treatment. Non-pharmacological treatment, namely modifying lifestyle, has an important role for both non-hypertensive individuals and individuals who have hypertension. One way of modifying your lifestyle is by adjusting your eating pattern or diet. Fruit and vegetables are important components of a healthy diet. Some fruits that contain high levels of potassium, such as bananas and star fruit, offer great health benefits, especially for lowering blood pressure (Yuliana, 2011).

From the results of research conducted by Yudha (2017) it is stated that by consuming bananas, the average arterial blood pressure in hypertension sufferers decreases. Research conducted in West Sumatra proves that ambon diet therapy (Musa Paradisiaca var. Sapientum Linn) carried out regularly for one week can reduce blood pressure.

The results of research conducted by Mahatidanar (2017) show that consuming star fruit regularly can lower blood pressure. Sweet starfruit juice works to lower

blood pressure by reducing the secretion of antidiuretic hormone (ADH) and thirst. Antidiuretic hormone is produced in the hypothalamus and acts on the kidneys to regulate urine osmolality and volume. With a decrease in ADH, more urine will be excreted so that the urine becomes more dilute with a lower osmolality. To concentrate it, the volume of intracellular fluid will be increased by withdrawing fluid from extracellular fluid. Meanwhile, the decrease in NaCl concentration will be concentrated by reducing extracellular fluid. Coupled with reduced thirst, fluid intake is also reduced. All of these mechanisms will result in a decrease in blood pressure.

Based on the description, researchers are interested in researching whether there is potential for Ambon Banana Juice (Musa Paradisiaca Var. Sapientum Linn) and/or Sweet Starfruit Juice (Averrhoa Carambola L) to change blood pressure in elderly men in the Tarus Community Health Center working area, Kupang Regency.

SUBJECTS AND METHOD

1. Study Design

This research is quantitative research with a quasi-experimental or Quasi-experimental method with a research design using a pretest-post-test control group in the Tarus Community Health Center Working Area, Kupang Tengah Regency.

2. Population and Sample

The population in this study was elderly men in the Tarus Community Health Center Working Area, Kupang Tengah Regency with a total of 20 people. Sample of 5 people for each treatment. The sampling technique used in this research was simple random sampling.

3. Study Variables

The dependent variable in this study is blood pressure. Meanwhile, the independent variables in this study were Ambon banana juice treatment, sweet starfruit juice treatment, combination treatment of Ambon banana and sweet starfruit, and administration of captopril as a positive control.

4. Operational definition of variables

Blood pressure is the blood pressure in the blood vessels which can be measured with a sphygmomanometer.

Ambon banana juice is a drink made from Ambon bananas and is drunk by blending it.

Sweet starfruit juice is a drink made from sweet starfruit which is drunk by blending it.

5. Study Instruments

The measuring instrument used in this research is a questionnaire.

6. Data analysis

Bivariate analysis was carried out using Anova and Tukey Post Hoc tests.

RESULTS

1. Sample Characteristics

Based on Table 1, it shows that respondents aged 60-74 years were 18 people with a percentage of 85%, aged 75-90 years were 2 people with a percentage of 15%. 10 people work as farmers with a percentage of 50%. There are 10 retirees with a percentage of 50%.

2. Bivariate Analysis

Table 2 shows the average change in blood pressure before and after being given Ambon banana juice. Before being given treatment the mean blood pressure was (Mean= 164; SD= 13) and after being given the intervention the mean blood pressure was (Mean= 140; SD= 10). The difference in pressure is statistically significant $p<0.001$.

Changes in mean blood pressure before and after being given sweet star fruit juice. Before being given treatment (Mean= 170; SD= 13) and after being given the

intervention blood pressure (Mean= 160; SD= 10). The difference in pressure is statistically significant where the p<0.001 means there is a significant difference in blood pressure before and after being given sweet star fruit juice.

Changes in mean blood pressure before and after being given the juice combination. Before being given treatment the mean blood pressure was (Mean= 156; SD= 9) and after being given the intervention the mean blood pressure was (Mean= 124; SD= 5). The difference in pressure is statistically significant where the p<0.001 means there is a significant difference in blood pressure before and after being given the juice combination.

Changes in mean blood pressure before and after being given Captopril. Before being given treatment the mean blood pressure was (Mean= 172; SD= 15) and after being given the intervention the mean blood pressure was (Mean= 1124; SD= 5). The difference in pressure is statistically significant where the p value <0.001 means there is a significant difference in blood pressure before and after being given Captopril.

Table 3. shows the p value <0.001 so it can be concluded that there is a significant difference between Ambon banana juice, sweet star fruit juice, a combination of juice and captopril. Therefore, to see the mean differences between treatment groups, a post hoc test (further test) was carried out using the Tukei HSD test.

Table 4 shows that the average blood pressure in the elderly decreased after being given Ambon Banana Juice, Sweet Starfruit Juice, a Combination of Juice and Captopril. The greatest reduction in blood pressure occurred in the group given Ambon banana juice (Mean= 140 mmHg; p=0.002), compared to sweet star fruit juice (Mean= 148 mmHg; p= 0.036), Captopril (Mean= 124 mmHg; p< 0.001) and the results are statistically significant. The juice combination also reduced the average blood pressure, but the results were not statistically significant (Mean= 156 mmHg; p= 0.454).

Table 1. Characteristics of Respondents Based on Age and Occupation at Tarus Health Center

Variable	Category	Frequency	Percentage
Age	60 - 74 years	18	85%
	75 – 90 years	2	15%
Occupation	farmer	10	50%
	retired	10	50%

Table 2. Systolic Blood Pressure of Respondents Before and After Giving Treatment in May 2020 at Tarus Health Center (n=20)

Variable	Mean	SD	p
Ambon Banana			
Before	164	13	< 0.001
After	140	10	
Sweet Starfruit			
Before	170	10	< 0.001

After	148	11	
Combination of Ambon Banana Juice and Sweet Starfruit Juice			
Before	164	13	< 0.001
After	156	9	
Captopril			
Before	172	15	< 0.001
After	124	5	

Table 3. Differences in Blood Pressure Between Treatment Groups (Anova)

	Sum of Squares	Df	Mean Square	F	p
Between Groups	2800.000	3	933.333	13.333	<0.001
Within Groups	1120.000	16	70.000		
Total	3920.000	19			

Table 4. Follow-up Test Mean Blood Pressure Between Treatments (Tukey HSD)

Treatment	Mean Systolic Blood Pressure/mmHg	p
Ambon Banana Juice	140 mmHg	0.002
Sweet Starfruit Juice	148 mmHg	0.036
Juice Combination	156 mmHg	0.454
Captopril	124 mmHg	<0.001

DISCUSSION

A. Difference in Blood Pressure Before and After Being Given Ambon Banana Juice

Ambon bananas contain high potassium, in potassium there is a secretion of renin and Angiotensin II, reduced vasoconstriction of blood vessels can ease the work of the heart so that blood pressure is reduced. Potassium is useful for controlling blood pressure, influencing heart rhythm, treating high blood pressure, removing carbon dioxide in the blood, playing a role in nerve and muscle density, and triggering the work of muscles and nerve nodes. High potassium will also facilitate oxygen delivery to the brain and help balance fluids in the body. Ambon bananas contain ACE 1 which can inhibit the action of the angiotensin enzyme in the process of lowering blood pressure. Bananas contain natural angiotensin converting enzyme or natural ACE inhibitor. ACE produces a substance called angiotensin-2 which causes blood vessels to narrow and increase the pressure within them. Consuming bananas has been proven to stop blood vessels from narrowing. ACE inhibitors lower blood pressure by blocking the production of the hormone angiotensin II which causes blood vessel constriction. In this way, ACE inhibitors can widen blood vessels, thereby reducing blood pressure (Gain, 2013).

The results of the study showed that the average change in systolic blood pressure before being given Ambon banana juice was 164 mmHg and after being given Ambon banana juice was 140 mmHg. The difference in mean blood pressure is statistically significant where the p<0.002 means there is a significant difference in blood pressure after being given Ambon banana juice.

The results of this research are in line with Susanti's (2019) research in Karanganyar. The Wilcoxon test results obtained a p= 0.027, which means there was a difference in blood pressure after being given the Ambon banana intervention. Ambon bananas contain potassium which can cause inhibition of the renin angiotensin system and also cause a decrease in aldosterone secretion, resulting in a decrease in sodium reabsorption, resulting in an increase in diuresis which causes a reduction in blood volume so that blood pressure decreases.

Based on the results above, it can be concluded that giving juice is very effective in lowering blood pressure in elderly people with hypertension.

B. Differences in Blood Pressure Before and After Given Sweet Starfruit Juice

Sweet star fruit has benefits in lowering blood pressure, where the ingredients that play a role in lowering blood pressure are Vitamin C, Potassium, Saponins, and Flavanoids. The Vitamin C content acts as a powerful vasodilator antioxidant which can reduce oxidative stress and improve endothelial function through the production of nitric oxide. If there is an increase in nitric oxide levels in the body, it will cause a relaxation process in the endothelium, which can reduce blood pressure. The potassium content can relax smooth muscle cells in blood vessels, which can then reduce peripheral vascular resistance so that it can lower blood pressure (Yona, 2018). Appropriate potassium levels in the body are needed as a comparison with sodium so that blood pressure remains within normal limits (Almatsier, 2009), apart from that, the increased concentration of intracellular potassium will attract fluid from the extracellular so that it can reduce blood pressure (Anggraini., 2015).

Saponin has diuretic properties by reducing plasma volume by removing water and electrolytes, especially sodium, which can cause a decrease in cardiac output (Asprilia, 2016). Flavonoids will affect the work of angiotensin converting enzyme (ACE), inhibiting ACE will inhibit the change of angiotensin I to angiotensin II, which causes vasodilation so that peripheral resistance falls and can reduce blood pressure (Safitri and Kusumastuti, 2015).

The results of the study showed that the average change in systolic blood pressure before being given sweet star fruit juice was 170 mmHg and after being given sweet star fruit juice was 148 mmHg.

The difference in mean blood pressure is statistically significant where the p<0.036 means there is a significant differrence in blood pressure after being given sweet star fruit juice.

The results of this study are in line with research by Berawi (2016) in Pontianak. The Wilcoxon test results obtained a p<0.001, which means there was a significant difference in systolic and diastolic blood pressure after being given sweet starfruit juice. Sweet starfruit contains high potassium and low sodium. By changing two main actions, namely decreasing intracellular fluid and increasing extracellular fluid in the body from Angiotensin I which is converted into angiotensin II by ACE (angiotensin I-converting enzyme) which causes an increase in blood pressure (hypertension), where high potassium will be able to reduce production. or secretion of the hormone ADH and thirst. This hormone works on the kidneys to regulate osmolality and urine volume. As ADH decreases, urine excreted out of the body increases, so that it becomes dilute with a low osmolality. To concentrate it, the volume of intracellular fluid will be increased by withdrawing fluid from the

extracellular part. Meanwhile, the decrease in NaCl concentration will be concentrated by reducing extracellular fluid which will then reduce blood pressure (Sumartini, 2019).

AUTHOR CONTRIBUTION

All of the writers contribute in this study.

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None.

CONFLICT OF INTEREST

There is no conflict of Interest in this study.

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