Bay Leaves *(Syzygium polyanthum)* and Rosella Flowers *(Hibiscus sabdariffa)* are Effective in Reducing Blood Pressure

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ARTICLE INFO

A B S T R A C T

The effort to treat hypertension is blood pressure management. Some plants that can treat blood pressure are bay leaves and rosella flowers. The aim is to determine the effects of bay leaves and rosella flowers on blood pressure in people with hypertension. The research used an experimental approach with a pretest and posttest control group design. The control group sample was 18 people, the bay leaves group was 17, and the rosella group was 17. The subject was taken using simple random sampling. Instruments to measure blood pressure were Sphygmomanometer digital and observation sheet. The statistical test used the Paired T-Test and Independent T-Test. The analysis of pretest-posttest SBP among control, bay leaves, and rosella groups were p=0.038, p=0.000, and p=0.000. The pre-posttest DBP analysis among control, bay leaves, and rosella groups were p=0.000, p=0.000, and p=0.000. The SBP and DBP between bay leaves and rosella were p=0.280 and p=0.396. The highest decrease in mean pre-posttest SBP and DBP rosellas were -12.64 and -11,41 mmHg. Bay leaves and rosella flowers effectively reduce blood pressure in people with hypertension. Rosella is more effective at lowering blood pressure in terms of the average decrease in blood pressure. As a community nurse, you can improve health promotion about complementary therapies using herbal plants such as rosella and bay leaves as an alternative therapy to maintain blood pressure in hypertensive patients.

A B S T R A K

Upaya pengobatan hipertensi adalah mengelola tekanan darah. Beberapa tanaman yang dapat digunakan untuk mengelola tekanan darah adalah daun salam dan bunga rosella. Tujuan penelitian untuk mengetahui pengaruh daun salam dan bunga rosella terhadap tekanan darah pada penderita hipertensi. Penelitian menggunakan pendekatan eksperimen dengan desain pretest and posttest control group design. Sampel kelompok kontrol 18 orang, kelompok daun salam 17 orang, dan kelompok rosella 17 orang. Pengambilan sampel dilakukan secara simple random sampling. Alat untuk mengukur tekanan darah adalah Sphygmomanometer digital dan lembar observasi. Uji statistik menggunakan Paired T-Test dan Independent T-Test. Analisis pretest-posttest SBP antara kelompok kontrol, daun salam, dan rosella adalah p=0,038, p=0,000, dan p=0,000. Analisis DBP pre-posttest antara kelompok kontrol, daun salam, dan rosella adalah p=0,000, p=0,000, dan p=0,000. SBP dan DBP antara daun salam dan rosella adalah p=0,280 dan p=0,396. Penurunan rerata pre-posttest SBP dan DBP rosella tertinggi adalah -12,64 dan -11,41 mmHg. Daun salam, dan bunga rosella efektif menurunkan tekanan darah pada penderita hipertensi. Rosella lebih efektif dalam menurunkan tekanan darah dalam hal penurunan rata-rata tekanan darah. Sebagai perawat komunitas dapat meningkatkan promosi kesehatan tentang terapi komplementer dengan menggunakan tanaman herbal

seperti rosella dan daun salam sebagai terapi alternatif untuk menjaga tekanan darah pada pasien hipertensi.

INTRODUCTION

Data from the Centers for Disease Control and Prevention's (CDC), National Center for Health Statistics (NCHS), the incidence of hypertension at >18 years of age in 2015-2016 was 29.0% (Matthew et al., 2019). Hypertension occurs in more than 1.13 billion people in the world. The ratio in men is 1:4; the proportion in women is 1:5. The prevalence of hypertension is currently the lowest in the American Region (18%) and the highest in Africa (27%). The number of hypertension sufferers in Southeast Asia is in the third position, namely 25% (World Health Organization, 2019).Hypertension kills 1.5 million people in the Asian region(Thomas, 2020).

Hypertension is a cause of other diseases such as heart problems (myocardial infarction, left ventricular hypertrophy, and heart failure), stroke, retinopathy, and renal failure if not detected early and treated appropriately (American Academy of Family Physicians, 2014)(Muhadi, 2016). Hypertension is the silent killer. Most of the time, there are no apparent symptoms. The best effort to treat hypertension is to manage blood pressure. A healthy lifestyle is the right choice of therapy(American Heart Association, 2017). Pharmacotherapy and non-pharmacotherapy are options in the management of hypertensive patients. Hypertension non-pharmacotherapy includes a healthy lifestyle(Dennison et al., 2014), increasing physical activity, limiting sodium intake to <5 g/day, stopping smoking, and not consuming alcohol. The diets recommended by DASH to lower blood pressure include fruits, vegetables, fibre, minerals, and low-fat products(Paffer et al., 2019)(Fadlilah et al., 2020)(S. Fadlilah et al., 2021).

Many herbal plants can be used as alternative therapies to keep blood pressure regular(Anita T et al., 2017).One of the plants used to treat blood pressure is bay leaves and roselle flowers (Nucahyati, 2014)(Ritonga NJ et al., 2017).Bay leaves contain essential oils (citral, eugenol), tannins, and flavonoids, which help treat high blood pressure(Savitri, 2016).Bay leaves contain essential oils (citral, eugenol), tannins, and flavonoids, which help treat high blood pressure. Meanwhile, Rosella (Hibiscus Sabdariffa) contains flavonoids. The flavonoid content of roselle petals consists of gossiping, anthocyanin, and mucilage compounds(Badan Pengawas Obat dan Makanan, 2010).These substances function as diuretics, lower blood pressure, reduce blood viscosity, and stimulate bowel movements. The anthocyanins in rosella have an antihypertensive effect(Kusumastuti, 2014).

Previous research has shown that bay leaves and rosella flowers effectively lower blood pressure. Previous research was conducted without comparing the effectiveness of these two herbs. Based on this background, the study aimed to determine the effect of bay leaves and roselle flowers on hypertensive patients' blood pressure. Researchers wanted to compare the results between the two herbs in lowering blood pressure.

METHOD

This study used an experimental approach with a pretest and posttest control group design. The independent variable was boiled water from bay leaves and rosella flowers, then blood pressure as the dependent variable. The sample was taken using simple random sampling. The sample consisted of three groups, one control group and two interventions (the bay leaves group and roselle flowers group). The subject in the control group was 18 respondents. There were 17 people in each group in the intervention group because one person did not follow the intervention process until it was finished. According to the inclusion criteria, samples were selected: willingness to be a respondent, age 25-59 years, Body Mass Index in the normal category, not smoking, and following all treatments. While the exclusion criteria set were illness at the time of the study, consuming alcohol, suffering from diabetes mellitus, suffering from chronic kidney failure, and taking blood pressure medications.

Select samples with normal BMI by measuring height and weight directly, then calculating BMI. The digital weight scales used have been tested for calibration at the Legal Metrology Unit of Yogyakarta City with the certificate number 212/MET/TE-72/II/2020. Microtoice has conducted a calibration test at the Legal Metrology Unit of Yogyakarta City with certificate number 212/MET/UP- 20/II/2020. Making rosella flowers and bay leaves are done according to standard operating procedures. The group of bay leaves received a drink from the boiled leaves from the respondent. Making bay leaf boiled water is to prepare 5 washed young bay leaves. 300 ml (3 cups) of water is boiled to a boil and added with bay leaves. The stew is cooked until the water becomes 150 ml. After chilling, the water is then filtered and then drunk. Rosella flower infusion is made using 2 grams of dried roselle petals and 150 ml of hot water. Then let the brew stand for 5 minutes.

Blood pressure was measured using a digital Sphygmomanometer. The digital Sphygmomanometer used has been tested for calibration at the Legal Metrology Unit of Yogyakarta City with the certificate number 212/MET/TE-73/II/2020. The process of measuring blood pressure is carried out according to standard operating procedures that have been tested for reliability by experts. The data of blood pressure are documented on the observation sheet.

The study was conducted on hypertensive patients in the Sleman Yogyakarta, Indonesia, in August-September 2020. Three assistants helped the researcher collect data. The respondents were arranged in their diets and activities during the research process. Respondents got a diet of carbohydrates and protein. Respondents are not allowed to consume foods high in fat. The activities that are permitted are light and moderate. The first intervention group received bay leaf drink water regularly once a day in the morning for seven days. The second intervention drinks rosella flowers water periodically once a day in the morning, for seven days. The control group did not receive any therapy.

Respondents measured blood pressure in the pretest and posttest serial every day. Blood pressure consists of Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP). The

researcher measured the pretest blood pressure on the left arm in a sitting position after the respondent had rested for 5 minutes. The researcher estimated the pretest blood pressure 10 minutes before the intervention was given. Posttest blood pressure was measured after 24 hours of intervention D7. A summary of the research process is in Figure 1.

Descriptive statistics were computed for all variables, including the minimum, the maximum, the means, standard deviation (SD) for continuous variables, and frequencies and percentages for categorical variables. The normality test used the Kolmogorov-Smirnov test express normally distributed. Bivariate analysis to see the pretest and posttest data for each group using Paired T-Test. The differences between groups were measured using the Independent T-Test.

RESULTS AND DISCUSSION

Table 1
Distribution Characteristics of Respondent

Characteristics of Respondents		Control Group (n=18)	Bay Leaves Group (n=17)	Rosella Flower Group (n=17)	Total (N=52)	P-value*
		f (%)	f (%)	f (%)	F (%)	
Gender	Man	10 (55.6)	3 (17.7)	5 (29.4)	18 (34,6)	0.084
	Woman	8 (44.4)	14 (82.3)	12 (70.6)	34 (65,4)	
Age	Early Adult	7 (38.9)	4 (23.6)	7 (41.2)	18 (34,6)	0.137
	Middle Adult	11 (61.1)	13 (76.4)	10 (58.8)	34 (65,4)	

Homogenity test used One-way ANOVA

Table 1 shows that most respondents are women (65.4%) and middle adulthood (65.4%). The number of females in the bay leaves and rosella flowers group (82.3%) and (70.6%), while in the control group, most of them were male (55.6%). Age was categorized according to Harlock as Early Adult (20-40 years) and middle Adult (41-60 years). All groups mainly were middle adults, 61.1% in the control group, 76.4% in the bay leaf group, and 58.8% in the rosella group. The homogeneity test of respondents between groups based on gender and age using One-way Anova showed the results of p=0.084 and p=0.137, meaning that the respondent's data was homogeneous.

Table 2 shows an increase in the mean posttest systolic and diastolic blood pressure in the control group compared to pretest (135.50 to 141.44 mmHg) and (86.11 to 88.11 mmHg). There was a decrease in the average posttest systolic and diastolic blood pressure in the Bay Leaf group compared to pretest (145.35 to 135.71 mmHg) and (95.24 to 85.53 mmHg). There was a decrease in the average posttest systolic and diastolic blood pressure in the Rosella Flower group compared to the pretest (148.88 to 136.24 mmHg) and (97.59 to 86.18 mmHg).

Figure 2 shows that the average posttest-pretest SBP difference in the bay leaf and rosella groups decreased. The most significant decrease in the group of bay leaves occurred on the eighth day (8.24 mmHg). The most significant decline in rosella flower groups happened on the eighth day (7.82 mmHg). In the control group, the average posttest-pretest SBP difference in the majority experienced an increase; only on the fourth day did it decreases by 0.28 mmHg. The highest increase occurred on the first day (5.06 mmHg).

Figure 3 shows that the average posttest-pretest DBP difference in most of the bay leaves group experienced a decrease; only on the sixth-day increases (0.29 mmHg). The most significant decline occurred on the seventh day (5.24 mmHg). In the rosella flower group, the DBP decreased every day. The highest reduction in the rosella flower group occurred on the third day (4.18 mmHg). In the control group, the average posttest-pretest SBP difference increased every day. The highest increase occurred on the eighth day (3.33 mmHg).

Table 3 shows the mean differences between the SBP/DBP D1 to D8; the most significant decline was in the rosella flower group (-12.64/-11.41 mmHg). The SBP and DBP increased (5.94/1.64 mmHg). The bivariate analysis of SBP pretest D1 and D8 values in the control group, group bay leaves, and group rosella flowers obtained p=0.038, p=0000, and p=0.000. This funding shows differences in the SBP pretest and posttest scores in the control, bay leaves, and rosella flowers group. Bivariate analysis of the DBP pretest D1 and D8 values in the control group, group bay leaves, and group rosella flowers obtained p=0.000, p=0000, and p=0.000. This result shows a difference in the DBP pretest and posttest scores in control, bay leaves, and roselle flowers.

In Table 3, the comparison of the difference between the control group and the group of bay leaves and rosella flowers obtained p=0.000 and p=0.000. The results showed differences in SBP between the control group, the bay leaf group, and the rosella group. Meanwhile, the comparison between the SBP posttest D8-pretest D1 between the bay leaf and rosella flower groups was obtained p=0.280, indicating no difference in the effectiveness of the SBP in the two groups. Table 3 also compares the DBP posttest D8-pretest D1 difference between the control group and the bay leaf and rosella groups, obtained p=0.000 and p=0.000. The results showed a difference in DBP between the control group, the bay leaf group, and the rosella group. While the comparison between the DBP posttest D8-pretest D1 between the bay leaf and roselle groups was p=0.396, indicating that there was no difference in the DBP's effectiveness in the two groups.

Table 2
Pretest-Posttest on Systolic and Diastolic Blood Pressure Data in Effect Bay leaves (Syzygium polyanthum) and rosella flowers (Hibiscus sabdariffa)

G	D	SBP and DSP Pretest-Posttest (mmHg)				P-value[†] SBP-DBP
		Min	Max	Mean SBP Pretest-Posttest ±SD	Mean DBP Pretest-Posttest ±SD	
C (N18)	1	130-125 and 77-80	148-160 and 96-98	135,50±6,148 to 140,56±8,024	86,11±5,676 to 87,78±4,906	0.053-0.085
	2	130-132 and 78-75	154-155 and 96-99	140,56±8,665 to 141,89±7,760	86,78±7.084 to 88,00±7,784	0.067-0.395
	3	121-121 and 75-79	156-159 and 96-100	139,78±10,44 to 139,94±10,99	84,28±5,676 to 86,67±5,790	0.067-0.116
	4	126-121 and 72-72	152-152 and 94-93	141,61±7,547 to 142,33±7,372	81,17±5,993 to 82,39±6,344	0.044-0.145
	5	129-129 and 74-75	153-154 and 92-92	143,33±7,380 to 143,44±7,469	82,61±5,852 to 83,39±5,606	0.074-0.055
	6	132-133 and 71-75	153-156 and 94-95	142,61±7,220 to 142,89±7,896	85,44±5,586 to 86,22±4,609	0.088-0.747
	7	127-130 and 75-75	156-157 and 92-92	142,44±7,485 to 143,33±7,600	84,17±5,639 to 84,78±5,515	0.054-0.517
	8	129 and 75	153 and 96	141,44±7,326	88,11±6,521	
BL (N17)	1	138-128 and 85-78	158-150 and 111-111	145,35±6,254 to139,0±6,663	95,24±8,243 to 91,35±7,866	0.000-0.003
	2	127-121 and 85-83	160-150 and 111-102	139,29±8,410 to134,82±7,367	92,47±5,547 to 91,94±7,496	0.000-0.005
	3	121-120 and 80-78	156-149 and 102-107	138,35±8,838 to131,35±7,382	89,76±7,207 to 88,12±8,069	0.000-0.102
	4	130-117 and 80-75	150-145 and 105-105	135,06±9,627 to129,29±8,402	88,59±7,229 to 86,82±7,038	0.000-0.045
	5	130-119 and 78-75	150-148 and 99-96	138,47±5,768 to132,41±7,133	88,29±6,202 to 84,12±6,585	0.002-0.003
	6	126-113 and 75-76	145-144 and 95-95	138,00±5,362 to133,06±8,370	87,29±5,775 to 87,59±5,602	0.000-0.687
	7	122-119 and 75-70	156-141 and 97-90	138,65±9,158 to130,41±7,400	86,88±5,995 to 81,65±6,214	0.000-0.000
	8	120 and 75	148 and 99	135,71±9,245	85,53±6,974	
RF (N17)	1	135-125 and 85-87	165-155 and 107-104	148,88±9,407 to 141,71±10,670	97,59±5,557 to 95,06±4,293	0.001-0.052
	2	128-123 and 78-79	160-155 and 110-107	145,29±8,244 to 138,76±10,461	93,28±8,022 to 91,94±7,496	0.001-0.336
	3	113-123 and 76-75	153-155 and 114-90	136,94±13,20 to 129,59±11,60	88,29±10,03 to 84,12±3,967	0.002-0.080
	4	113-107 and 77-75	164-150 and 97-99	140,18±14,58 to 126,76±13,31	86,47±5,149 to 85,88±6,909	0.002-0.593
	5	113-117 and 75-70	164-162 and 107-101	140,18±14,58 to 133,65±14,37	89,06±8,158 to 84,94±7,996	0.000-0.003
	6	123-122 and 80-78	168-160 and 108-103	144,65±12,24 to 138,06±12,51	93,24±7,996 to 89,35±6,274	0.001-0.029
	7	116-104 and 71-73	161-155 and 106-100	138,06±14,66 to 130,24±14,49	86,82±8,443 to 82,71±6,872	0.000-0.003
	8	118 and 75	155 and 96	136,24±12,43	86,18±6,521	

G=Group D=Days C=Control BL=Bay leaf RF=Rosella Flower SBP=Systolic Blood Pressure DBP= Diastolic Blood Pressure N= Number Min=Minimum Max=Maximum SD=Standard Deviation [†] tested using Paired T-test

Table 3
Effect Bay leaves (Syzygium polyanthum) and rosella flowers (Hibiscus sabdariffa) For Blood Pressure Among Hypertension

Group	Mean Systole/Diastole (mmHg)	The Mean Difference Posttest-Pretest Systole/Diastole	P-value
Control Group			
Pretest D1	135.50/86.11	5.94/1.67	0.038/0.000[†]
Posttest D8	141.44/88.11		
Bay Leaves Group			
Pretest D1	145.35/95.24	-9.64/-9.71	0.000/0.000[†]
Posttest D8	135.71/85.53		
Rosella Flower Group			
Pretest D1	148.88/97.59	-12,64/-11.41	0,000/0.000[†]
Posttest D8	136.24/86.18		
Systole Blood Pressure			
Posttest D8 –Pretest D1 Control and Bay Leaves group			0.000[‡]
Posttest D8 –Pretest D1 Control and Rosella Flower Group			0.000[‡]
Posttest D8 –Pretest D1 Bay Leaves Group and Rosella Flower Group			0.280[‡]
Diastolic Blood Pressure			
Posttest D8 –Pretest D1 Control and Bay Leaves group			0.000[‡]
Posttest D8 –Pretest D1 Control and Rosella Flower Group			0.000[‡]
Posttest D8 –Pretest D1 Bay Leaves Group and Rosella Flower Group			0.396[‡]

[†]*tested using Paired T-test*
[‡] *tested using Independent T-test*

After repeated examinations, hypertension is diagnosed in someone with an SBP 140 mmHg and DBP ≥90 mmHg(Thomas, 2020). Hypertension is influenced by gender. Men suffer from hypertension more than women, but during pre-menopause, the number of hypertension sufferers in men is more than in women (Reckelhoff, 2001)(Hayon et al., 2017)(Hussein et al., 2018). It does not follow this study; hypertensive patients are more in women. This condition is because women are aware of their health status and adopt a healthy lifestyle. The results of studies such as those with Everett & Zayacova found that the number of women with hypertension was lower than men(Everett & Zajacova, 2015).Generally, SBP increases with age, while DBP rises until 50 and decreases(Penuela & Penuela, 2015)(Gurven et al., 2012).This result is consistent with this study, where the number of respondents with hypertension was more in middle adults.

The result shows a significant difference between SBP and DBP pretest in the control group compared to the posttest. This difference in the control group occurred due to an increase in SBP and DBP posttest compared to the pretest. So, in the control group, the respondents experienced an increase in the mean SBP and DBP. Judging from the mean comparison of pretest-posttest serial blood pressure every day, the control group showed an increase in SBP, except that it decreased on the fourth day. Meanwhile, the DBP increased every day, and the highest increase occurred on the eighth day. This condition was caused by the control group not receiving any therapy.

Hypertension is a significant independent risk factor for cardiovascular, cerebrovascular, renal failure, and visual disturbances(Eduardo, 2015)(Kim et al., 2019)(Flint et al., 2019). Maintaining blood pressure is the central pillar of hypertension management. Non-pharmacological management using herbal plants of bay leaves and rosella flowers is an option. The result shows that bay leaves are effective in reducing SBP and DBP. The results were confirmed by a decrease in the mean pressure pretest versus posttest. Judging from the mean comparison of pretest-posttest serial blood pressure every day, the bay leaf group showed a reduction in SBP every day; the highest decrease was in D-8 (8.24 mmHg). Meanwhile, most DBP increases every day, except in D6, it has grown. The highest decline in DBP was in D7 (5.24 mmHg).

Bay leaf (Syzygium polyanthum) contain essential oils (citral, eugenol), tannins, and flavonoids. The high content of tannins and flavonoids in bay leaves allows it to become a herbal remedy for hypertension (Nucahyati, 2014)(Savitri, 2016).The content of citral essential oils and eugenol functions as an anaesthetic and antiseptic. The flavonoids in bay leaves have antimicrobial, anti-inflammatory, stimulate collagen formation, protect blood vessels, are antioxidants, and are anti-carcinogenic. Flavonoids can also control HDL cholesterol, a vasodilator agent, and inhibit ACE. Angiotensin I cannot be converted into angiotensin II(Utami, 2017)(Susyani et al., 2020)The spices bay leaves are used for blood pressure management. This study is different from previous research; Purtri & Darmawan used a literature review on bay leaves(Putri & Darmawan, 2016), Hasliani & Endah compared the effects of bay leaves and cucumbers(Hasliani & Endah, 2021). This study compared the administration of bay leaves rosella flowers with the control group.

The result also shows that rosella flowers effectively reduce SBP and DBP. The results were confirmed by a decrease in the mean pressure pretest versus posttest. The rosella flower group showed a daily reduction in SBP and DBP. The highest reduction in SBP was in D8 (7.82 mmHg) and DBP in D3 (4.18 mmHg). Vitamins contained in rosella flowers every 100 grams, namely 260-280 mg of vitamin C, vitamin D, vitamin A, vitamins B1 and B2. It also contains

magnesium, omega 3, iron, potassium, beta carotene, and essential acids. Rosella includes gossiping anthocyanin and mucilage compounds(Badan Pengawas Obat dan Makanan, 2010)(Apriyanti, 2012).These substances function as diuretics, lower blood pressure, reduce blood viscosity, and stimulate bowel movements. The anthocyanins in rosella have an antihypertensive effect (Kusumastuti, 2014).

Rosella consumption is used as a new way to reduce the risk of heart disease. This flora is clinically proven to reduce plaque that sticks to the walls of blood vessels. Rosella can also reduce harmful cholesterol levels called LDL and fat in the body. This study shows that rosella is also beneficial for lowering blood pressure in hypertension and improving blood circulation (Apriyanti, 2012). Previous research results show Hibiscus sabdariffa is sufficient to treat hypertension and hyperlipidemia in animals and humans(Hopkins et al., 2013). This study differs from the research of Hopskin et al. using experimental animals, while this study used hypertensive patients.

The result also provides information that there is no significant difference in SBP and DBP between the bay leaf and roselle flower groups. The bay leaves and rosella flowers were equally effective at lowering blood pressure, but there was no difference between these herbs. Although statistically there was no difference, in terms of decreasing blood pressure, the rosella flower group decreased more in terms of SBP (12.64>9.64) and DBP (11.41>9.71). Rosella flowers are more effective at reducing SBP and DBP in hypertensive patients.

Drinking boiled water from bay leaves or rosella flowers is highly recommended for hypertension. The mineral content in bay leaves makes blood circulation smoother and reduces high blood pressure. The safety of bay leaves has been tested for their acute toxicity within female Balb/C mice; herpetologically, it does not show any toxic effects on the heart, lungs, intestines, spleen, and kidneys(Lajania et al., 2018). The only known side effects of rosella flowers are heart palpitations, and no severe side effects have been reported. However, Native Rosella (*Hibiscus heterophyllus*), another roselle species, can cause kidney damage if consumed(Kusumastuti, 2014). These complications will not occur if rosella flowers are consumed correctly.

LIMITATION OF THE STUDY

A limitation in this study was that the patient was not monitored for 24 hours, so researchers do not know the patient's compliance in doing what is allowed and not allowed.

CONCLUSIONS AND SUGGESTIONS

The results showed that bay leaf decoction therapy effectively reduces blood pressure in people with hypertension. Likewise, rosella flowers have demonstrated effective results in lowering blood pressure in people with hypertension. Statistically, there was no difference in effectiveness in lowering blood pressure between bay leaves and rosella flowers. Still, in terms of the decrease in the average blood pressure in the roselle flower group, the reduction results were higher than that of the bay leaves. Bay leaves, and rosella flowers are herbal plants that are easy to grow and cultivate. The low prices of bay leaves and roselle flowers are also considered an easy, efficient, and economical choice in non-pharmacotherapy efforts for hypertension sufferers.

ETHICAL CONSIDERATIONS

The researcher explains the purpose, benefits, and process of the research. The researcher also explained what should and should not be done during the research process. Respondents signed informed consent as evidence of agreeing to participate in the study. The researcher also explained that all respondents and their parents had the right to resign if they felt disadvantaged during the research process. All respondents signed informed consent as evidence of willingness to participate in the study. After obtaining ethical clearance from Universitas Respati Yogyakarta's ethical commission, the study was conducted with the number 164.3/FIKES/PL/VII/2020.
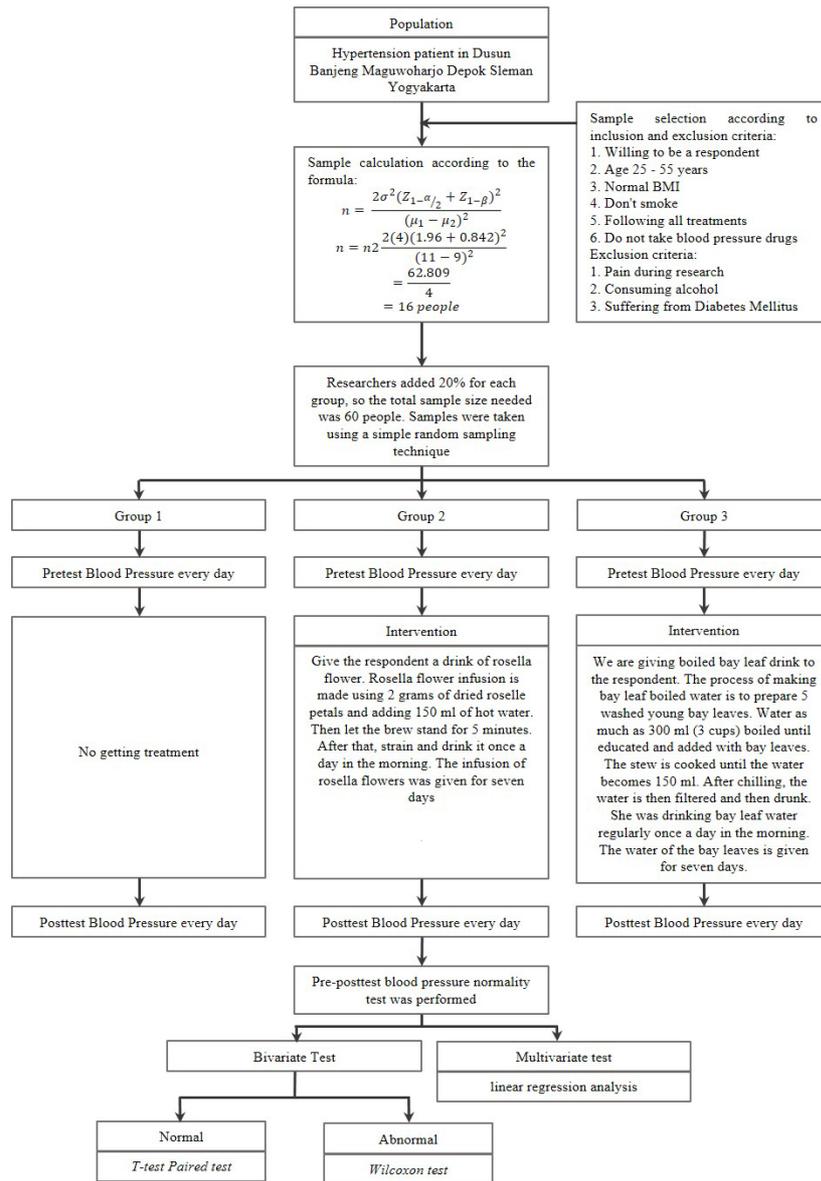
Conflict of Interest Statement

There was no conflict of interest in this study.

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Population

Hypertension patient in Dusun Banjeng Maguwoharjo Depok Sleman Yogyakarta

Sample calculation according to the formula:

$$n = \frac{2\sigma^2(Z_{1-\alpha/2} + Z_{1-\beta})^2}{(\mu_1 - \mu_2)^2}$$

$$n = n2\frac{2(4)(1.96 + 0.842)^2}{(11-9)^2}$$

$$= \frac{62.809}{4}$$

$$= 16 \ people$$

Sample selection according to inclusion and exclusion criteria:
1. Willing to be a respondent
2. Age 25 - 55 years
3. Normal BMI
4. Don't smoke
5. Following all treatments
6. Do not take blood pressure drugs
Exclusion criteria:
1. Pain during research
2. Consuming alcohol
3. Suffering from Diabetes Mellitus

Researchers added 20% for each group, so the total sample size needed was 60 people. Samples were taken using a simple random sampling technique

Group 1

Pretest Blood Pressure every day

No getting treatment

Posttest Blood Pressure every day

Group 2

Pretest Blood Pressure every day

Intervention

Give the respondent a drink of rosella flower. Rosella flower infusion is made using 2 grams of dried roselle petals and adding 150 ml of hot water. Then let the brew stand for 5 minutes. After that, strain and drink it once a day in the morning. The infusion of rosella flowers was given for seven days

Posttest Blood Pressure every day

Group 3

Pretest Blood Pressure every day

Intervention

We are giving boiled bay leaf drink to the respondent. The process of making bay leaf boiled water is to prepare 5 washed young bay leaves. Water as much as 300 ml (3 cups) boiled until educated and added with bay leaves. The stew is cooked until the water becomes 150 ml. After chilling, the water is then filtered and then drunk. She was drinking bay leaf water regularly once a day in the morning. The water of the bay leaves is given for seven days.

Posttest Blood Pressure every day

Pre-posttest blood pressure normality test was performed

Bivariate Test

Multivariate test

linear regression analysis

Normal

T-test Paired test

Abnormal

Wilcoxon test

Note: Pretest–Posttest Blood pressure examined every day
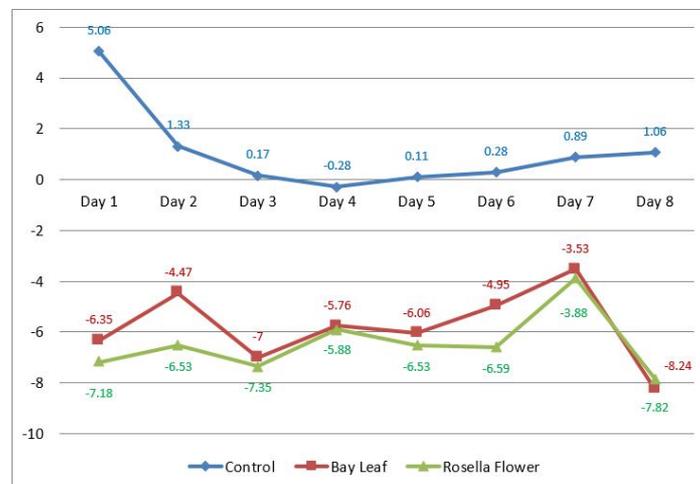**Figure 1. Study framework**

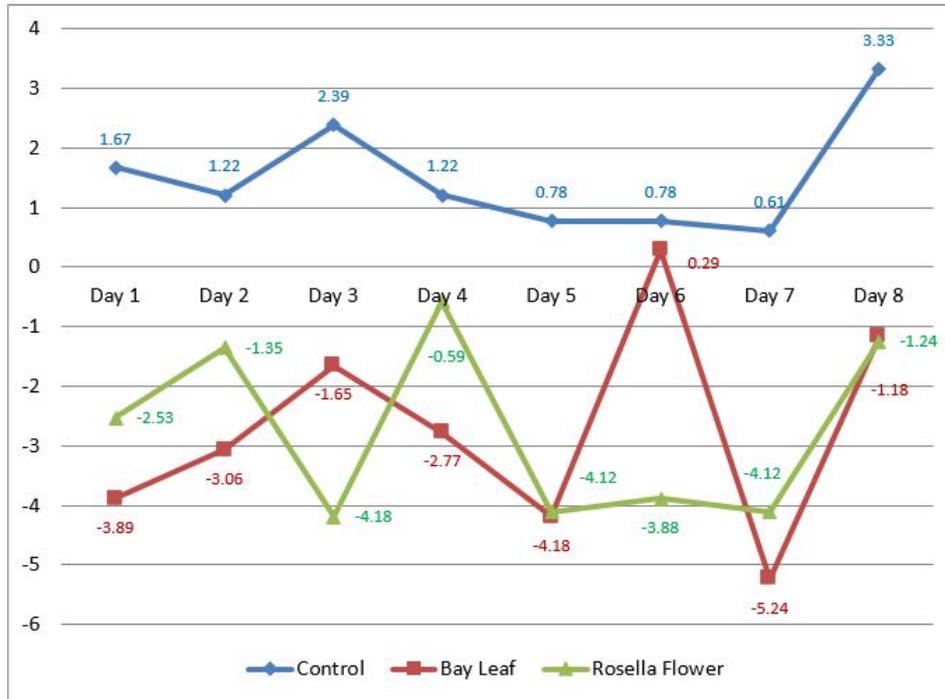**Figure 2. Average Systolic Blood Pressure of Posttest-PretestEvery Day**

Figure 3. Average Diastolic Blood Pressure of Posttest- Pretest Every Day