

The Comparison Study of Celery Leaves in Juice and Celery Boiled Water to Reduce of Blood Pressure on Elderly Patients with Hypertension

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Abstract-- Hypertension or high blood pressure is an increase in systolic blood pressure more than 140 mmHg and diastolic blood pressure more than 90 mmHg on two measurements with an interval of five minutes in a state of rest / calm. Basically, hypertension management can be done pharmacologically and non- pharmacologically. One of the non-pharmacological treatments is to use celery. Celery contains apigenin which is very useful for prevent narrowing of blood vessels and high blood pressure. In addition, celery also contains flavonoids, vitamin C, apiin, calcium, and magnesium which can help lower high blood pressure. Celery for consumption in juice form and cooking water. This study aims to analyze the differences in the effectiveness of celery juice and celery boiled water in reduce blood pressure in patients with hypertension. This study used a pre post experimental design. The number of respondents in the work place of the Simalingkar Community Health Center was 40 respondents. With 20 respondents were given juice and 20 respondents were given boiled water with a significance level of <0.05. The results showed that the systole p value of 0.000 (<0.05) and diastole 0.001 (<0.05), which means that there are difference between giving celery juice and celery boiled water to reduce blood pressure. The average difference between systole and dystole after celery juice was 29 mmHg and 16 mmHg, while celery boild water was found the average difference between systole and dystole 15 mmHg and 10 mmHg, so it can be concluded that celery juice is more effective than celery boiled water to reduction of hypertension.

Keywords—*Celery Juice, Celery Boiled Water, Hypertension.*

I. INTRODUCTION

Hypertension or high blood pressure is an increase in systolic blood pressure more than 140 mmHg and diastolic blood pressure more than 90 mmHg on two measurements with an interval of five minutes in a state of rest / calm. Increased blood pressure that lasts for a long time (persistent) can cause damage to the kidneys (kidney failure), heart (coronary heart disease) and brain (causing stroke) if not detected early and receive adequate treatment. It can happen because the heart works harder to pump blood to meet the body's oxygen and nutritional needs [1][2].

Hypertension is a degenerative disease. by increasing age, the maximum heart rate and other functions of the heart also gradually decrease. In the elderly, blood pressure will increase gradually, the elasticity of the heart muscle in people aged 70 years decreased by about 50% compared to young people aged 20 years. The classification of elderly according to WHO includes: middle age (45-59 years), elderly (60-74 years), old (75-90 years), very old (over 90 years old) [3].

Evidence-based medicine is a treatment based on the best available evidence in making decisions when choosing drugs consciously, clearly, and wisely for each patient and / or disease. Evidence-based practice for hypertension includes selecting specific drugs based on data showing reduced cardiovascular mortality and morbidity or target organ damage due to

hypertension. Scientific evidence shows that simply lowering blood pressure, tolerability and cost alone cannot be used in the selection of hypertension drugs. Taking these factors into account, the most useful drugs are diuretics, angiotensin conversion enzyme (ACEI) inhibitors, angiotensin receptor blockers (ARBs), beta blockers, and antagonyscalcium (CCB).

Implementation of healthy lifestyle for everyone is very important to prevent high blood pressure and an important part of managing hypertension. All patients with prehypertension and hypertension should make lifestyle changes. Besides lowering blood pressure in patients with hypertension, lifestyle modification can also reduce blood pressure progression to hypertension in patients with prehypertension blood pressure. Important lifestyle modifications that appear to lower blood pressure include weight loss for obese or obese individuals, adopting the DASH (Dietary Approach to Stop Hypertension) diet rich in potassium and calcium, a low sodium diet, physical activity and consuming little alcohol.

According Soewito (1991) celery is a vegetable plant with short stems, indented leaves and long leaf stalks. Celery is a plant that has pinnate compound leaves, odd, pointed leaf base and edged edges. This plant is \pm 15 cm high with 2 - 3 cm wide leaves and 2 cm long petiole. Celery (*Apium graveolens* L) is one of the types of herbal therapy to treat hypertension. Traditional Chinese society has long used celery to lower blood pressure. Celery has more content to lower blood pressure than other plants which can also be used to lower high blood pressure such as bay leaves which only contain essential oils and flavonoids to lower blood pressure and mahogany which only contains flavonoids to lower blood pressure, meanwhile Celery contains apigenin which is very useful for preventing narrowing of blood vessels and high blood pressure. In addition, celery also contains flavonoids, vitamin C, apiin, calcium, and magnesium which can help reduce high blood pressure [4]. The procedure for the presentation or use of this herbal therapy also varies, for example by consuming it directly, or changing it into other forms such as juice and boiled water as desired [5].

Based on Riskesdas data in 2018, The prevalence of hypertension at age \geq 18 years in Indonesia increased to 34.1%, from Riskesdas 2013 of 25.8%. From the provincial data, North Sumatra also has a high prevalence rate of hypertension, namely 24.7% [6]. The Simalingkar Community health center or Puskesmas is one of the puskesmas under the auspices of the Medan City Health Office which also participates in implementing the national program by conducting the PTM posbindu. In 2016, hypertension

ranks third of the ten highest diseases in the working area of the Simalingkar Health Center, this number has increased every year, and in 2018 it reached 1,479 people.

Basically, hypertension management can be done pharmacologically and non-pharmacologically. When symptoms arise, hypertension becomes a disease that must be treated for life, the treatment that must be issued is quite expensive and takes a long time. In addition to pharmacological therapy, hypertension treatment can also be done with non- pharmacological therapies, including by utilizing celery leaves.

Based on the description above, the researchers conducted a study entitled "Comparative Study of Celery Leaves in Juice and Celery Boiled Water to Reduce Blood Pressure in Elderly Patients with Hypertension".

II. METHOD

A. Research Design

The design used in this study was the Pre-Post Experiment with the design used to determine the effect of celery juice and Celery boiled water on blood pressure in hypertensive patients with a dependent t test (paired t test), then to determine the comparison of celery juice and boiled water against blood pressure using independent t test [7].

B. Population and Sample

Population is a generalization area consist of objects or subjects that have certain quantities and characteristics determined by researchers to study and then draw conclusions. The population in this study were 1.479 people.

The sample is part of the population will be researched or part number of characteristics the population have. The sample is part or representative of the population studied [8]. From the data on the population above, the sample criteria will be selected consisting of inclusion criteria and exclusion criteria. The sampling technique used in this study was purposive sampling. The criteria in this study are: hypertensive patients, aged \geq 60 years to 74 years, willing to be respondents.

The sample size for simple experimental research, the number of sample members is between 10-20. Then the number of samples in this study amounted to 20 samples [7]. Where to give celery juice and 20 for giving celery stew.

C. Location and Time of Research

The research location was conducted at the work area

of the Simalingkar Community Health Center, Medan City. This research was conducted from April to September 2020.

D. Measurement Method

Elderly suffering from hypertension who came and were willing to be the study sample during the study time were interviewed using a questionnaire to determine the characteristics of the elderly. Then the BP measurement was taken.

Giving celery juice is done by providing 100 cc of cold water, washing all ingredients, putting it in a juicer or blender, filtering the water, drinking for 2 times a day, morning and evening. Drink for 7 days regularly. Giving celery stew, provide 100 grams of celery then washed, boiled the celery with 400 ml of water to 300 ml, poured into 150 ml glasses each, drink every morning and evening. Drink for 7 days regularly.

1. Observation

Observation is a step in extracting data by making direct observations in the field in order to obtain actual data on various existing phenomena.

2. Data Analysis

Data analysis was carried out in stages and carried out through a computerized process using statistical SPSS 22. This univariate analysis was carried out by descriptive statistical tests to determine the frequency distribution or frequency table. In this study, the variables that have been described in the form of frequency distribution are the characteristics of hypertensive patients which include: gender, age, obesity, sports activities, salt consumption, fruit and vegetable consumption, smoking, alcohol consumption.

Bivariate analysis was used to determine the effect of celery leaf juice and boiled water on blood pressure in hypertensive patients with a paired t test. The use of paired test is to test the effectiveness of a treatment on a variable magnitude to be determined. This design is most commonly known as the pre-post design, meaning that it compares the average pre-test and post-test scores of a sample. Furthermore, to determine the comparison of celery juice and boiled water to blood pressure using an independent t test. The value used for the standard error is 0.05 [7].

III. RESULTS

This research is a Comparative Study Of Celery in Juice and Celery Boiled Water to Reduce Blood Pressure in Elderly Patients with Hypertension in the work area of Simalingkar Public Health Center in 2020. This research was conducted from April to September 2020. The research subjects were elderly people aged 60-74 years. Respondents in this study

were 40 patients with hypertension where 20 respondents were given celery juice and 20 respondents were given celery boiled water then observed for one week and a comparison was made to the respondent's blood pressure.

The general description of respondents in this study can be explained as follows:

Table 1. Frequency Distribution of Respondent based on Characteristic (n=40) hypertension Patient at work place The Simalingkar Community Health center in 2020

Characteristic of respondent	celery Juice		Celery Boiled Water	
	Total (n)	Proportion (%)	Total (n)	Proportion (%)
Gender				
Man	7	35	4	20
woman	13	65	16	80
Total	20	100	20	100
Age				
60-64 Years	9	45	9	45
65-69 Years	6	30	7	35
70-74 Years	5	25	4	20
Total	20	100	20	100
Obesity				
Obesity	3	15	2	10
Not Obesity	17	85	18	90
Total	20	100	20	100
Activity				
Sport				
Regular	6	30	5	25
Irregular	14	70	15	75
Total	20	100	20	100
Fruit Consumption				
Vegetable				
Rotine	11	55	15	75
Not Routine	9	45	5	25
Total	20	100	20	100
Smoke				
Yes	2	10	1	5
No	18	90	19	95
Total	20	100	20	100
Alcohol Drink				
Yes	1	5	0	0
No	19	95	20	100
Total	20	100	20	100

Table 1 shows that for the group of celery juice and celery boiled water, the majority are female as many as 29 respondents, for age characteristics it can be seen that the majority are 60-64 years old as many as 18 respondents, for obesity the majority of respondents are not obese as many as 35 respondents, for activities sport of irregular respondents were 29 respondents, for respondents who consumed excess salt the majority of respondents did not consume excessive salt as many as 29 respondents, for consumption of fruits, the majority of respondents routinely consumed vegetables as many

as 26 respondents, for smoking the majority of respondents did not smoke as many as 37 respondents Also for alcohol, the majority of respondents did not consume alcohol as many as 39 respondents.

Table 2. Deviation Difference of Blood Pressure before and after Given by Celery Juice on Hypertension Patient at work Place The Simalingkar Community health center in 2020

No	Blood pressure Given by Celery Juice					
	Pre test		Post test		Deviation	
	Systole	Dyas tole	Systole	Dyasto le	Systole	Dyastole
1.	157	98	133	81	24	17
2.	190	105	135	99	55	6
3.	176	112	138	92	38	20
4.	165	108	140	97	25	11
5.	168	102	150	81	18	21
6.	165	98	143	76	22	22
7.	176	94	160	87	16	7
8.	177	105	156	87	21	18
9.	175	102	130	81	45	21
10.	189	95	150	76	39	19
11.	185	108	146	90	39	18
12.	154	99	139	81	15	18
13.	149	96	133	79	16	17
14.	189	105	143	89	46	16
15.	175	95	140	84	35	11
16.	185	92	152	77	33	15
17.	157	98	140	76	17	22
18.	160	94	138	79	22	15
19.	175	93	136	86	39	7
20.	176	93	153	81	23	12
Average	172	100	143	84	29	16

Table 2. Shows that the average deviation between systole and diastole after celery juice given are 29 mmHg and 16 mmHg

Table 3. Deviation difference of Blood Pressure Before and after Given by Celery Boiled Water on pada Hypertension Patient at Work Place The Simalingkar Community health Center in 2020

Table 3 shows that Average Deviation between systole and diastole after giving boiled water difference deviation are 15 mmHg and 10 mmHg.

No	TD Given by Celery Boiled Water					
	Pre test		Post test		Deviation	
	Systole	Dyas tole	Systole	Dyasto le	Systole	Dyastole
1.	150	98	140	80	10	18
2.	154	95	149	82	5	13
3.	150	112	141	98	9	14
4.	161	108	145	99	16	9
5.	182	102	160	89	22	13
6.	175	98	158	90	17	8
7.	168	94	157	79	11	15
8.	175	105	143	96	32	9
9.	154	102	140	98	14	4
10.	167	95	152	88	15	7
11.	175	104	151	98	24	6
12.	156	99	146	87	10	12
13.	157	96	148	89	9	7
14.	165	105	154	96	11	9
15.	154	95	145	82	9	13
16.	168	95	150	76	18	19
17.	165	101	152	98	13	3
18.	149	94	134	89	15	5
19.	155	93	143	85	12	8
20.	173	92	148	79	25	13
Average	163	99	148	89	15	10

Table 4. The Effect of juice and Celery Boiled Water on Blood Pressure in Hypertension Patient at Work Place The simalingkar Community Health center in 2020

Celery Juice	T	SD	P value
Systole before drink Juice – Systole after drink Juice	11,052	19	,000
Dystole before drink Juice – Dystole after drink Juice	13,802	19	,000
Celery Boiled Water			
Systole before drink Boiled water - Systole after drink Boiled water	10,009	19	,000
Dystole before drink boiled water - Dystole after drink boiled water	10,253	19	,000

Table 5. Comparison of the provision of celery juice and boiled water to blood pressure in patients with hypertension at the work area Simalingkar Community Health Center in 2020

Blood Pressure	Mean	F	t	Sig .(2 tail ed)
TD. systole celery juice	29,40			
Systole systole Celery Boiled	14,85	13,24	4,77	0,000
TD. dystole Celery Juic	15,65			
Dystole dystole Celery Boiled	10,25	1,86	3,57	0,001

Table 5 shows the significance value of the F test for Systole blood pressure and Dystole blood pressure > 0,05, so the variance of the two groups is homogeneous. The t test results on Systole blood pressure found the t value of 4.77 with sig (2- tailed) 0,000. Because the sig value <0,05, it can be concluded that there are average difference between Systole blood pressure after giving celery juice and celery stew. Likewise, for Dystole blood pressure, the t value was found to be 3.57 with a sig (2-tailed) of 0,001. Because the sig value <0.05, it can be concluded that there are averagedifference between Dystole blood pressure after giving celery juice and celery stew. When viewed from the mean value of systole and dystole blood pressure in celery juice deviation more better than the mean value of systole and dystole blood pressure in giving celery boiled water, it can be concluded that celery juice is more effective than celery boiled water to reduce hypertension.

IV. DISCUSSION

A. Differences in blood pressure before and after celery juice is given in the working area at the Simalingkar community health center in 2020
Based on the results of the study in the celery juice

group of 20 respondents who had hypertension, it was found that before giving celery juice the average value of systole was 172 mmHg and dystole 100 mmHg, but after being given the intervention, giving celery juice for 1 week, the average value was obtained. systole 143 mmHg and dystole 84 mmHg with the difference after being given celery juice, there was a decrease in systolic BP by 29 mmHg and dystolic by 16 mmHg.

Celery contains flavonoids, saponins, 1% tannins, 0.033% essential oils, flavo-glucosides (apiin), apigenin, phytosterols, choline, lipase, pthalides, asparagine, bitter substances, vitamins (A, B and C), apiin, evaporated oil, apigenin and alkaloids, Apigenin has hypotensive properties [5]. The chemical content of celery as a whole can be seen in table 6 below:

Composition/ 100 gr	Total
Water	93 ml
Fat	0,1 gr
Carbohidrat	4 gr
Protein	0,9 gr
Fiber	0,9 gr
Calsium	50 mg
Iron	1 mg
Phospor	40 mg
Iodine	150 mg
Kalium	400 mg
Magnesium	85 mg
Vitamin A	130 IU
Vitamin K	15 mg
Vitamin C	15 mg
Riboflavin	0,05 mg
Thiamine	0,03 mg
Nikotinamid	0,4 mg

Apigenin in celery acts as a beta blocker, which can slow down the heart rate and reduce the force of heart contractions so that less blood is pumped and blood pressure is reduced. Mannitol and apiin, are diuretic, which helps the kidneys remove excess fluid and salt from the body, so that reduced fluid in the blood will lower blood pressure [9].

Potassium contained in celery will be beneficial to increase intracellular fluid by attracting extracellular fluids, so that there is a change in the balance of the sodium – potassium pump which will cause a decrease in blood pressure. One of the strategies in managing hypertension is to change the Na + balance. Changes in Na + balance are usually accomplished with oral diuretics [10]. The results of this study were supported by research conducted by Halimah & Ekwantini, 2014 on rats with hypertension strain Wistar rats given celery juice (*Apium graveolens L.*) twice a day using sonde for 2 weeks. The systolic reduction was given by giving celery juice 0.009 gr / gr body weight for 2 weeks was 38.83mmHg (p = 0.000) and the systolic reduction was given by giving celery juice

0.0225 gr / gr bb for 2 weeks was 85 mmHg (p = 0.000) The mean reduction in systolic blood pressure in Wistar strain rats was 3 mmHg (p = 0.000) [11].

From the results of statistical tests using paired t test, it was found that the p value of the systolic blood pressure was 0.00 and the diastolic was 0.00. This shows that the p value <0.05, which means there is a difference in BP before and after being given celery juice. So that the efficacy of celery juice is that in the content of celery there are many substances that can increase intracellular fluid by attracting extracellular fluids, so that there is a change in the balance of the sodium – potassium pump which will cause a decrease in blood pressure. Thus it can be stated that there is an effect of celery juice on reducing blood pressure in hypertensive patients in the work area of the Simalingkar Community Health Center.

B. Differences of Blood Pressure before and after given celery boiled water at work place the simalingkar Community health center in 2020

Based on the results of research in the group giving celery stew as many as 20 respondents who experienced hypertension, it was found that before giving celery stew the average value of systole was 163 mmHg and dystole 99 mmHg, but after being given intervention, giving celery stew for 1 week, the average value was obtained. systole 148 mmHg and dystole 89 mmHg. where after being given celery stew, there was an average decrease in systolic BP by 15 mmHg and dystolic by 10 mmHg.

According Dalimartha (2008), the chemical composition of celery is flavonoids, saponins, 1% tannins, 0.033% essential oils, flavor-glucosides (apiin), apigenin, choline, lipase, asparagines, bitter substances, vitamins (A, B, and C). Every 100 g of celery contains 93 ml of water, 0,9 g protein, 0,1 g fat, 4 g carbohydrates, 0,9 g fiber, 50 mg calcium, 1 mg iron, 40 mg phosphorus, 150 mg iodine, potassium 400 mg, 85 mg magnesium, 130 IU vitamin A, 15 mg vitamin C, 0,05 mg riboflavin, 0,03 mg thiamine, and 0,4 mg nicotinamide. The root contains asparagine, manite, starch, lenders, essential oils, pentosan, glutamine, and tyrosine. Seeds contain apiin, evaporated oil, apigenin, and alkaloids. Apigenin has hypotensive properties [5].

The results of this study were supported by Arie Ni, MN (2013) who examined the effect of celery boiled water on the elderly with hypertension in West Gogodalem Hamlet where the results showed a p-value of 0.046 <0.05, meaning that there was a significant effect of celery boiled water on decrease in blood pressure both systole and dystole in elderly people with hypertension in Dusun Gogodalem Barat [12].

Likewise, research conducted by Asmawati, N., (2015) on the Effectiveness of Celery Stew in Lowering Blood Pressure in Elderly Patients with Hypertension at Elderly Posyandu, Pajar Bulan Village, Way Tenong District, West Lampung. The results showed that the statistical test results obtained p-value 0.000 <0.05, which means that it can be concluded that there is a significant effect between before and after drinking celery stew to decrease blood pressure [13].

From the results of statistical tests using paired t test, it was found that the p value of the systolic blood pressure was 0.00 and the diastolic was 0.00. This shows that the p value <0.05, which means there is a difference in Blood Pressure before and after being given celery stew. The difference in blood pressure before and after being given celery stew is due to the content of celery which plays an important role in lowering blood pressure, including magnesium, pthalides, potassium apigenin and asparagine. Magnesium and pthalides play a role in flexing blood vessels. Apeginin functions to prevent narrowing of blood vessels and high blood pressure. Potassium and asparagine are diuretic, which is to increase urine so that blood volume decreases. Besides that, the previous experience of lowering blood pressure is very influential in this study because it can be used as a benchmark for proper blood pressure reduction. Thus it can be stated that there is an effect of celery stew on reducing blood pressure in hypertensive patients in the work area at the Simalingkar Community Health Center.

C. Comparison of Giving Celery Juice and Celery Boiled Water to Patients with Hypertension at the work area of the Simalingkar Community Health Center in 2020

Based on the results of statistical tests using the t test from 40 respondents, it was found that the average value decreased in 20 respondents who gave celery juice, the average decrease was obtained with the results of systole pressure of 29 mmHg and dystole 16 mmHg, while for giving celery boiled water at 20 respondents with systolic blood pressure results of 15 mmHg and diastole 10 mmHg. Leaves that are cooked by boiling are more likely to experience a reduction in content or nutrients by up to 50 percent, whereas when processed in juices, most of the fibers contained will be damaged [5].

The boiling process involves contact between water and vegetables, so some experts say there is a withdrawal of the active compounds from the vegetables themselves (Extraction). As a result of this withdrawal, some of the nutritional content of the boiled ingredients is lost. Based on research published

in the British Journal of Nutrition, boiling food (studies using broccoli or spinach) resulted in up to 50% loss of folate. It can even remove the content of vitamin C and some B vitamins, which are water soluble. Boiling is also believed to be able to melt more antioxidants because some disease-fighting compounds dissolve in hot water, let alone boiling food for too long, so that vitamin and mineral compounds will also dissolve in hot water.

The results of this study were supported by research conducted by Alamsyah, AF in 2017 which examined the Comparative Study of Celery Leaves (*Apium Graveolens* Linn) in the form of juice and boiled water against a decrease in blood pressure in hypertension sufferers, where the results of the study showed a difference in the average systole and dystole after giving celery juice 39 mmHg and 22 mmHg, while the boiled water resulted in a difference of 20 mmHg and 20 mmHg with a p value of 0,000 systole and 0.025 dystole. So that celery juice is more effective than boiled water from celery leaves [14].

From the results of the analysis carried out by the researcher using the independent t test to compare the measurement results of systole and dystole after giving celery juice and stew, the systole p value was 0.000 <0.05 and dystole was 0.001 <0.05, which means that there was a difference between giving juice Celery and celery stew to decrease blood pressure where the average difference between systole and dystole after celery juice is 29 mmHg and 16 mmHg, while boiled water shows a difference of 15 mmHg and 10 mmHg, so it can be concluded that celery juice is more effective than celery boiled water.

V. CONCLUSION

The results showed that the systole p value of 0.000 (<0.05) and diastole 0.001 (<0.05), which means that there are difference between giving celery juice and celery boiled water to reduce blood pressure, so it can be concluded that celery juice is more effective than celery boiled water to reduction of hypertension.

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