

The Effectiveness of Cucumber (*Cucumis Sativus*) and Ambon Banana Fruit (*Musa Acuminata Cola*) in Reducing Blood Pressure in Hypertensive Patients in Palangga Gowa District, Indonesia

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Abstract

Hypertensive patients who are not adhering to treatment cannot control their blood pressure so it is important to find solutions that can stabilize blood pressure with food that is consumed and can be found anytime around them. **Objective:** This study was to identify the effectiveness of cucumber and Ambon banana fruit in reducing blood pressure in hypertensive sufferers. **Method:** This type of research is a Quasy Experiment with a non-randomized pretest and posttest control group design. Population of this study were hypertensive patient in Pallangga subdistrict and Sample participated were 24 people with hypertension selected by purposive sampling with the sample formula of unpaired numerical analytic research. **Results:** There were differences before and after treatment in the two groups, there was no difference in the effectiveness of the sample in the two same treatments. **Conclusion:** Cucumber and banana fruit are effective for lowering blood pressure.

Keywords: *Cucumber juice, Ambon banana fruit, hypertension.*

Introduction

Currently, modernization results in lifestyle changes in society, such as excessive eating habits, too much activity, smoking a lot, and lack of rest. These patterns and lifestyles cause increased heart and blood vessel disease, especially for people over the age of 40 years. One of them is the emergence of high blood pressure or what is often referred to as hypertension.¹

Hypertension or better known as high blood pressure disease is a disorder that occurs in the circulatory system where blood pressure is above normal limits. Normal

blood pressure is 120 mmHg for systolic and 80 mmHg for diastolic. A person is stated to have hypertension and is at risk for health problems if after several measurements, the blood pressure value remains high, >140 mmHg for systolic and >90 mmHg for diastolic.²

Hypertension is often called the “silent killer” because it does not provide characteristic symptoms. But it can increase the incidence of strokes, heart attacks, chronic kidney disease, and even blindness if not controlled and controlled properly.³

Nearly 1 billion people worldwide have high blood pressure. Hypertension is one of the leading causes of early death worldwide. In 2020 about 1.56 billion adults will live with hypertension. Hypertension kills nearly 8 million people every year in the world and nearly 1.5 million people annually in the East-South Asia region. About a third of adults in East-South Asia suffer from hypertension.⁴

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Based on data from the 2016 National Health Indicator Survey, the national prevalence of the population with high blood pressure is 30.9%. The prevalence of high blood pressure in women (32.9%) was higher than that of men (28.7%). The prevalence in urban areas was slightly higher (31.7%) than in rural areas (30.2%). The prevalence increases with age.⁵

Basic health research in 2018 showed that the prevalence of non-communicable diseases has increased compared to 2013, including hypertension. From the results of blood pressure measurements, hypertension rose from 25.8% to 34.1%. The increase in the prevalence of non-communicable diseases is related to lifestyle, including smoking, alcohol consumption and physical activity.⁶

Most cases of hypertension (90%) are primary hypertension, the cause is unknown. As a result of this, not all hypertensive patients need anti-hypertensive drugs. The more important treatment effort is to eliminate risk factors that are thought to be associated with the incidence of hypertension. In principle, there are two types of therapy that can be performed to treat hypertension, they are pharmacological therapy using drugs, and non-pharmacological therapy, by modifying daily life patterns and returning to natural products. Referring to the concept of back to nature, it's doing by using local ingredients that are widely available in the community, because these ingredients are rich in antioxidants and potassium in the form of fruit juices as an effort to reduce blood pressure in hypertensive patients as indicated by a blood pressure reduction graph. This research was conducted to see the effectiveness of the fruit juice in lowering blood pressure.⁷

One of these natural products is the cucumber (*Cucumis sativus*) which is widely available in the community. Cucumber has long been used as a traditional medicine that is useful for lowering high blood pressure. Cucumber is a type of vegetable that is commonly consumed by people to lower blood pressure. Previous studies have shown that there is a significant effect of cucumber juice on blood pressure reduction, the largest decrease occurred at 2 hours and after treatment on days 4 and 5 of cucumber juice. This fruit contains high levels of potassium and low sodium, making it suitable for consumption by people with hypertension.⁸

The substances in cucumber which can help lower blood pressure, including potassium (potassium), magnesium, and phosphorus are effective in treating hypertension. Apart from that, cucumber is also a diuretic because of its high water content which helps lower blood pressure.⁹

Bananas can lower blood pressure because they have Angiotensin Converting Enzyme Inhibitor (ACE-I) activity in the body. As the name implies, this substance inhibits the action of the angiotensin enzyme in the process of increasing blood pressure. Apart from ACE-I, bananas also contain high potassium and low sodium so it is good for people with hypertension. Consumption of two Ambon bananas every day, potassium-rich foods such as bananas can help lower blood pressure.¹⁰

Likewise, consumption of other fruits such as bananas can also lower blood pressure. One study shows that consumption of Ambon banana (*Musa acuminata colla*) is very effective in lowering blood pressure. The decrease in blood pressure is caused by Ambon banana contains high potassium and low sodium. Potassium helps maintain osmotic pressure in the intracellular space while sodium maintains osmotic pressure in the extracellular space so that high potassium levels can increase sodium excretion in the urine (natriuresis), thereby decreasing blood volume and blood pressure, but on the other hand a decrease in potassium in the intracellular space causes the fluid in the intracellular space tends to be attracted to the extracellular space and sodium retention due to the body's response to the osmolality of the two compartments at equilibrium but this can increase blood pressure.¹⁰

The prevalence of hypertension in South Sulawesi which was obtained through measurements at ≥ 18 years of age was 28.1 percent, the highest was in Enrekang (31.3%), followed by Bulukumba (30.8%), Sinjai (30.4%) and Gowa (29.2%). The prevalence of hypertension in South Sulawesi which was obtained through a questionnaire diagnosed by health workers was 10.3 percent, 10.5 percent diagnosed by health workers or currently taking medication, so that 0.2 percent were taking their own medication.¹¹ For Gowa Regency, hypertension is ranked 4th out of 10 diseases with a total of 975 with a prevalence of 5.02% in 2016.¹²

Seeing this fact, to provide a solution to stabilize blood pressure, several treatments will be given that do not cause boredom and are burdened by having to take medicine that sometimes they forget. The research objective was to identify the effectiveness of cucumber and Ambon banana in reducing blood pressure in hypertension sufferers.

Material and Method

This type of research is a Quasy Experiment with a non-randomized pretest and posttest control group design. Population of this study were hypertensive patient in Pallangga subdistrict and sample participated were 24 people with hypertension selected by purposive sampling with the sample formula of unpaired numerical analytic research. This research performed by intervening all subjects based on their group with giving consuming Ambon banana and cucumber for each group. Both of interventions hypotesized could lower blood pressure in people with hypertension.

The research design used was non-randomized pretest and posttest control group. The study was divided into 2 treatment groups, namely the Ambon banana group and the cucumber group, each group consisting of 12 samples that were given treatment then carried out measurements. Each of which was given treatment in the form of giving 2 pieces of Ambon banana fruit per day in the first group while the second group was given 1 portion of cucumber juice as much as 50 grams per day.

Results

The subject characteristics of this study distributed in age group 45-54 years old were 7 subjects (29.1%), 55-64 years old were 10 subjects (41.6%), and >64 years old were 7 subjects (29.1%). In addition, this study also measured physical activity habits and smoking habits of subjects. In the physical activity habits, 17 subjects (70.83%) used to do gymnastic while 7 subjects (29.16%) used to do jogging everyday. In the smoking behavior, 4 of 24 subjects (16.66%), had been smoking while others not smoking.

Blood pressure of subjects after having 2 pieces of Ambon banana fruit in the first group and cucumber juice in the second group showed in Table 1.

Table 1. Blood pressure measurement result pre and post intervention for both groups

		Blood pressure	n	Mean	Medium	SD	Min-Max	95%CI
Cucumber group								
Systolic								
Pre	12	157.50	150.00	20.05	140-190	144.75-170.24		
Post1	12	143.33	135.00	17.75	120-170	132.05-154.61		
Post2	12	137.71	140.00	7.53	130-150	132.71-142.28		
Diastolic								
Pre	12	96.66	100.00	4.92	90-100	93.53-99.79		
Post1	12	96.66	100.00	4.92	90-100	93.53-99.79		
Post2	12	95.00	95.00	5.22	90-100	91.68-98.31		
		Blood pressure	n	Mean	Medium	SD	Min-Max	95%CI
Ambon banana fruit group								
Systolic								
Pre	12	155.83	150.00	13.11	140-180	147.50-164.16		
Post1	12	155.83	130	13.78	120-170	125.40-142.92		
Post2	12	142.50	140	10.55	120-160	135.79-149.20		
Diastolyc								
Pre	12	94.16	90.00	5.14	90-100	90.89-97.43		
Post1	12	87.50	90.00	4.52	80-90	84.62-90.37		
Post2	12	93.33	90.00	4.92	90-100	90.20-96.46		

Table 1 showed that the patient’s mean systolic blood pressure decreased after intervening of cucumber juice from 157.50 ± 20.05 mmHg to 143.33 ± 17.75 after the first intervention and 137.71 ± 7.53 mmHg after the second intervention. Meanwhile, diastolic blood pressure remained persistent after the first intervention and decreased after the second intervention from 96.66 mmHg to 95.00 mmHg. The lowest value for systolic pressure reduction was obtained by 140 mmHg before the intervention decreased by 120 mmHg, while the lowest value for diastolic blood pressure was 90 mmHg and the highest was 100 mmHg. The estimation results of the 95% confidence interval showed that the patient’s systolic blood pressure was 132.71-142.28 mmHg and diastolic blood pressure 91.68-98.31 mmHg after being given cucumber juice.

In the second group that was given intervention with Ambon banana, the patient's average diastolic blood pressure had not decreased after the first intervention with Ambon banana. After the second intervention, diastolic blood pressure decreased from 155.83 ± 13.78 mmHg to 142.50 ± 10.55 . Meanwhile, diastolic blood pressure decreased after the first intervention from 94.16 ± 5.14 to 87.50 ± 4.52 and again increased after the second intervention to 93.33 ± 4.92 mmHg. The results of the 95% confidence interval estimation indicated that

the patient's systolic blood pressure was 135.79-149.20 mmHg and diastolic blood pressure 90.20-96.46 mmHg after being given Ambon banana.

Inferential analysis was used to determine the effectiveness of cucumber and banana interventions in reducing blood pressure in hypertensive patients. The effectiveness of cucumber and Ambon banana in reducing blood pressure based on the results of this study can be seen in Table 2 below:

Tabel 2: The effectiveness of cucumber and Ambon banana in reducing blood pressure in hypertensive patients (n=12)

Blood pressure	n	Chi-Square	p
Cucumber group			
Systolic	12	1.474	0.479
Dyastolic	12	0.750	0.687
Ambon banana fruit group			
Systolic	12	7.610	0.022*
Dyastolic	12	12.286	0.002*

*Uji Friedman

Table 2 showed that the Friedman test results found p value = 0.479 indicating that there was no difference in systolic blood pressure before cucumber administration, after the first intervention and the second intervention. The same thing happened to diastolic blood pressure, there was no difference before giving cucumber, after the first intervention and the second intervention. This table also showed that in the group that intervened with Ambon banana fruit, the Friedman test results showed a value of $p = 0.022$, which means that there was a difference in systolic blood pressure before giving Ambon banana, after the first intervention and the second intervention. The same thing also happened to diastolic blood pressure, it was found p value = 0.002 which indicates that there was a difference before giving Ambon banana, after the first and the second intervention.

Discussion

The results of this study illustrate that the age group of respondents is mostly in the 55-64 years age group (41.6%) and for the two age groups 29.1% respectively. This study shows that older people tend to suffer from high blood pressure. The prevalence of hypertension increases with increasing age. This situation is caused by the increase in arterial pressure with age, the occurrence of aortic regurgitation, and the presence of a degenerative process, which is more frequent in old age. At the time of increasing age until they reach old age, there is also an increased risk of diseases including neurological / psychiatric disorders, heart and blood vessel disorders as well as reduced sensory function and metabolic disorders in the body.¹³

Isotonic sports, such as walking, jogging, swimming, can reduce hypertension. Exercise can reduce non-adrenaline hormones and other hormones that cause

blood vessels to shrink, which can lead to increased blood pressure. Conversely for people with hypertension avoid isometric exercises such as lifting weights, because they can increase blood pressure. In this study, respondents who had a habit of walking were 29.1%, while those who did exercise were 70.83%. This is because the *Prolanis* group (Chronic disease management program) in the Palangga Public Health Care Center has a program for this community, and the pedestrian group is a group formed since the respondent is still active in work until when he retires, this activity is still continuing.

Most of the respondents did not smoke (83.3%) and 16.6% of respondents smoked, this was found because the respondents were male smokers. From the results of previous research, it was known that patients who smoke tend to have high blood pressure, the nicotine in cigarettes can increase blood clots in blood vessels and can cause calcification of the walls of blood vessels.

The smoking habit for men is common place in this area so it is rare to find people who do not smoke, even though efforts to eliminate smoking have been made by the government. If there are men who do not smoke, it is likely that they have been banned by health workers because they are related to the illness they are suffering from. So that when we find subjects who smoke, it is because they feel that there is no health disorders so far with their smoking habits.

This study shows empirical evidence that there was a significant effect of giving cucumber juice and Ambon banana on reducing blood pressure, this is possible because cucumbers contain potassium, magnesium, and phosphorus, where these minerals can effectively lower blood pressure. Apart from that, cucumber is also a diuretic because of its high water content which helps lower blood pressure. Potassium is the main intracellular electrolyte, in fact 98% of the body's potassium resides in cells, the remaining 2% is outside cells. What matters is this 2% for neuromuscular function. Potassium affects the activity of both the skeletal muscle and the heart muscle. Bananas can lower blood pressure because they have Angiotensin Converting Enzyme Inhibitor (ACE-I) activity in the body. As the name implies, this substance inhibits the action of the angiotensin enzyme in the process of increasing blood pressure. Apart from ACE-I, bananas also contains high potassium and low sodium so

it is good for people with hypertension.

The results of this study indicate that the consumption of both types of fruit can reduce blood pressure in patients with hypertension. Although statistically the decrease in blood pressure was not significant in the group given cucumbers, a significant decrease was found in the group that received Ambon banana.

Subjects who were treated were patients who did not adhere to pharmacological treatment, who sometimes did not take their medication, the need to take medication felt only when symptoms occurs. Referring to the results of this study, cucumber and Ambon banana juice can be recommended as food ingredients that must always be present in every family meal. Because of the mineral content present in both of these, increase their concentration in the intracellular fluid so that it tends to draw fluid from the extracellular and lowers blood pressure.

When seen in various previous studies that describe a decrease in blood pressure both systolic and diastolic, the effectiveness of cucumber juice on changes in blood pressure occurs with a fairly rapid onset, but the duration of cucumber juice is not that long. Likewise, giving Ambon banana fruit whose effectiveness is almost the same as cucumber juice in reducing blood pressure. No reference has been found that clearly describes the onset of action and duration of action. Therefore, this research can be continued by looking at how long the effect of cucumber and banana juice in maintaining blood pressure in hypertension sufferers.

Conclusion

From the results of the research that has been carried out, it can be concluded that there was a difference in the average blood pressure before and after being treated with cucumber juice and Ambon banana fruit in hypertensive patients. Significant results were found in the group that received the intervention with Ambon banana 2 fruit per day, while in cucumber juice there was a decrease in blood pressure which was not statistically significant. Cucumbers and Ambon bananas are recommended to be the fruit of choice in the diet of people with hypertension and are suggested to be part of the Public Health care center Program in implementing community movements with a family approach in their

environment, considering that these two fruits are local fruit products. It is recommended that the Public Health care center be able to launch a local fruit consumption program for health for all people in Palangga sub-district. The Prolanis group can be encouraged to replace carbohydrates as snacks with bananas or cucumbers.

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