Pak. j. life soc. Sci. (2024), 22(2): 19557-19571 E-ISSN: 2221-7630;P-ISSN: 1727-4915

Pakistan Journal of Life and Social Sciences
www.pjlss.edu.pk

https://doi.org/10.57239/PJLSS-2024-22.2.001435

RESEARCH ARTICLE

The Effect of Watermelon Juice on Blood Pressure Reduction in Hypertensive Patients: A Study on Barrang Lompo Island, Indonesia 2024

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ARTICLE INFO

Received: Sep 17, 2024

Accepted: Nov 21, 2024

Keywords

Hypertension

Watermelon Juice

Blood Pressure Reduction

Celery Leaf Decoction

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ABSTRACT

Hypertension is a condition where blood pressure rises above normal levels, potentially leading to severe health complications and even death. A person is diagnosed with hypertension when their blood pressure exceeds 140/90 mmHg. Various dietary interventions, including natural remedies like watermelon juice, are being explored as potential strategies for managing hypertension. To evaluate the effect of watermelon juice administration on blood pressure reduction in hypertensive patients on Barrang Lompo Island in 2024. This quasi-experimental study used a randomised pre-test and post-test control group design involving 60 respondents, divided equally into two groups: 30 in the watermelon juice intervention group and 30 in the celery leaf decoction comparison group. Statistical analyses included the Wilcoxon Test, Paired T-Test, and T-Independent Test. Significant reductions in blood pressure were observed in both intervention groups ($p = 0.000$). The celery leaf decoction group demonstrated greater efficacy in lowering systolic blood pressure compared to the watermelon juice group, with mean reductions of 27.60 mmHg and 21.10 mmHg, respectively ($p = 0.036$). Watermelon juice significantly reduces blood pressure in hypertensive patients. However, celery leaf decoction proved more effective in achieving blood pressure reduction.

INTRODUCTION

Hypertension is among the most prevalent cardiovascular diseases globally and is a significant contributor to heart disease, kidney failure, diabetes, and stroke (Yuliza et al., 2023). It is also one of the leading catastrophic diseases in Indonesia, causing high mortality due to delayed detection and expensive long-term care (Sugianto, 2023).

The shift in the global disease burden from communicable to non-communicable diseases (NCDs) highlights the urgency of addressing hypertension. According to the Ministry of Health's 2022 report, NCDs account for 74% of global deaths, with cardiovascular diseases leading at 17.9 million deaths annually. Hypertension, a primary risk factor, affects an estimated 1.28 billion adults aged 30–79 globally. Alarmingly, 46% of hypertensive adults are unaware of their condition, and only 21% achieve proper blood pressure control through lifestyle changes (WHO, 2021; Oktaria et al., 2023).

Hypertension is particularly prevalent in low- and middle-income countries, where 86% of premature NCD-related deaths occur. The Eastern Mediterranean region recorded the highest adult hypertension prevalence in 2019 at 37.8%, followed by Europe (36.9%), Africa (35.5%), and the Americas (35.4%) (P2PM, 2022). In the U.S., about 90–95% of hypertension cases have no known cause, and the prevalence is expected to rise significantly in developing countries, reaching 1.15 billion cases by 2025 (Silwanah et al., 2020).

In Indonesia, the 2018 Basic Health Research (Riskesdas) reported a rise in hypertension prevalence from 25.8% in 2013 to 34.1% in 2018. South Kalimantan Province had the highest prevalence (44.13%), while Papua Province reported the lowest (22.22%) (Ministry of Health, 2022; Handayani, 2022). In Makassar, South Sulawesi, hypertension affects 31.68% of individuals aged 18 and above, with contributing factors including high salt consumption, limited healthcare access, and unhealthy lifestyles (Susanti et al., 2022). Coastal communities, such as Barrang Lompo Island, face unique challenges in hypertension management due to these factors, alongside high smoking rates and low physical activity (Syahrir et al., 2021).

Data from Barrang Lompo's Community Health Centre shows a concerning trend, with hypertension cases rising from 20.6% in 2021 to 35.5% in 2022, before slightly declining to 32% in 2023. Women aged 25–54 are disproportionately affected, largely due to excessive salt consumption (Barrang Lompo Community Health Centre, 2023).

Red watermelon is gaining attention for its potential in lowering blood pressure. Rich in citrulline, it enhances nitric oxide production, which dilates blood vessels and improves blood flow. Consuming watermelon juice provides faster absorption of key nutrients like citrulline and lycopene, making it more effective for blood pressure management than consuming the fruit directly (Volino-Souza et al., 2022; Matthews et al., 2023).

Non-pharmacological interventions, such as incorporating watermelon into the diet, can complement pharmacological treatments. These lifestyle changes reduce reliance on medication, lower healthcare costs, and improve overall hypertension management. Combined approaches may provide optimal blood pressure control and enhance patient outcomes.

METHODS

This study is a quasi-experimental study with the design of *the randomised Pre-test and Post-test Control Group Design* which aims to compare the results of the main intervention with the comparison group. This study involved two treatment groups, namely the main intervention group, namely hypertensive patients who were given watermelon fruit juice. While the comparison intervention group is hypertensive patients who are given celery leaf decoction. Aiming to determine the effect of watermelon fruit juice on blood pressure reduction in hypertensive patients on Barrang Lompo Island in 2024. This study was conducted in September 2024 with the population in this study were all hypertensive patients on Barrang Lompo Island. While the number of samples to be studied is 60 patients with hypertension with 30 main intervention groups (giving watermelon fruit juice) and 30 comparison intervention groups (giving celery leaf decoction) at the Barrang Lompo Island Health Centre that meet the inclusion and exclusion criteria. This study was conducted by giving a pre-test questionnaire and interview before checking blood pressure and then giving intervention for both groups then measuring blood pressure for 7 consecutive days to see the level of blood pressure changes in respondents.

RESULTS

General characteristics of respondents

Table 1: Frequency distribution of respondents' general characteristics between the main intervention group and the comparison intervention group

General characteristics of respondents	Main Intervention		Comparison Intervention	
	n	%	n	%
Gender				
Male	8	26,67	7	23,33
Women	22	73,33	23	76,67
Age (Year)				
≤45	22	73,33	3	10,00
>46	8	26,67	27	90,00
Education				
Finished primary school	8	26,67	10	33,33
Completed junior high school	7	23,33	9	30,00
Completed high school	11	36,67	10	33,33

D3/D4/S1/S2	4	13,33	1	3,33
Jobs				
Fisherman	7	23,33	6	20,00
Merchants	4	13,33	8	26,67
IRT	15	50,00	16	53,33
PNS	4	13,33	0	0,0
Total	**30**	**100**	**30**	**100**

Source: Primary data, 2024

Based on the table above, the characteristics of respondents based on the gender of respondents in the main intervention group and the comparison intervention group were mostly female with a proportion in the main intervention group of 22 respondents (73.33%) and in the comparison intervention group of 23 respondents (76.67%).

The age group of respondents in this study was the majority in the main intervention group in the age group ≤45 years with a proportion of 22 respondents (73.33%) while in the comparison intervention group the majority were in the age group >46 years with a proportion of 27 respondents (90.00%).

The education of respondents in the main intervention group was mostly in the high school completion category with a proportion of 11 respondents (36.67%) and in the comparison intervention group the most in the elementary and high school completion categories with a proportion of 10 respondents (33.33%).

The occupation of respondents in the main intervention group and the comparison intervention group was mostly categorised as housewives with the proportion in the main intervention group being 15 respondents (50.00%) and in the comparison intervention group being 16 respondents (53.33%).

Clinical characteristics of respondents

Table 2: Frequency distribution of respondents' clinical characteristics between groups Main Intervention and Comparison Intervention Groups in 2024

Clinical characteristics of respondents	Main Intervention		Comparison Intervention	
	n	%	n	%
Length of history				
≤ 6 Months	21	70,00	10	33,33
> 6 Months	9	30,00	20	66,67
Genetic History				
Yes	21	70,00	16	53,33
No	9	30,00	14	46,67
History of other diseases				
DM	12	40,00	18	60,00
Cholestrol	4	13,33	5	16,67
None	14	46,67	7	23,33
Smoking Habit				
Yes	10	33,33	8	26,67
No	20	66,67	22	73,33
Eat Vegetables and Fruit				
Yes	19	63,33	18	60,00
No	11	36,67	12	40,00
Physical Activity				
Yes	15	50,00	16	53,33
No	15	50,00	14	46,67
Total	**30**	**100**	**30**	**100**

Source: Primary data, 2024

The majority of respondents in the main intervention group were in the ≤6 months category with a proportion of 21 respondents (70.00%) and while in the comparison intervention group the majority were in the >6 months category with a proportion of 20 respondents (66.67%).

Genetic history in this study, the main intervention and comparison intervention groups were in the category of no genetic history with a proportion of 21 respondents (70.00%) and a proportion of 16 respondents (53.33%).

The majority of respondents in the main intervention group did not have a history of other diseases with a proportion of 14 respondents (46.67%) while in the comparison intervention group the majority who had a history of other diseases were DM with a proportion of 18 respondents (60.00%).

The majority of smoking respondents in this study in the main intervention and comparison intervention groups were non-smoking with a proportion of 20 respondents (66.67%) and 22 respondents (73.33%).

Respondents who consumed vegetables and fruits in this study in the main intervention group were in the consuming category with a proportion of 19 respondents (63.33%) and while in the comparison intervention group 18 respondents (60.00%).

Physical activity carried out by respondents in this study in the main intervention group with a proportion of 15 respondents (50.0%) who did physical activity and the comparison intervention group with a proportion of 16 respondents (53.33%) who did physical activity.

Analysis of the mean difference in blood pressure between the main intervention and comparison intervention groups before and after the intervention

Table 3: Distribution of mean blood pressure of watermelon juice group before and after treatment year 2024

Blood Pressure	Group	Min	Max	Mean	SD
Systolic	Pretest	149	199	163,46	11,30
	Posttest	130	156	142,36	6,36
Diastolic	Pretest	65	177	92,03	12,35
	Posttest	54	85	72,86	8,13

Source: Primary data, 2024

Based on the table above, it can be seen that the average systolic blood pressure in the main intervention group before treatment was 163.46 mmHg with Standard Deviation = 11.30 and after treatment decreased to 142.36 mmHg with Standard Deviation = 6.36. While the average diastolic blood pressure in the main intervention group before treatment was 92.03 mmHg with Standard Deviation = 12.35 and after treatment decreased to 72.86 mmHg with Standard Deviation = 8.13. So that there is a decrease in systolic blood pressure by 12% and diastolic blood pressure by 20%.

Table 4: Distribution of mean blood pressure of celery leaf decoction before and after treatment year 2024

Blood Pressure	Group	Min	Max	Mean	SD
Systolic	Pretest	153	232	170,10	17,97
	Posttest	135	163	142,50	7,25
Diastolic	Pretest	80	114	94,30	9,37
	Posttest	67	85	76,70	4,61

Source: Primary data, 2024

Based on the table above, it can be seen that the average systolic blood pressure in the comparison intervention group before treatment was 170.10 mmHg with Standard Deviation = 17.97 and after treatment decreased to 142.36 mmHg with Standard Deviation = 7.25. While the average diastolic blood pressure in the comparison intervention group before treatment was 94.30 mmHg with Standard Deviation = 9.37 and after treatment decreased to 76.70 mmHg with Standard Deviation = 4.61. So there was a decrease in systolic blood pressure by 16% and diastolic blood pressure by 18%.

Analysis of mean differences in blood pressure based on respondent characteristics in the

main intervention and comparison intervention groups

Table 5: Differences in pre-posttest systolic and diastolic blood pressure based on respondents' characteristics in the watermelon juice group

Variables	Blood Pressure of Watermelon Juice Group					
	Pretest			Posttest		
	N	Systolic Mean	Diastolic Mean	Systolic Mean	Diastolic Mean	*p-value*
Gender						
Male	8	162,12	95,37	139,62	75,12	0,970
Women	22	163,47	90,82	143,36	72,04	
Age (Year)						
≤45	22	165,14	94,04	141,82	72,91	0,051
>46	8	158,87	86,50	143,87	72,75	
Genetic History						
Yes	21	164,52	93,14	143,0	72,90	0,827
No	9	161,0	89,44	140,89	72,78	
Smoking Habit						
Yes	10	163,0	96,30	140,30	73,10	0,986
No	20	163,70	89,90	143,40	72,75	
Eat Vegetables and Fruit						
Yes	19	161,84	89,53	142,47	71,68	0,579
No	11	166,27	96,36	142,18	74,91	
Physical Activity						
Yes	15	163,87	91,73	142,87	71,73	0,547
No	15	163,07	92,33	141,87	74,0	

Notes: Independent t-test

The findings indicate that watermelon juice effectively reduces both systolic and diastolic blood pressure across various demographic and lifestyle groups, although statistical analyses revealed no significant differences based on specific characteristics. In the main intervention group, systolic blood pressure in males decreased from 162.12 mmHg pre-test to 139.62 mmHg post-test, and in females, from 163.47 mmHg to 143.36 mmHg. Similarly, diastolic blood pressure in males dropped from 95.37 mmHg to 75.12 mmHg, and in females, from 90.82 mmHg to 72.04 mmHg. However, the p-value of 0.970 indicates no significant gender-based differences in the effect of watermelon juice. Age-based analysis showed that systolic blood pressure in participants ≤45 years reduced from 165.14 mmHg to 141.82 mmHg, while those >46 years experienced a reduction from 158.87 mmHg to 143.87 mmHg. Diastolic blood pressure decreased from 94.04 mmHg to 72.91 mmHg in the ≤45 age group and from 86.50 mmHg to 72.75 mmHg in the >46 group. The p-value of 0.051 confirms no significant difference based on age.

Regarding family history of hypertension, systolic blood pressure decreased from 164.52 mmHg to 143 mmHg in those with a history and from 161 mmHg to 140.89 mmHg in those without. Diastolic blood pressure reduced from 93.14 mmHg to 72.90 mmHg and from 89.90 mmHg to 72.78 mmHg, respectively. A p-value of 0.827 indicates no significant difference based on genetic predisposition. For smoking habits, smokers experienced a reduction in systolic blood pressure from 163 mmHg to 140.30 mmHg, while non-smokers showed a decrease from 163.70 mmHg to 143.40 mmHg. Diastolic blood pressure in smokers dropped from 96.30 mmHg to 73.10 mmHg, and in non-smokers, from 89.90 mmHg to 72.75 mmHg. A p-value of 0.986 suggests no significant difference between smokers and non-smokers. Dietary habits, specifically fruit and vegetable consumption, also showed reductions in blood pressure. Respondents who consumed fruits and vegetables experienced a decrease in systolic pressure from 161.84 mmHg to 142.47 mmHg, while those who did not showed

a reduction from 166.27 mmHg to 142.18 mmHg. Diastolic pressure in consumers decreased from 89.53 mmHg to 71.68 mmHg, and in non-consumers, from 96.36 mmHg to 74.91 mmHg. A p-value of 0.579 indicates no significant difference between the two groups.

Finally, physical activity was analyzed. Systolic blood pressure dropped from 163.87 mmHg to 142.87 mmHg in active individuals and from 163.07 mmHg to 141.87 mmHg in inactive ones. Diastolic blood pressure fell from 91.73 mmHg to 71.73 mmHg in active participants and from 92.33 mmHg to 74 mmHg in inactive ones. With a p-value of 0.547, there was no significant difference based on physical activity levels. In summary, watermelon juice effectively reduces blood pressure in hypertensive individuals across all groups, but the reductions are not significantly influenced by gender, age, genetic history, smoking habits, dietary patterns, or physical activity.

Table 6: Differences in pre-posttest systolic and diastolic blood pressure based on respondents' characteristics in the celery leaf decoction group

Variables	Blood Pressure of Celery Leaf Decoction Group					
	Pretest			Posttest		
	N	Systolic Mean	Diastolic Mean	Systolic Mean	Diastolic Mean	*p-value*
Gender						
Male	7	162,28	88,86	138,28	72,71	0,391
Women	23	172,48	95,96	143,78	77,91	
Age (Year)						
≤45	3	172,33	104,33	144,33	80,67	0,894
>46	27	169,85	93,18	142,30	76,26	
Genetic History						
Yes	16	171,12	94,06	143,81	76,25	0,511
No	14	168,93	94,57	141,0	77,21	
Smoking Habit						
Yes	8	165,75	88,0	140,37	74,25	0,928
No	22	171,68	96,59	143,27	77,59	
Eat Vegetables and Fruit						
Yes	18	166,0	91,78	142,05	76,28	0,418
No	12	176,25	98,08	143,17	77,33	
Physical Activity						
Yes	16	169,94	94,12	76,94	76,94	0,931
No	14	170,28	94,50	76,43	76,43	

Notes: Independent t-test

Based on the table above, it shows that in the comparison intervention group, the average value of systolic blood pressure in the male gender is *pre-test of* 162.28 mmHg and *post-test* decreased to 138.28 mmHg. As *for* the female gender, the *pre-test* was 172.48 mmHg and the *post-test* decreased to 143.78 mmHg. While diastolic blood pressure in the male gender, namely the *pre test of* 88.86 mmHg and the *post test* dropped to 72.71 mmHg. As for the female gender, the *pre test was* 95.96 mmHg and the *post test* dropped to 77.91 mmHg. Furthermore, the difference test based on gender, the p value is 0.391> 0.05, which means there is no difference in blood pressure before and after giving celery leaf decoction based on gender.

The mean value of systolic blood pressure in the comparison intervention group based on the age group ≤45, namely the *pre-test of* 172.33 mmHg and the *post-test* dropped to 144.33 mmHg. As for the >46 age group, the *pre test* was 169.85 mmHg and the *post test* decreased to 142.30 mmHg. While diastolic blood pressure in the ≤45 age group, the *pre test* was 104.33 mmHg and the *post test* decreased to 80.67 mmHg. As for the age group >46, the *pre test was* 93.18 mmHg and the *post test*

dropped to 76.26 mmHg. Furthermore, the difference test based on age group, the p value is 0.894> 0.05 which means there is no difference in blood pressure before and after giving celery leaf decoction based on age group.

The mean value of systolic blood pressure in the comparison intervention group based on genetic history, for respondents who have a family history of hypertension, the *pre-test* was 171.12 mmHg and the *post-test* decreased to 143.81 mmHg. As for respondents who did not have a family history of hypertension, the *pre-test* was 168.93 mmHg and the *post-test* dropped to 141 mmHg. Meanwhile, the diastolic blood pressure of respondents who have a family history of hypertension, namely the *pre-test of* 94.06 mmHg and the *post test* dropped to 76.25 mmHg. As for respondents who did not have a family history of hypertension, the *pre test* was 94.57 mmHg and the *post test* dropped to 77.21 mmHg. Furthermore, the difference test based on genetic history of hypertension, the p value is 0.511> 0.05 which means that there is no difference in blood pressure before and after giving celery leaf decoction based on family history of hypertension.

The mean value of systolic blood pressure in the comparison intervention group based on smoking habits, for respondents who smoke, the *pre-test* was 165.75 mmHg and the *post-test* decreased to 140.37 mmHg. As *fo*r respondents who did not smoke, the *pre-test* was 171.68 mmHg and the *post-test* decreased to 143.27 mmHg. While in the diastolic blood pressure of respondents who smoke, the *pre test is* 88 mmHg and the *post test* drops to 74.25 mmHg. As for respondents who do not smoke, the *pre test* is 96.59 mmHg and the *post test* drops to 77.59 mmHg. Furthermore, the difference test based on smoking behaviour, the p value is 0.928> 0.05 which means there is no difference in blood pressure before and after giving celery leaf decoction based on smoking habits.

The mean value of systolic blood pressure in the comparison intervention group based on vegetable and fruit consumption, in respondents who consumed the *pre-test of* 166 mmHg and *post-test* decreased to 142.05 mmHg. As for respondents who did not consume, the *pre-test* was 176.25 mmHg and the *post-test* decreased to 143.17 mmHg. Meanwhile, the diastolic blood pressure of respondents who consumed the *pre test* was 91.78 mmHg and the *post test* decreased to 76.28 mmHg. As for respondents who do not consume, the *pre test* is 98.08 and the *post test* drops to 77.33 mmHg. Furthermore, the difference test based on consuming vegetables and fruits, the p value is 0.418> 0.05, which means that there is no difference in blood pressure before and after giving celery leaf decoction based on consuming vegetables and fruits.

The mean value of systolic blood pressure in the comparison intervention group based on physical activity, in respondents who did physical activity, the *pre-test* was 169.94 mmHg and the *post-test* decreased to 76.94 mmHg. As for respondents who did not do physical activity, the *pre-test* was 170.28 mmHg and the *post-test* decreased to 76.43 mmHg. Meanwhile, the diastolic blood pressure of respondents who do physical activity is the *pre test of* 94.12 mmHg and the *post test* drops to 76.94 mmHg. As for respondents who did not do physical activity, the *pre test* was 94.50 mmHg and the *post test* dropped to 76.43 mmHg. Furthermore, the difference test based on physical activity, the p value is 0.931> 0.05, which means there is no difference in blood pressure before and after giving celery leaf decoction based on physical activity.

Analysis of differences in blood pressure before and after the intervention in the main intervention and comparison intervention groups

Table 7: Differences in systolic and diastolic blood pressure before and after treatment in watermelon juice group and celery leaf decoction group

Group	Blood pressure	Variables	Mean	SD	The difference		*p-value*
					Mean	SD	
Watermelon Juice	**Systolic**	Pretest	163,46	11,30	21,1	4,94	0,000
		Posttest	142,36	6,36			
Watermelon Juice	**Diastolic**	Pretest	92,03	12,35	19,17	4,22	0,000
	Systolic	Pretest	170,10	17,97	27,6	0,72	0,000

Celery Leaf Decoction		Posttest	142,50	7,25			
Celery Leaf Decoction	**Diastolic**	Pretest	94,30	9,37	17,6	4,76	0,000

Description: Wilcoxon test and paired t-test

Based on the results of the systolic blood pressure test before and after treatment in the group given watermelon juice treatment, significant changes were found. The average systolic blood pressure before treatment (pretest) was 163.46 mmHg with a standard deviation of 11.30. After treatment (posttest), the average systolic blood pressure decreased to 142.36 mmHg with a standard deviation of 6.36 with a p value of 0.000 <0.05 which indicates a significant difference between systolic blood pressure before and after treatment in the group given watermelon.

Based on the results of the systolic blood pressure test before and after treatment in the group given celery leaf decoction, a significant decrease was found. The average systolic blood pressure before treatment (pretest) was 170.10 mmHg with a standard deviation of 17.97. After treatment (posttest), the average systolic blood pressure decreased to 142.50 mmHg with a standard deviation of 7.25 with a p value of 0.000 <0.05 which indicates a significant difference between systolic blood pressure before and after treatment in the group given celery leaf decoction.

The results of the diastolic blood pressure test before and after treatment in the group given watermelon juice, there was a significant change. The average diastolic blood pressure before treatment (pretest) was 92.03 mmHg with a standard deviation of 12.35. After treatment (posttest), the average diastolic blood pressure decreased to 72.86 mmHg with a standard deviation of 8.13. The Paired T-Test test results showed a significant value of 0.000, indicating a significant difference between diastolic blood pressure before and after treatment.

Based on the results of the diastolic blood pressure test before and after treatment in the group given celery leaf decoction, a significant decrease was found. The average diastolic blood pressure before treatment (pretest) was 94.30 mmHg with a standard deviation of 9.37. After treatment (posttest), the average diastolic blood pressure decreased to 76.70 mmHg with a standard deviation of 4.61. The Paired T-Test test results showed a significant value of 0.000 which indicated a significant difference between diastolic blood pressure before and after treatment.

Mean and difference in blood pressure reduction in the main intervention group and the comparator intervention group

Table 8: Analysis of mean and difference of systolic and diastolic blood pressure decrease in watermelon juice group and celery leaf decoction group

Blood Pressure (Pre-Post Test)	Group	Mean	SD	The difference		*p-value*
				Mean	SD	
Systolic	Watermelon Juice	21,10	10,41	6,5	2,5	0,036
	Celery Leaf Decoction	27,60	12,91			
Diastolic	Watermelon Juice	19,16	14,69	1,56	6,79	0,609
	Celery Leaf Decoction	17,60	7,90			

Notes: Independent t-test

Based on the results of the difference test analysis of systolic blood pressure reduction between the watermelon juice and celery leaf decoction groups, it was found that the average decrease in systolic blood pressure in the watermelon juice group was 21.10 mmHg with a standard deviation of 10.41 while in the celery leaf decoction group the average decrease was greater at 27.60 mmHg with a standard deviation of 12.91. And obtained a p value of 0.036 <0.05 which means that celery leaf decoction is proven to be more effective in reducing systolic blood pressure compared to watermelon juice.

Based on the results of the differential test of diastolic blood pressure reduction between the watermelon juice and celery leaf decoction groups, several significant results were obtained. The average decrease in diastolic blood pressure in the watermelon juice group was 19.16 mmHg with a standard deviation of 14.69 while in the celery leaf decoction group the decrease was 17.60 mmHg with a standard deviation of 7.90. Furthermore, the test results showed a significant value of 0.609 > 0.05, indicating that there was no significant difference between the diastolic blood pressure reduction in the watermelon juice and celery leaf decoction groups.

DISCUSSION

General characteristics of respondents

The results of the analysis according to Table 1 show that the most dominant research sample in both groups is female. It is also seen from the existing facts that the dominant sample of both groups is female. Hypertension is more at risk for women, due to hormonal changes, especially estrogen and progesterone. When hormonal changes occur, for example during pregnancy or after childbirth, women are more prone to spikes in blood pressure. The results of this study are in line with research conducted (Bura et al., 2023) that the main factor for women experiencing hormonal changes is a decrease in the ratio of estrogen and endrogen hormones which causes an increase in the release of rennin which can trigger an increase in blood pressure.

The majority of respondents in this study were in the age group of 56-65 years in the control group. Hypertension tends to increase with age. In individuals over 60 years old, about 50-60% have blood pressure equal to or more than 140/90 mmHg. This condition is influenced by degenerative processes that occur with age. As a person gets older, the elasticity of his or her blood vessels decreases, which causes blood pressure in elderly people to increase and exceed normal limits (Bura et al., 2023).

In the characteristics of education level, the majority of respondents were at the high school education level in the main intervention group and graduated from elementary school in the comparison intervention group. The level of education allows individuals to have a higher level of knowledge related to hypertension so that education affects the blood pressure of respondents. The results obtained are in line with research conducted by (Mazidah et al., 2020) that people with low education levels have twice the risk of hypertension than those with high education. Low education is often related to limited access to information and knowledge. In addition, lack of education can cause a person to be less concerned about hypertension prevention programmes, so they may not be aware of the health impacts that hypertension can cause.

The majority of respondents in this study were housewives in both groups. Working as a housewife may be associated with a higher risk of developing hypertension. Housewives generally have great responsibility in managing family needs, such as taking care of children, managing household finances, and keeping the house clean. This is in line with research conducted by (Yasril & Abbas, 2023) that the status of IRTs with low husband's income can also influence the decision to seek health care at health facilities. Hypertension sufferers who do not feel symptoms that interfere with their daily activities tend to choose not to have regular health checks, because they feel that their condition is not life-threatening. This condition can lead to chronic stress as one of the main triggers of hypertension because it triggers an increase in the hormones cortisol and adrenaline, which can raise blood pressure significantly.

Clinical characteristics of respondents

In the variable of duration of suffering, respondents who had suffered from hypertension ≤6 months were more in the main intervention group and respondents who had suffered >6 months were the majority in the comparison intervention group. Individuals with hypertension experience significant impact during the 6-12 month period, especially in terms of health complications and management challenges. During this time, it can trigger adverse conditions in people with hypertension. Therefore, it is important for individuals who have a history of hypertension to regularly monitor their blood pressure and follow medical advice well.

In the genetic history variable, the majority of respondents had a history of hypertension inherited from their mothers in both intervention groups. Some genes inherited from parents may play a role in blood pressure regulation. These genes relate to hormone production, fluid balance, and blood vessel function, all of which are critical in controlling blood pressure. For example, genes that affect the renin-angiotensin system can lead to increased salt and water retention in the body, which in turn can increase blood pressure. When a mother suffers from hypertension, her child could potentially inherit the genetic variation, thereby increasing their susceptibility to hypertension. This is in line with research conducted by (Yuliza et al., 2023) said that people who have parents with a history of hypertension are at twice the risk of developing hypertension compared to those who do not have a family history of hypertension.

The history of other diseases in the study showed that the majority of respondents in the comparison intervention group had diabetes millitus. Diabetes mellitus (DM) and hypertension (high blood pressure) are two health conditions that often occur together. The relationship between the two is very complex and mutually influencing. According to (Figueroa et al., 2011) Elevated glucose levels can trigger various physiological processes that contribute to increased blood pressure. Insulin that is not functioning effectively can affect the work of the endothelium, which is the layer of cells lining blood vessels, thereby reducing the ability of blood vessels to dilate and increasing resistance in blood vessels.

The majority of respondents in this study do not smoke. This is because the majority of respondents are female. In Indonesian society, smoking among women is still largely seen as a taboo, leading to significant social stigma and negative judgement towards female smokers. Cigarettes contain harmful substances, one of which has an impact on increasing blood pressure. Nicotine in cigarettes has the effect of constricting blood vessels (vasoconstrictor). When a person smokes, nicotine is quickly absorbed by the body, causing blood vessels to constrict and increasing blood flow resistance. As a result, the heart must work harder to pump blood through the narrowed vessels, leading to an increase in blood pressure. (Hidayat & Agnesia, 2021).

Respondents in this study mostly had a good diet in both intervention groups, namely consuming vegetables and fruit. From the results of interviews, respondents often consume clear vegetables but there are also those who consume coconut milk vegetables. Consuming fatty foods is not good for heart health because it can increase cholesterol which is a major risk factor for *atherosclerosis* which is the cause of cardiovascular problems including hypertension. (Hidayat & Agnesia, 2021). consuming these vegetables is accompanied by salted fish where consuming salted fish has become a habit of the islanders because according to them the fish can last a long time so it is the main choice when they don't have food ingredients. According to (Bura et al., 2023) One of the factors causing hypertension is salt consumption or high sodium content in foodstuffs consumed by the community. Excessive salt intake causes sodium ions from food to be absorbed into the blood vessels. The presence of sodium ions triggers fluid retention in the body, thus increasing blood volume.

Respondents in this study did the majority of physical activity in both intervention groups. From the results of interviews conducted, there were various physical activities carried out by respondents such as cycling, jogging, cleaning the house and gymnastics. Physical activity can improve the performance of the heart and blood vessels and help lower blood pressure. In this study, the majority of respondents were women who besides doing housework they also did gymnastics every afternoon twice a week. They have a schedule of when and where they will exercise and are led by health workers. According to (Yuliza et al., 2023) Gymnastics can help lose weight and manage stress (a factor that can increase the risk of hypertension). This activity is carried out for 30 minutes and is recommended at least twice a week.

Changes in *pretest-posttest* blood pressure by giving watermelon juice to reduce blood pressure in hypertensive patients

Based on the results of the systolic blood pressure test before and after treatment in the group given watermelon juice treatment, significant changes were found. The average systolic blood pressure before treatment (pretest) was 163.46 with a standard deviation of 11.30. After treatment (posttest), the average systolic blood pressure decreased to 142.36 with a standard deviation of 6.36.

Based on the results of the diastolic blood pressure test before and after treatment in the group given watermelon juice, there was a significant change. The average diastolic blood pressure before treatment (pretest) was 92.03 with a standard deviation of 12.35. After treatment (posttest), the average diastolic blood pressure decreased to 72.86 with a standard deviation of 8.13.

The occurrence of a decrease in blood pressure indicates that watermelon fruit juice is effective in reducing blood pressure in people with hypertension. The evidence showing that watermelon fruit juice is effective in lowering blood pressure is through the *Wilcoxon* statistical test, for *pretest-posttest* systolic blood pressure, the administration of watermelon fruit juice shows that 30 respondents experienced a decrease in systolic blood pressure as evidenced by the *p-value* = 0.000 ≤ α = 0.05. For *pretest-posttest* diastolic blood pressure, watermelon juice administration showed that 30 respondents experienced a decrease in diastolic blood pressure as evidenced by the *p-value* = 0.000 ≤ α = 0.05. So the conclusion of the statistical test above is that there is an effect of watermelon fruit juice to reduce blood pressure in hypertensive patients.

Watermelon is high in potassium, which plays an important role in reducing the secretion of renin and angiotensin II. Reduced vasoconstriction of blood vessels can ease the workload of the heart and lower blood pressure. Potassium is also beneficial in controlling blood pressure, influencing heart function, aiding the treatment of hypertension, clearing carbon dioxide from the blood, and supporting muscle activity. (Furngili & Kustriyani, 2023).. Watermelon is also diuretic due to its abundant water content, which plays a role in lowering blood pressure. In addition, watermelon contains flavonoids that inhibit the formation of angiotensin II by suppressing the activity of angiotensin I, which functions to form angiotensin II. Angiotensin II itself causes constriction of blood vessels which can increase blood pressure. Flavonoids also act as ACE Inhibitors, helping to dilate blood vessels and allowing more blood flow to the heart, resulting in lower blood pressure. (Rohmaniah, 2023).

The results of this study are in line with research conducted by (Sari et al., 2022), entitled "The effect of watermelon fruit juice therapy on reducing hypertension in the elderly". In the study, there was a decrease in average blood pressure from 149/88.12 mmHg to 131/79.37 mmHg after giving watermelon juice in the pretest-posttest test. with a *p-value* = 0.000 ≤ α = 0.05.

Other research conducted by (Fadliyah & Aini, 2024) showed that giving watermelon juice intervention to hypertensive patients, the effect of giving watermelon juice on lowering blood pressure with a fruit weight of 100 grams of watermelon was significantly able to reduce blood pressure given for 7 consecutive days was able to reduce blood pressure. The occurrence of a decrease in blood pressure in patients is also due to the potassium content contained in watermelon juice as much as 409.1 mg.

(Nurliana & Dewi, 2023) In a pre-experimental study conducted on all hypertensive menopausal mothers in RT.04 Talang Jambe Village, Palembang City, it was shown that giving watermelon juice intervention to hypertensive patients, the effect of giving watermelon juice on lowering blood pressure with a fruit weight of 100 grams of watermelon was significantly able to reduce blood pressure given for 7 consecutive days was able to reduce blood pressure. The occurrence of a decrease in blood pressure in patients is also due to the potassium content contained in watermelon juice as much as 409.1 mg. So it can be concluded that watermelon is effective in lowering blood pressure in menopausal mothers with hypertension.

The reduction in blood pressure in hypertensive patients is due to the high lycopene content in watermelon, as well as the diuretic effect of red watermelon. Lycopene has antioxidant and diuretic properties that help improve the elasticity of blood vessels, resulting in smoother blood flow. This contributes to lower blood pressure in hypertensive patients. The fibre found in watermelon can help improve blood flow throughout the body. Fibre interacts with bile acids, thereby lowering cholesterol levels. By binding to bile salts, dietary fibre prevents the absorption of cholesterol in the intestines, which causes the initially thick blood to become thinner. As a result, blood pressure in the peripheral vessels is reduced.

Changes in *pretest-posttest* blood pressure by giving celery leaf decoction to reduce blood pressure in hypertensive patients

Based on the results of the systolic blood pressure test before and after treatment in the group given celery leaf decoction, a significant decrease was found. The average systolic blood pressure before treatment (pretest) was 170.10 with a standard deviation of 17.97. After treatment (posttest), the average systolic blood pressure decreased to 142.50 with a standard deviation of 7.25.

Based on the results of the diastolic blood pressure test before and after treatment in the group given celery leaf decoction, a significant decrease was found. The average diastolic blood pressure before treatment (pretest) was 94.30 with a standard deviation of 9.37. After treatment (posttest), the average diastolic blood pressure decreased to 76.70 with a standard deviation of 4.61.

The occurrence of a decrease in blood pressure indicates that celery leaf decoction is effective in lowering blood pressure in people with hypertension. The evidence that shows that celery leaf decoction is effective in lowering blood pressure is through the *Wilcoxon* statistical test, for *pretest-posttest* systolic blood pressure, the administration of celery leaf decoction shows that 30 respondents experienced a decrease in systolic blood pressure as evidenced by the *p-value* = 0.000 ≤ α = 0.05. For *pretest-posttest* diastolic blood pressure, the administration of celery leaf decoction showed that 30 respondents experienced a decrease in diastolic blood pressure as evidenced by the *p-value* = 0.000 ≤ α = 0.05. So the conclusion of the statistical test above is that there is an effect of celery leaf decoction to reduce blood pressure in patients with hypertension.

Celery contains the flavonoids apiin and apigenin. Apiin is a compound in celery that works to lower blood pressure, both systolic and diastolic. Celery is also used as an herbal therapy to treat hypertension due to its apigenin content, which is beneficial in preventing constriction of blood vessels and reducing high blood pressure. In addition, celery contains pthalides and magnesium that help relax the muscles around arterial blood vessels, and normalise blood vessel constriction.

The results of this study are in line with research conducted by (Aryani, 2020), entitled "The Effect of Giving Celery Leaf Decoction Water on Lowering Blood Pressure in Elderly People with Hypertension". In the study, there was a decrease in average blood pressure from 156/92.50 mmHg to 145/82.59 mmHg after giving watermelon juice in the pretest-posttest test. with a *p-value* = 0.000 ≤ α = 0.05.

Other research conducted by (Isnainy et al., 2021) entitled "Giving Celery Leaf Decoction to Lower Blood Pressure in Hypertensive Clients in Sekampung Mudik Village Brawijaya District" shows that non-pharmacological therapy giving celery leaf decoction is proven to reduce blood pressure in hypertensive patients. This proves some of the results of research that has been done on clients with hypertension, that giving celery leaf decoction can be used as a cheap, easy, and safe alternative to hypertension treatment.

Potassium found in celery leaves plays an important role in controlling blood pressure. This mineral helps balance sodium levels in the body. Excess sodium is often associated with increased blood pressure as it causes fluid retention, which in turn increases blood volume and pressure on blood vessels. Potassium works by helping the body get rid of excess sodium through urine, resulting in lower blood pressure and a reduced risk of complications from hypertension. In addition, celery also has a diuretic effect, which means that it helps the body remove excess fluid through urine. With the reduction of fluid volume in the body, blood flow becomes lighter, which in turn lowers blood pressure. This diuretic effect of celery leaf decoction works similarly to some diuretics used in medical treatment for hypertension.

Differences in the effect of watermelon juice and celery leaf decoction on blood pressure reduction in hypertensive patients

Based on the results of the difference test analysis of systolic blood pressure reduction between the watermelon juice and celery leaf decoction groups, it was found that the average decrease in systolic blood pressure in the watermelon juice group was 21.10 with a standard deviation of 10.41, while in the celery leaf decoction group the average decrease was greater, namely 27.60 with a standard

deviation of 12.91. And obtained a p value of 0.036 <0.05, which means that celery leaf decoction is proven to be more effective in reducing systolic blood pressure compared to watermelon juice.

Based on the results of the differential test of diastolic blood pressure reduction between the watermelon juice and celery leaf decoction groups, several significant results were obtained. The average decrease in diastolic blood pressure in the watermelon juice group was 19.16 with a standard deviation of 14.69, while in the celery leaf decoction group, the decrease was 17.60 with a standard deviation of 7.90. Furthermore, the test results showed a significant value of 0.609 > 0.05, indicating that there was no significant difference between the diastolic blood pressure reduction in the watermelon juice and celery leaf decoction groups.

Watermelon is rich in potassium, which can reduce the secretion of renin and angiotensin II. This decrease in vasoconstriction of blood vessels helps ease the workload of the heart and lower blood pressure. Meanwhile, celery leaves contain apigenin, which plays an important role in preventing narrowing of blood vessels and relaxing the smooth muscles of blood vessels. Apigenin functions to regulate blood flow, so that blood vessels can widen and blood pressure is reduced.

The results of this study are in line with research conducted by (Sari et al., 2022), entitled "The effect of watermelon fruit juice therapy on reducing hypertension in the elderly". In the study, there was a comparison of the effectiveness between giving watermelon fruit juice and celery leaf decoction in elderly people with hypertension. Where it is known that celery leaf decoction is more effective in reducing diastolic blood pressure compared to watermelon fruit juice in the elderly.

Other research conducted by (Lazdia et al., 2020) showed that the average systolic blood pressure after consuming celery leaves was 136 mmHg (SD = 10.750), lower than the average systolic blood pressure before consuming celery leaf decoction, which was 142 mmHg (SD = 13.984) (p>0.05). The average diastolic blood pressure after consuming celery leaf decoction was 87 mmHg (SD = 4.830), lower than the average diastolic blood pressure before consuming celery leaf decoction of 94 mmHg (SD = 9.661) (p<0.05). Celery contains which functions as a beta blocker that can slow the heart rate and reduce the strength of heart contractions so that less blood flow is pumped and blood pressure is reduced.

Celery leaves contain phthalides, compounds that play an important role as vasodilators. Phthalides work by relaxing the muscles around the blood vessels, so that the blood vessels widen, increasing blood flow and lowering the pressure on the vessel walls. In addition, celery leaves are also rich in potassium, an important mineral that helps control sodium levels in the body and prevents fluid retention, which is often a major cause of high blood pressure.

Watermelon contains citrulline, an amino acid that helps the body produce nitric oxide. Nitric oxide dilates blood vessels and improves blood flow, which in turn lowers blood pressure. Watermelon is also rich in lycopene, a powerful antioxidant that protects blood vessels from free radical damage. Although beneficial, compounds like citrulline in watermelon work more slowly and have a gradual, long-term effect, compared to the compounds in celery leaves that give faster results.

The strong diuretic effect of celery leaves is one of the factors that make celery leaf decoction more effective. Celery is known to have significant diuretic ability, which means it can help the body expel excess fluid through urine. When the body expels excess fluid, the volume of blood in the body decreases, leading to a drop in blood pressure. This diuretic effect is similar to the mechanism of action of some diuretic drugs that are usually prescribed to people with hypertension. On the other hand, although watermelon has a high water content, its diuretic effect is not as strong as that of celery, so its effect on lowering blood pressure may be smaller.

The speed and effectiveness of celery leaves in lowering blood pressure is higher than that of watermelon juice. Celery leaf decoction, thanks to its phthalide content and diuretic properties, can lower blood pressure more quickly. In contrast, the benefits of watermelon juice tend to appear in the long term and take longer to show, as the process of increasing nitric oxide and improving blood vessel elasticity takes longer.

CONCLUSSION

There is a significant decrease in blood pressure among hypertensive patients after the administration of both watermelon juice and celery leaf decoction. Furthermore, a comparison between the two intervention groups revealed that celery leaf decoction was more effective in reducing blood pressure than watermelon juice, as indicated by a statistically significant p-value of 0.036 ($p < 0.05$).

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