

Comparison Efficiency of Consuming Sweet Star Fruit Juice, Carrot Juice and Cucumber Juice against Patients with Hypertension Analyzed with Kruskal Wallis

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Abstract: Hypertension is still a degenerative disease which remains a major problem in society and even in the world. Hypertension is one of the main causes of mortality and morbidity in Indonesia, so the management of this disease is a very common intervention at various levels of health facilities. Intake with modified food ingredients containing potassium and magnesium into one of the complementary therapies to lower blood pressure. This study examined the effectiveness of sweet star fruit juice, carrot juice, cucumber juice in patients with hypertension. The sample uses non-probability techniques namely purposive sampling of 54 samples. This research is a quasi experiment or quasi experiment. Wilcoxon test results of 200 ml sweet starfruit juice for 7 days can reduce systole 23.89 (p-value = 0,000) and diastole 12.78 (p-value = 0,000), for systolic carrot juice 9.44 (p-value) = 0.00) and diastole 4.44 (p-value = 0.000), and for cucumber juice cyste 15 (p-value = 0,000) and diastole 7.78 (p-value = 0.001). The results of the kruskal wallis show p-value cystole = 0,000 and p-value diastole = 0.001 with mean rank cystole and sweet starfruit juice diastole namely 37.5 and 35.03, mean rank cystole and diastole carrot juice are 18.58 and 16.19, the mean rank of cucumber and diastole of cucumber juice is 26.42 and 31.28.

1 INTRODUCTION

Hypertension is a major problem for us all, because it does not only occur in Indonesia, it remains in the world. This is because hypertension is an entry point or risk factor for diseases such as heart disease, kidney failure, diabetes and stroke. Hypertension is often found in adults and many adults suffer from the disease, but are not aware of it. Hypertension is referred to as the silent killer because it is often without complaints, so the patient does not know he has hypertension and only becomes known after complications occur. Other complications of hypertension that are not treated can also be myocardial infarction, kidney failure, encephalopathy, and seizures. Data shows that around 1.13 billion people in the world have hypertension, meaning that 1 in 3 people in the world is diagnosed with hypertension. The number of people with hypertension continues to increase every year, it is estimated that in 2025 there will be 1.5 billion people

affected by hypertension, and it is estimated that every year 9.4 million people die from hypertension and its complications (Ministry of Health, 2019).

According to Indonesia's 2014 Sample Registration System (SRS) data, hypertension with complications (5.3%) is the number 5 cause of death at all ages. Whereas based on 2017 International Health Metrics Monitoring and Evaluation (IHME) data in Indonesia, the first-ranked cause of death is caused by stroke, followed by ischemic heart disease, diabetes, tuberculosis, cirrhosis, diarrhea, COPD, Alzheimer's, lower respiratory tract infections and disorders neonatal and traffic accidents.

Based on the Basic Health Research (RISKESDAS) 2018 the prevalence of hypertension based on measurement results in the 18-year-old population of 34.1%, From the prevalence of hypertension of 34.1% it is known that of 8.8% diagnosed with hypertension and 13.3% of people diagnosed with hypertension did not take medication and 32.3% did not take medication regularly. This shows that most hypertension sufferers do not know

that they are hypertensive so they do not get treatment.

Hypertension can be overcome with pharmacological treatment and non-pharmacological treatment. Pharmacological treatment is by taking antihypertensive drugs. Pharmacological treatment is by taking antihypertensive drugs and non-pharmacological treatment by implementing a healthy lifestyle in the form of weight loss, exercise, smoking cessation, diet modification such as consuming fruits and vegetables, reducing salt intake, and reducing alcohol consumption (PERKI, 2016). One way to make lifestyle modifications in people with hypertension is by eating settings. The DASH (Dietary Approaches to Stop Hypertension) diet is a lifelong approach to healthy eating that is designed to help treat or prevent high blood pressure. The DASH diet encourages reducing sodium in the diet and eating a variety of nutrient-rich foods that help lower blood pressure, such as potassium, calcium and magnesium. The DASH diet is also in line with dietary recommendations to prevent osteoporosis, cancer, heart disease, stroke and diabetes.

According to Mama Lubna (2016), one of the carrots that is good for reducing or controlling blood pressure is potassium. Potassium is a strong diuretic that helps maintain blood pressure balance. Potassium also has a function as a vasodilation in blood vessels. Vasodilation in blood vessels can reduce peripheral pressure and increase cardiac output so that blood pressure can be normal. Research conducted by Nurul Fitriani Haris (2012), shows that carrot juice has an effect on reducing blood pressure in hypertensive patients and research conducted by Fitri Parwanti (2010) also shows that administration of carrot juice is effective in reducing systolic blood pressure and diastolic pressure in hypertensive patients. Based on Zul Fikar Ahmad (2017), lowering blood pressure can be done by drinking cucumber juice. Cucumber is a fruit that is found in many communities and has been widely consumed as a complement to dishes. Based on the report of the United State Department of Agriculture (USDA) every 100 grams of cucumber contains 147 mg of potassium and does not contain sodium, and many other nutritional content. The high potassium content, making cucumbers as one of the choices in efforts to treat nonpharmacological hypertension. Based on research conducted by Kusumastuty, et al (2016) about potassium intake on blood pressure, found that potassium intake is associated with systolic blood pressure and diastolic blood pressure with a negative correlation direction, it shows that the higher the consumption of potassium, it can reduce blood pressure in patients

hypertension. The absence of sodium content also makes clear the benefits of cucumbers. Based on research conducted Riyadi, et al (2016), that excessive sodium consumption is four times the risk of suffering from essential hypertension when compared with those who consume less sodium. Sweet star fruit can also be sweet star fruit has a diuretic effect that can facilitate urine so that it can reduce the workload of the heart. A food is said to be healthy food for the heart and blood vessels, if it contains a ratio of potassium to sodium of at least 5: 1. Star fruit contains potassium and sodium with a ratio of 66: 1, so it is very good for people with hypertension (Astawan, 2016). Based on the explanation above, the researchers aimed to comparison the effectiveness of sweet star fruit juice, carrot juice, cucumber juice in patients with hypertension.

The Kruskal-Wallis test was used to compare two free samples from two different populations. The Kruskal-Wallis test was chosen if the data were not normally distributed and the data variance was different. The Kruskal-Wallis test, also called the H test, is an alternative procedure to one-way ANOVA. The Kruskal-Wallis test also assumes that the variance between the population k (treatment) is the same, but the population k has a continuous distribution and has the same shape (while the shape can be skewed, bimodal, or whatever). And unlike the ANOVA test, Kruskal-Wallis, which is an alternative nonparametric method, can be used for ordinal or ranked data response. The p -value is less than the critical limit of α , generally 0.05, which means rejecting H_0 or accepting H_1 , meaning that the treatment has a significant effect. Kruskal Wallis is an omnibus test that is a test that can only find out if there are statistically significant differences without being able to know which treatments differ, so a Post Hoc test or a further test is needed. As in the previous discussion that the Post Hoc test after Kruskal Wallis can use the Mann Whitney U Test, which is to test the difference in mean between one group or treatment with other treatments.

2 METHODS

This research was conducted at the Namorambe Health Center, Namorambe District, Deli Serdang Regency. From Table 1 it can be seen that this study used a sample of 54 adults with a non-probability sampling technique that is purposive sampling. This study used 3 groups of juice therapy samples: the first group 18 samples using star fruit juice, the second

group 18 samples using carrot juice, and 18 samples using cucumber juice. All samples were hypertension patients aged 26-70 years, with the classification of mild hypertension (stage 1) 140-159 mmHg and moderate hypertension (stage 2) 160-179 mmHg.

Table 1: Pretest and Posttest data for Patient Hypertension with Sweet Star Fruit Juice

No	Age	Gender	Blood pressure		Juice Therapy
			Pre-Test	Post-Test	
1	56	P	160/90	140/80	Sweet Star fruit juice
2	50	P	170/100	150/90	
3	55	L	160/100	130/80	
4	46	P	150/100	120/80	
5	57	L	150/90	130/80	
6	48	P	140/90	120/80	
7	62	L	160/90	150/80	
8	44	P	150/90	130/80	
9	44	P	140/80	110/70	
10	60	P	150/100	120/80	
11	55	L	150/90	130/80	
12	64	P	170/100	140/90	
13	51	P	160/90	130/80	
14	50	L	160/100	130/80	
15	55	L	170/100	150/80	
16	63	L	150/90	130/80	
17	50	P	140/90	120/80	
18	53	L	150/100	120/90	

Table 2 : Pretest and Posttest data for Patient Hypertension with Sweet Carrot Juice

No	Age	Gender	Blood pressure		Juice Therapy
			Pre-Test	Post-Test	
1	52	L	160/90	150/90	Carrot juice
2	40	L	150/90	140/90	
3	53	P	160/100	150/90	
4	55	L	160/90	150/80	
5	42	P	160/90	160/100	
6	56	P	170/100	160/90	
7	43	L	150/90	140/90	
8	60	P	150/90	140/90	

9	63	L	160/100	150/90	
10	52	L	140/90	130/90	
11	50	P	150/100	140/90	
12	66	P	150/100	140/90	
13	59	P	170/100	160/90	
14	46	L	150/90	140/90	
15	57	P	140/90	130/80	
16	64	L	160/90	150/80	
17	60	L	160/80	150/90	
18	58	P	160/100	150/90	

Table 3 : Pretest and Posttest data for Patient Hypertension with Cucumber Juice

No	Age	Gender	Blood pressure		Juice Therapy
			Pre-Test	Post-Test	
1	50	L	160/100	130/80	Cucumber juice
2	55	L	170/100	150/80	
3	63	L	150/90	130/80	
4	50	P	140/90	120/80	
5	53	L	150/100	120/90	
6	63	L	160/100	150/90	
7	52	L	140/90	130/90	
8	53	L	150/100	120/90	
9	52	L	160/90	150/90	
10	40	L	150/90	140/90	
11	63	L	160/100	150/90	
12	52	L	140/90	130/90	
13	50	P	150/100	140/90	
14	66	P	150/100	140/90	
15	59	P	170/100	160/90	
16	46	L	150/90	140/90	
17	57	P	140/90	130/80	
18	40	L	150/90	140/90	

This research is a quasi-experimental where the research is given treatment to the research subjects. This research was carried out by means of preliminary data collected including measurement of hypertension blood pressure with a sphygmomanometer before being given the treatment of star fruit juice, carrot juice and cucumber juice. During treatment, the sample is monitored for the

portion of juice consumed and all complaints experienced by the sample are recorded. This treatment is given for 7 days, each juice group sample taken by 100 ml. After 7 days, blood pressure measurements were taken to systole and diastole with a sphygmomanometer. The ingredients used to make juice are blenders, knives, filters, measuring cups, Liostar brand scales with a capacity of 3 kg. The data obtained were processed using the Wilcoxon Rank

and Kruskal Wallis tests. Prior to the Wilcoxon Rank and Kruskal Wallis tests, the normality and homogeneity tests were previously carried out, which is to find out whether the data is normal or not and homogeneous or not. Because to use the test data must not be normally distributed. Normality test obtained p-value <0.05 and vice versa for data not normally distributed.



Figure 1: The process of making juice

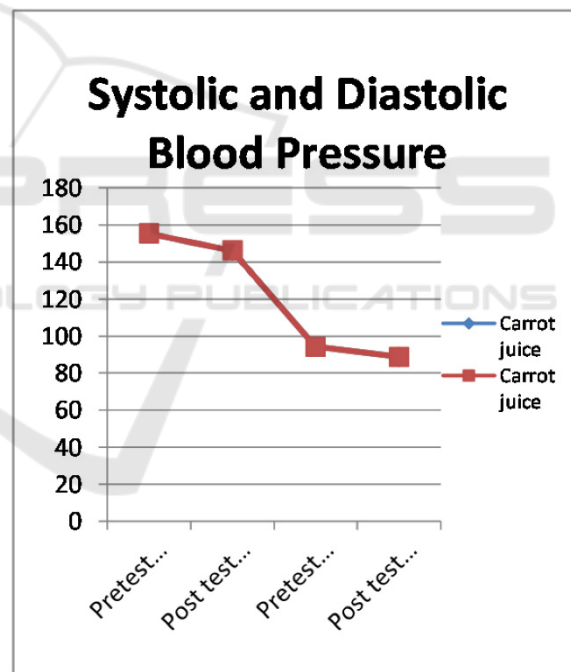
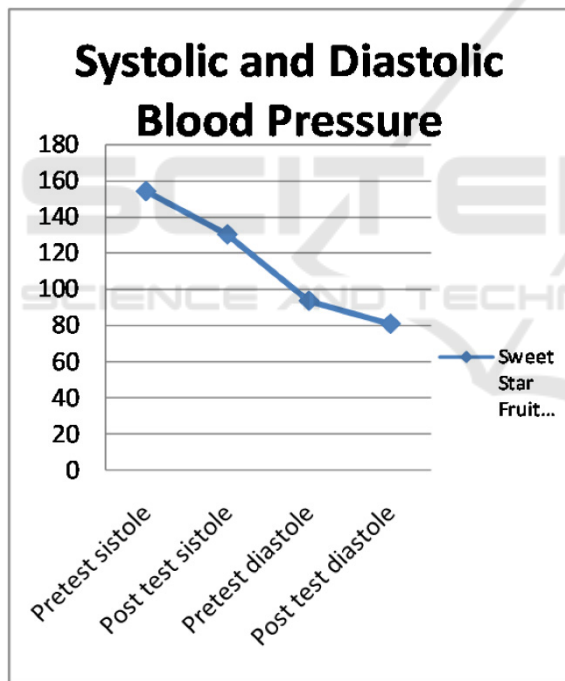
3 RESULTS AND DISCUSSION

Based on the results of research conducted for 7 days, obtained samples that suffer from hypertension as

many as 54 people, each grouped 18 people using sweet starfruit juice, 18 people using carrot juice, and 18 people using cucumber juice, obtained blood pressure data after drinking juice as follows:

Table 4: Result of Differences in Juice Therapy with Wilcoxon Test in Hypertension

	Pressue Results Blood	N	Mean	Median	SD	p-value
Sweet star fruit juice	Pretest sistole	18	154,4	150	9,835	0,000
	Post test sistole	18	130,5	130	11,617	
	Pretest diastole	18	93,8	90	6,076	0,000
	Post test diastole	18	81,1	80	4,714	
Carrot juice	Pretest sistole	18	155,5	160	8,555	0,000
	Post test sistole	18	146,1	150	9,164	
	Pretest diastole	18	94,4	90	5,113	0,000
	Post test diastole	18	88,8	90	4,714	
Cucumber juice	Pretest sistole	18	152,22	150	9,428	0,000
	Post test sistole	18	137,22	140	11,785	
	Pretest diastole	18	95	95	5,145	0,001
	Post test diastole	18	87,22	90	4,609	



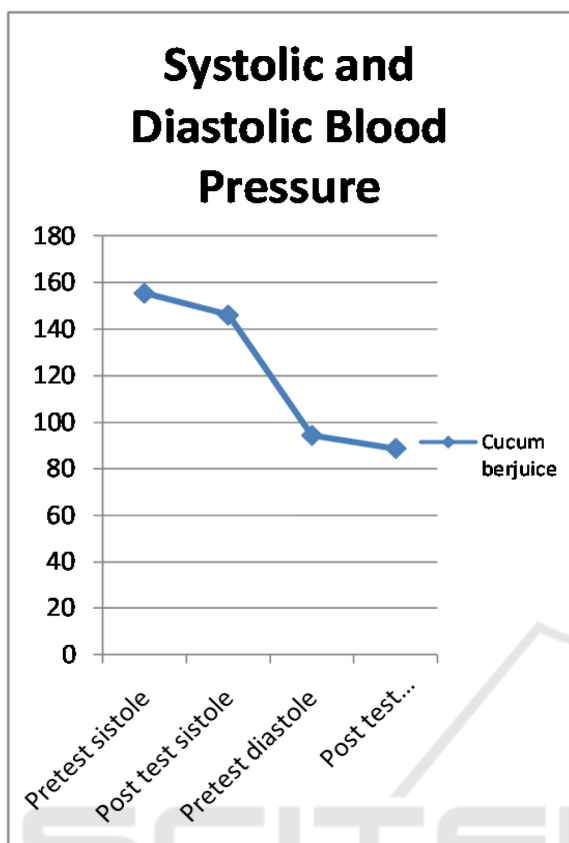


Figure 2: The Graphic Pretest and Posttest Systole-Diastole

Based on Table 4, the p-value of systole 0.001 and diastole 0.000 is obtained so that it can be concluded that Reject H_0 which means there is a difference in the effectiveness of giving sweet star fruit juice, carrot juice and cucumber juice to decrease high blood pressure in people with hypertension. With the mean rank of systole sweet starfruit juice group 37.50 and systole carrot juice group 18.58, and systole cucumber juice group 26.42. While the results of diastole in the sweet starfruit juice group 35.03, diastole in the carrot juice group 16.19, and diastole in the cucumber juice group 31.28. From the above results it can be seen that sweet starfruit juice is more effective in lowering blood pressure in people with hypertension compared to carrot juice and cucumber juice.

Table 5: Distribution of Average Differences in Effectiveness of Juice Therapy with the Kruskal Wallis Test in Hypertension

Blood Pressure Results	N	Mean Rank	p-value
Sweet star fruit systole	18	37,50	0,001
Carrot systole	18	18,58	
Cucumber systole	18	26,42	
Sweet star Fruit Diastole	18	35,03	0,000
Carrot Diastole	18	16,19	
Cucumber Diastole	18	31,28	

The results of this study are in line with research based on DASH (Dietary Approaches to Stop Hypertension) said to reduce blood pressure is highly recommended to consume foods high in potassium and fiber (Chaturvedi, 2009). Sweet star fruit has a diuretic effect that can expedite urine so as to reduce the workload of the heart. A food is said to be healthy food for the heart and blood vessels, if it contains a ratio of potassium to sodium of at least 5: 1. Sweet star fruit contains potassium and sodium with a ratio of 66: 1, so it is very good for people with hypertension (Astawan, 2009). Diuretics have an antihypertensive effect by increasing the release of water and sodium salt. Potassium maintains the stability of the body's electrolytes through potassium sodium pumps, reducing the amount of water and salt in the body and loosening blood vessels so that the amount of salt in blood vessels enlarges, this condition helps blood pressure to become normal. Magnesium and potassium affect the smooth muscle of blood vessels then cause vasodilation and decrease peripheral resistance and blood pressure. Star fruit is rich in content of provitamin A, vitamin B1, vitamin B2, and vitamin C, in addition there are other contents such as phosphorus, calcium, potassium, iron, pectin, and fiber that can help nourish blood vessels while lowering blood pressure. This study is in line with research conducted by Dwipayanti (2011) entitled "Effectiveness of Star Fruit on Reducing Blood Pressure in People with Hypertension", it was found that starfruit is effective for reducing blood pressure in patients with hypertension because star fruit has high potassium (potassium) levels with low sodium as a proper hypertension drug. Research conducted by Wanayanti (2015) entitled "Effect of Starfruit Juice (Avverhoa Carambola Linn) on Reducing Blood Pressure in Elderly Patients with Hypertension", the results showed that there was an effect of star fruit juice on reducing blood pressure in patients with hypertension in the elderly group. Research conducted by Ardiyanto (2014) entitled

"Effectiveness of Starfruit Juice on Reducing Blood Pressure in the Elderly in Tawangmas Baru Sub-District, West Semarang District", found the effect of starfruit juice on reducing pressure in the elderly with hypertension in Tawangmas Barat Sub-District, West Semarang District .

4 CONCLUSION

Based on the results of the study, it was found that there were differences in the effectiveness of administration of sweet starfruit juice, carrot juice and cucumber juice to decrease high blood pressure in people with hypertension. With the mean rank of systole sweet starfruit juice group 37.50 and systole carrot juice group 18.58, and systole cucumber juice group 26.42. While the results of diastole in the sweet starfruit juice group 35.03, diastole in the carrot juice group 16.19, and diastole in the cucumber juice group 31.28. From the above results it can be seen that sweet starfruit juice is more effective in lowering blood pressure in people with hypertension compared to carrot juice and cucumber juice.

Star fruit is rich in content of provitamin A, vitamin B1, vitamin B2, and vitamin C, in addition there are other contents such as phosphorus, calcium, potassium, iron, pectin, and fiber that can help nourish blood vessels while lowering blood pressure. For kidney disease sufferers it is not recommended to consume star fruit, so in this study if hypertensive sufferers who experience kidney disease are not advised to drink star fruit juice. Other scientific research shows, the content of pectin in star fruit has a role in lowering blood pressure. Pectin in star fruit works by binding cholesterol, then taking it out with feces. Therefore, people who consume star fruit to lower blood pressure also get a bonus to reduce levels of bad cholesterol. This fruit has vitamin A and C which is quite high. Especially vitamin C which reaches 33.00 mg in 100 grams of star fruit. Of course, high vitamin C content has antioxidant benefits that can prevent the development of cancer cells and enhance the body's immune system. Star fruit has very effective properties to reduce high blood pressure or hypertension when consumed in juice. This is because the content of vitamins, minerals, fiber and various antioxidants in star fruit that is useful for people with hypertension to lower blood pressure. Star fruit also contains less than 1 gram of fat, so it is very good for people with hypertension who have an obsession in losing weight. The fat contained in star fruit is polyunsaturated fat that can produce vitamin E and antioxidants. These

compounds can help protect body cells. When weight has fallen to the ideal range thanks to the consumption of star fruit, blood pressure will be stable in the normal range and the occurrence of heart disease and stroke in the future can be avoided. According to the National Kidney Foundation, consumption of star fruit in people suffering from kidney disease will cause reactions such as hiccups, confusion, and seizures. That is caused by the inability of the kidneys to process and get rid of "poisons" from star fruit. As a result, what happens next is damage to the brain. Starfruit effective for reducing high blood pressure in people with hypertension that only applies to people with hypertension whose disease is still not severe. If the disease is already severe and causes complications to the kidneys, starfruit can even bring disaster to health

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