

Averrhoa carambola Benefits to Reduce Hypertension

Jenita Doli Tine Donsu, Harmilah, Maria H. Bakri

Health Polytechnic of Health Ministry Yogyakarta

Jl. Tata Bumi No. 03 Banyuraden, Gamping, Sleman, Yogyakarta

donsu.tine@gmail.com

ABSTRACT

Hypertension is a common health problem in the community. Uncontrolled hypertension can lead to degenerative diseases, such as congestive heart failure, kidney failure, and vascular disease. Hypertension is called the "silent killer" because it is symptomatic that cause strokes and heart disease. Therefore, patients with hypertension should have adherence to effectively control and obtain regular double intervention either farmako and other alternatives such as complementary therapies. The purpose of this study was to determine the star fruit (*Averrhoacarambola*) as a complementary therapy is effective in reducing systolic and diastolic blood pressure in patients with essential hypertension. This study begins with empirical studies and phytochemical test on star fruit in a laboratory Pharmacy Polytechnic Bandung, and worthy of ethics and the MoU between the Ministry of Health Polytechnic Yogyakarta and Bandung. This research method using experimental design, the type of Quasi experimental, with "Pre-test and Post-test Control Group Design without" 80 respondents in Community Health Centre Sleman Yogyakarta and Sukajadi Bandung. The results of the analysis of different test by Mann-Whitney that there was no significant difference to the decrease in blood pressure between the groups and slices of star fruit juice in systolic blood pressure $p = 0.197 (> 0.05)$ and diastolic $p = 0.061 (> 0.05)$. Results Wilcoxon analysis, significantly there is a decrease in systolic blood pressure $p = 0.000 (< 0.05)$ and diastolic $p = 0.000 (< 0.05)$ after given juice and slices of starfruit. Phytochemical screening observed in the flavonoid as an amplifier arrangement of capillaries, decrease the permeability and fragility of blood vessels, as well as having bioactive compounds such as diuretics which can promote blood circulation, and thus can reduce the risk of heart and cardiovascular disease as well as preventing hypertensive disorders. Starfruit juice as a complementary therapy known to be effective in lowering systolic and diastolic blood pressure in patients with essential hypertension.

Keywords: *Averrhoa carambola*, Complementary therapies, Hypertension

I. BACKGROUND

Hypertension is a major contributor to the short life expectancy of African- Americans. Lifestyle changes as an intervention have not been developed especially for African-American young men. Hypertension in the community requires lifestyle changes as a form of educational development and knowledge of hypertension. It needs careful planning in doing intervention that is by doing intensive medical examination and this requires quality test to focus group. That is, any intervention can be done on a quality basis focusing on a specific group with a particular program. The community will be very enthusiastic in improvement programs such as improving individual guidance, building good relationships/ communication, and defining what is felt by people who have hypertension, so that the program can guarantee the reduction of hypertension in the community. Similarly with prevention, can be preventive program on the development of hypertension in the community, namely by approaching to the community through the evaluation of the effectiveness of lifestyle changes (Margaret, S., et al. [1]; Junaidi [2]; Hebert, P.L., et al. [3]; Ramanath, K.V. and Venkappa, K.R. [4])[1,2,3,4].

The relative risk of hypertension depends on the amount and severity of the modifiable and unmodifiable risk factors. Factors that can not be modified include genetic factors; Age, gender, and ethnicity. While the factors that can be modified, among others, stress obesity and nutrition (Junaidi [2]; Hebert, P.L., et al. [3]).

In overcoming hypertension drugs are needed, and the best ones are those derived from herbs as complementary therapies. The use of medicinal plants is intended to maintain health, maintain stamina and treat disease. Star fruit has its own benefits because it contains nutrients per 100 grams (3.5 oz), namely: Calories 36 cal; Protein 0.4 g; 0.4 g fat; 8.8 g carbs; Fiber 4 g; Calcium 12 mg; Phosphorus 1.1 mg; Iron 170 mg; Vitamin A 0.03 IU; Vitamin B1 35 mg; Vitamin C 90 mg; Water 86 g. Thus star fruit provides health benefits of lowering hypertension, lower cholesterol, facilitate defecation, lose weight, overcome liver disorders, reduce fever, and over throat disturbances. In addition to cheap and easy to obtain, traditional medicines derived from plants are considered to have far less dangerous side effects compared with synthetic or chemical drugs [5,6,7].

The main content in star fruit such as water and vitamin C is an antioxidant, in this case is the antioxidant of flavonoid polyphenols; Such as epithelekin, quercetin, gallic

acid. In general, antioxidants serve to counteract and fight free radicals that enter the body, especially to maintain cell survival. So that cells can play an active role in the body's metabolism also against free radicals as the cause of cell damage. Nutrition in starfruit also has a great effect in maintaining the immune system so free from virus attack especially influenza virus, help to overcome inflammation, improve blood vessel system and elasticity of heart blood vessel so give positive effect on blood pressure that is by lowering high blood pressure. While the benefits of other star fruit is still a lot that has not been revealed, but most star fruit is used in the world of beauty that is facial treatment, it becomes interesting because it is also star fruit star as anti aging (Widjaja E.A. et al. [5]; Hariana [6]; Peraturan Kepala Badan Pengawas Obat dan Makanan RI [7]).

Experiments on mice with the provision of fruits including starfruit have been done by Khoo. Experiment by giving star fruit juice causes an effective reaction of the mice (Khoo, Z.Y., Teh, C.C., Rao, N.K., Chin, J.H. [8]). In this study experiments star fruit performed on healthy people first then in patients with hypertension.

The purpose of this research is to know the form of star fruit (*Averrhoa carambola*) as complementary therapy is effective in lowering systolic and diastolic blood pressure in patients with essential hypertension. Knowing the benefits of *Averrhoa carambola* as a complementary therapy to maintain blood pressure remains stable in healthy people so that the body feels healthier and fitter.

The benefits of this study; As a complementary therapy in lowering blood pressure in essential hypertensive patients, as a natural therapy for the community in preventing and maintaining basic health without significant side effects, as a form of environmental empowerment that increases the potential of natural ingredients users in the form of garden cultivation.

II. REFERENCE REVIEW

Hypertension or high blood pressure is a common complaint in the community. Based on the prevalence, the incidence of hypertension is increasing from year to year. In addition, many patients with hypertension who have not received treatment should, or have been treated but his blood pressure is still not falling as expected. It is also possible for hypertensive patients with accompanying diseases and complications to increase morbidity and mortality (Margaret, S., Monica, O., Anna, A., Laurie, W., Thomas, M. [1]).

The Causes of Essential Hypertension are usually multifactorial arising from the interaction of various risk factors. The risk factors are as follows: 1) Risk factors, such as advanced age, female gender, family history of hypertension, dietary salt intake, stress, obesity, dyslipidemia (high LDL cholesterol), smoking, and diabetes

mellitus; 2) sympathetic nervous system; 3) The balance of vasodilation and vasoconstriction of blood vessels; 4) Angiotensin Renin System (Junaidi [2]).

Hypertension is often not accompanied by symptoms (asymptomatic), so sometimes someone is less aware with the disease. But usually, hypertension that has caused symptoms is hypertension that has been more severe. Among the symptoms are headache, neck pain, nocturia (frequent night urination), dizziness (oyong), tinnitus (audible voices, etc.), epistaxis (nosebleeds), etc. If any of these symptoms are present, it is advisable to consult a Puskesmas doctor to begin treatment. Actually this hypertension can be controlled. The most effective way is to reduce the risk factors above. Lifestyle modification and low-salt and low-fat diets are also highly recommended. Regular light exercise is also very helpful, such as aerobic exercise at least 3 times a week for 30 minutes, avoid smoking (Junaidi [2]).

Star fruit can also provide a number of benefits either as a source of consumption or as a medicine. Parts that can be utilized from sweet star fruit plants, among others, leaves, flowers, roots, and of course the fruit star fruit. Benefits/ benefits of star fruit to treat various diseases in humans, including: thrush and bleeding gums, high blood pressure, skin on the skin, facial acne, whooping cough, improve the functioning of the digestive system, overcome inflammatory problems in the rectum, reduce tooth pain, and cure paralysis (Widjaja EA, Rahayuningsih Y, Rahajoe JS, Ubaidillah R, Maryanto I, Walujo EB, Semiadi G. [5]). Based on the above study, the hypothesis in this study is "The form of star fruit (*Averrhoa carambola*) as an effective complementary therapy to reduce blood pressure in patients with essential hypertension"

III. METHOD

The study was conducted at several health centers in Sleman district of Yogyakarta and Sukajadi Health Center of Bandung. The research stages before the intervention were literature study, empirical test and phytochemical test. Intervention is done for 5 weeks. Materials and tools used; Star fruit, stethoscope and tensi meter. The experimental Quasi research design, with "Pre-test and Post-test Design without Control Group [9]. The total sample size was 80, consisting of 20 samples of healthy people and 60 samples of hypertensive patients (30 juice interventions and 30 iris fruit interventions). In 20 healthy individuals, a descriptive analysis and 60 intervention samples were performed using statistical analysis of Mann-Whitney and Wilcoxon. Overall, observational technique with qualitative data recording was performed on 80 respondents.

IV. RESULTS

Table 1. Characteristics of respondents of hypertension by age and gender

Variable	Category	Juice		Slices	
		f	%	f	%
Age	<46	7	23,3	8	26,7
	>46	23	76,7	22	73,3
Gender	Male	8	26,7	13	43,3
	Female	22	73,3	17	56,7

Based on the above table, age > 46 years most 23 people (76.7%) in the juice group and in the slice 22 people (73.3%). 22 women (73,3%) were the most sex group in the juice group and in the group the most were 17 female (56.7%).

Table 2. Mean result of systolic blood pressure reduction and diastolic group of juice and slices of star fruit.

Blood Pressure	Mean Rank	Mann-Whitney	ilcoxon W	p
1 Systolic				
Juice	33,33	365,000	830,00	0,197
Slices	27,67			
2 Diastolic				
Juice	28,15	379,500	844,50	0,061
Slices	32,85			

The results of different test analyzes with Mann-Whitney (different test of two independent groups) that there was no significant difference to the decrease between juice group and sliced star fruit at systolic blood pressure $p=0,197 (> 0,05)$ and diastolic $p=0,061 (> 0,05)$.

Table 3. Results of pre and post blood pressure measurements systolic and diastolic groups juice and slices of star fruit

No	Blood Pressure	Mean Rank	p
1	Systolic		
	Pre	0,00	0,000
Post	30,00		
2	Diastolic		
	Pre	0,00	0,000
Post	28,50		

Based on the above table, Wilcoxon analysis results significantly there is a systolic decrease after being given star fruit juice and sliced star fruit. Measurement of pre-test and post-test with $p=0,000 (<0,05)$. This means that there is a decrease in systolic blood pressure between pre-test and post-test. Similarly, a decrease in diastolic blood pressure with $p=0,000 (<0,05)$.

Descriptive analysis results on 20 healthy respondents concluded that the provision of juice and slices of star fruit can increase the freshness of the body and maintain blood

pressure stability. The results of qualitative analysis of 80 respondents concluded the first week intervention of about 12% complained about stomach and diarrhea, but could be controlled by honey, but in the second week until the fifth week without complaint.

V. DISCUSSION

Literate and phytochemical studies that flavonoids in plants have four functions: 1) As color pigments, 2) Physiological and pathological functions, 3) Pharmacological activities, and 4) Flavonoids in food. Pharmacological activity is thought to be derived from the routine (flavonol glycosides) used to strengthen the capillary arrangement, decrease the permeability and fragility of the blood vessels, etc. Gabor states that flavonoids can be used as drugs because they have a variety of bioactivities such as anti-inflammatory, anti-cancer, anti fertility, antiviral, anti diabetic, antidepressant, diuretic, etc (Sun, Q., & Chou, G. [10]).

In respondents with normal blood pressure, there was no significant difference in systolic blood pressure. Giving juice or sliced star fruit on the first 10 minutes after the intervention was not there increase or decrease in blood pressure for 7 days. While on the diastolic measurements given juice or sliced star fruit for seven consecutive days, the results of pre-test and post-test measurement at minute 30 found significant differences.

Supporting Ayodale's research, the physiological problem of essential hypertension tends to be inflexible in people with further age, so this has an impact on the level of insufficient sensitivity. Older hypertensive patients have reduced the responsiveness of the blood vessels so that intervention is delayed (Ayodele, E., Alebiosu, Olutayo, C. Salako, B.L.[11]). In this study most respondents at age above 46 years, so there is a slow tendency in the acceptance of intervention due to arterial stiffness, so that in the first 10 minutes there was no significant change. Changes occur after 30 minutes of juice or slices of star fruit. Some respondents complained of slight nausea and frequent urination on the first day to day two, but the intervention continued until the seventh day. No complaints affect the decline in health, so a little nausea and more frequent urination is considered as an adjustment factor.

Hypertension is a multi factorial disease that arises because of the interaction of various factors. With age, blood pressure will also increase after the age of 45 years, the arterial wall will experience thickening due to the accumulation of collagen substances in the

muscle layer, so that the blood vessels will gradually narrow and become stiff. Systolic blood pressure increases as the elasticity of the large blood vessels diminishes in age to the seventh decade while diastolic blood pressure increases until the fifth and sixth decades then settle or tend to decrease. Increased age will cause some physiological changes in old age to increase peripheral resistance and sympathetic activity (Schwartz, I. F., et al. [12]).

The results of literature study that the most prominent vitamin of star fruit is vitamin C, which amounts to 45 to 57% of needs per day. In addition, there are small amounts of vitamins A, E, and B complexes such as folate, niacin, pyridoxine, riboflavin, and thiamine in it. The fruit is called as star fruit in Western countries is also a source of minerals such as phosphorus, zinc, iron, magnesium, calcium, and potassium. High content of vitamin C in star fruit serves to help the body fight germs and common infections. Vitamin C also includes a natural antioxidant that can protect the body from free radicals along with other antioxidants and flavonoids such as quercetin, epicatechin, and gallic acid. The total content of this polyphenol reached 143 mg /100. In general, antioxidants serve to counteract and fight free radicals that enter the body, especially to maintain cell survival. So that cells can play an active role in the body's metabolism also against free radicals as the cause of cell damage. Nutrition in star fruit also has a great effect in maintaining the immune system so free from virus attack especially influenza virus, help to overcome inflammation, improve blood vessel system and elasticity of heart blood vessel so that give positive effect to blood pressure that is by lowering high blood pressure. While the benefits of other star fruit is still a lot that has not been revealed, but most star fruit used in the world of beauty that is facial treatment, it is interesting because it is also star fruit star as anti aging premise (Widjaja E.A. et al. [5]; Hariana [6]; Peraturan Kepala Badan Pengawas Obat dan Makanan RI [7]).

VI. CONCLUSION

1. Star fruit juice is known to have an effect on decreasing systolic and diastolic blood pressure in patients with essential hypertension
2. Star fruit slices are known to have an effect on systolic and diastolic blood pressure reduction in patients with essential hypertension
3. Based on phytochemical results known fresh star fruit contains flavonoid compounds with high

fiber, an effect on the decrease in blood pressure in patients with essential hypertension.

4. Averhoa carambola can keep blood pressure within normal limits and excellent health so that one can enjoy a healthy condition with optimal stamina, thus one can enjoy a healthier longer to avoid premature aging.

REFERENCES

- [1] Margaret, S., Monica, O., Anna, A., Laurie, W., Thomas, M., (2013). Heart of hypertension project: Development of a community-based prevention program for young African American men. *Progress in community health partnerships*, 7. 2. 163-169.
- [2] Junaidi, Iskandar. (2010). *Hipertensi (Pengenalan, pencegahan, dan pengobatan)*. Jakarta : PT Bhuana Ilmu Populer
- [3] Hebert, P.L., Sisk, J.E., Tuzzio, L., Casabianca, J.M., Pogue, V.A., Wang, JJ., Chen, Y., Cowles, Ch., McLaughlin, M.A., (2012). Nurse-led disease management for hypertension control in a diverse urban community: a randomized trial. *Journal General Internal Medicine*, 27, 6, 630–9.
- [4] Ramanath, K.V., Venkappa, K.R. (2013). Study the impact of clinical pharmacist provided patient counseling on hypertension management in rural Indian population, *Archives of Pharmacy Practice*, Vol. 4, Issue 1 Jan-Mar 2013.
- [5] Widjaja EA, Rahayuningsih Y, Rahajoe JS, Ubaidillah R, Maryanto I, Walujo EB, Semiadi G. (2014). *Kekinian Keanekaragaman Hayati Indonesia*. LIPI Press, Kementerian Lingkungan Hidup dan Bappenas.
- [6] Hariana, Arief. (2008). *Tumbuhan Obat dan Khasiatnya*. Jakarta, Penebar Swadaya.
- [7] Peraturan Kepala Badan Pengawas Obat dan Makanan RI No. 12 (2014) Tentang Persyaratan Mutu Obat Tradisional
- [8] Khoo, Z.Y., Teh, C.C., Rao, N.K., Chin, J.H., (2010). Evaluation of the toxic effect of star fruit on serum biochemical parameters in rats. *Faculty of Pharmaceutical Sciences, UCSI University, Cheras, 56000, Kuala Lumpur, Malaysia*, Vol 6, 22, 120-124.
- [9] Shadish, W.R., Cook, Th.D., Campbell, D.T. (2001). *Experiental and Quasi Experimental for Generalized Causal Inference*, Houghton Mifflin Company, USA.

- [10] Sun, Q., & Chou, G. (2015) Isoflavonoids from *Crotalaria albida* Inhibit Adipocyte Differentiation and Lipid Accumulation in 3T3-L1 Cells via Suppression of PPAR-[gamma] Pathway: e0135893, *PLoS One*, Vol. 10, 8, 1-13.
- [11] Ayodele, E., Alebiosu, Olutayo, C. Salako, B.L. (2014). Differential control of systolic and diastolic blood pressure in blacks with essential hypertension. *Journal of The National Medical Association*. Vol. 96, 24-86.
- [12] Schwartz, I. F., A. Grupper, T. Chernichovski, O. Hillel, A. Engel, D. Schwartz, et al. 2011. Hyperuricemia Attenuates Aortic Nitric Oxide Generation, through Inhibition of Arginine Transport, in Rats. *Journal of Vascular Research*. Vol. 48:252-260.