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### The potential of red GEDI leaf extract (*Abelmoschus manihot* L) as an alternative change in blood pressure in postpartum mothers with hypertension

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#### ABSTRACT

##### Background

Hypertension is the most common non-communicable disease found during pregnancy, childbirth and childbirth. The dangers of hypertension include the emergence of pain in the chest, metabolic syndrome, tend to be easily irritated, disorders of the kidneys, hypertensive retinopathy, stroke resulting in an increased risk of morbidity and mortality. Half to two thirds of women with postpartum hypertension diagnoses are preeclampsia and eclampsia. The administration of antihypertensive chemical drugs such as diuretics, ace-inhibitors, beta blockers and ca blockers, contains many risks, while treatment by providing natural ingredients with minimal negative effects. One of the natural ingredients of medicinal plants for hypertension is red gedi leaf extract (*Abelmoschus manihot* L). Red gedi leaves contain flavonoids from flavanones and flavanols which act as antihypertensive agents.

##### Objective

Proving the administration of red gedi leaf extract (*Abelmoschus manihot* L) as an alternative change in blood pressure in postpartum mothers with hypertension

##### Methods

This research is a quantitative study with a quasi-experimental design with a pre-test and post-test controlled group design. The number of samples is 30 respondents. The respondents of the intervention group were 15 respondents and the control group was 15 respondents. In the intervention group the administration of red gedi leaf extract (*Abelmoschus manihot* L) dose of 480 mg, 1x2 capsules (each capsule 240 mg) and antihypertensive drugs nifedipine dose 10 mg, 3x1 tablets for 7 days in the intervention group. Whereas in the control group administration of antihypertensive drugs nifedipine dose 10 mg, 3x1 tablets and placebo 1x2 capsules for 7 days.

##### Results

The treatment group's systolic blood pressure drops 10 to 21 mmHg, the diastolic pressure drops 6 to 11 mmHg. The decrease in systolic blood pressure in the control group dropped by 1 to 11 mmHg, the diastolic pressure dropped from 0 to 9 mmHg. The bivariate analysis of systolic blood pressure before treatment was  $p = 0.595 (>$

0.05) and after intervention was  $p = 0.000 (<0.05)$ . The results of bivariate analysis of diastolic blood pressure before treatment were  $p = 0.897 (> 0.05)$ , after intervention was given  $p = 0.00 (<0.05)$ .

### Conclusions and Recommendations

Giving red gedi leaf extract (*Abelmoschus manihot* L) for 7 days has the potential to reduce systolic and diastolic blood pressure. Able to do more similar research with respondents and varying doses, can also check hormone levels that play a direct role in changes in blood pressure such as the hormone cortisol, betaendorphin or adosterone. Future studies can control external factors that affect changes in blood pressure.

**Keyword:** Hypertension, Postpartum mother, Red gedi.

## INTRODUCTION

Hypertension is the most common non-communicable disease found during pregnancy, childbirth and postpartum. Hypertension during puerperium is an increase in blood pressure  $\geq 140/90$  mmHg with or not accompanied by proteinuria or edema. Postpartum hypertension has a very large role in maternal and perinatal morbidity and mortality [1].

Data from the World Health Organization (WHO) 2015 shows that around 1.13 billion people in the world suffer from hypertension. That is, 1 in 3 people in the world are diagnosed with hypertension. The number of people with hypertension in the world continues to increase every year, estimated that by 2025 there will be 1.5 billion people affected by hypertension and every year 9.4 million people die from hypertension and complications. In Indonesia, the 2016 National Health Indicator Survey (Sirkesnas) data showed an increase in the prevalence of hypertension in people aged 18 years and over by 32.4%. To control it, the Government implemented a Healthy Indonesia Program with a Family Approach (PIS-PK) and the Healthy Living Society Movement (Germas) [2].

The World Health Organization estimates that around 830 women die every day due to complications of pregnancy and childbirth. Most of these deaths occur in developing countries and should be preventable[3]. In 2015, the Maternal Mortality Rate (MMR) in Indonesia was 305 per 100,000 live births (KH). Despite the decline from previous years, this figure is still very high when compared to the target of the Sustainable Development Goals (SDGs) of the AKI not more than 70 per 100,000 KH in 2030. The cause of maternal death in Indonesia is currently still dominated by bleeding (30 %), hypertension (25%),

infection (6%) and pregnancy comorbidities (39%)[4].

The dangers of hypertension include chest pain, metabolic syndrome, tend to be irritable, kidney problems, hypertensive retinopathy, stroke, resulting in an increased risk of increasing morbidity and mortality although this condition is still not a direct cause of pain and death. During this period, the risk of hypertensive complications such as eclampsia, hemorrhagic stroke, Hemolysis Elevated Liver enzymes Low Platelet (HELLP) Syndrome and even death, is also increasing[1],[5]. Therefore, postpartum hypertension requires adequate treatment[6].

The standard way of handling carried out throughout the world is relatively almost the same. That is, by giving the same medication as the treatment of pre-eclampsia and eclampsia in pregnancy. The types of drugs used include magnesium sulfate given intravenously and benzodiazepines to treat symptoms of seizures. As for lowering blood pressure, injections are usually given labelatol, nicardipine, nifedipine, or hidralazin[3]. The side effects of using hypertension drugs with a total of 34 incidents, which included captopril side effects as many as 9 events (8.9%), furosemide as many as 4 events (3.9%), amlodipine as many as 11 events (11.9%), nifedipine as much 1 event (1%), vasaltran 2 events (2%), irbesartan 2 events (2%), losartan 3 events (2.9%), clonidine 2 events (2%)[7].

Pharmacological treatment methods, namely the administration of antihypertensive chemical drugs such as diuretics, ace-inhibitors, beta blockers and ca blockers, while nonfarmacological treatment is to provide natural ingredients with very minimal negative effects or called complementary therapy. Treatment using natural ingredients that are economical and have minimal negative effects is the best solution to overcome health problems. One

of the natural ingredients of medicinal plants for hypertension is red gedi leaf extract (*Abelmoschus manihot* L) [8].

This plant contains isoquercitrin, hyperoside, hibifolin, quercetin-3'-O-glucoside, quercetin and isorhamnetin which have an antidepressant effect[9]. Another study by Chumbhale (2013), about the phenolic content found in red gedi leaves (*Abelmoschus manihot* L) reported the presence of flavonoids namely flavones, flavonols, isoflavones, anthocyanins and proanthocyanins[10]. Flavonoid compounds in food have antihypertensive effects, because flavonoids can inhibit the conversion enzyme angiotensin I to angiotensin II [11]. Treatment of hypertension using medicinal plants is carried out based on a concept that includes four sides, namely a reduction in blood pressure, repair of organ damage or irregularities that causes blood pressure rise, treatment or prevention of complications and participation, and maintenance of the body environment under normal blood pressure conditions[12].

Red gedi leaves contain flavonoids from flavanones and flavanols which act as antihypertensive agents. The compounds of red gedi leaves include: flavonoids, glycosides, isokucetins, kaemperon glycosides, ramnetine glycosides, canabestine, quersimeritin. The results of the study by Suoth et al. (2013) showed that the total content of flavonoids and polyphenols in gedi merah leaves was very high, namely 722.5 mg/kg and 1003.5 mg/kg [13],[14],[15].

The incidence of hypertension both during pregnancy, childbirth and childbirth has not been well controlled.6 Therefore a new breakthrough is needed to combine non-pharmacological (herbal) therapy in addition to pharmacological (medical) therapy. So the researcher was interested in

conducting a study entitled "The Potential of Red Gedi Leaf Extract (*Abelmoschus manihot* L) as an Alternative Change in Blood Pressure in Postpartum Mothers With Hypertension"

### Study Objectives

Proving the administration of red gedi leaf extract (*Abelmoschus manihot* L) as an alternative change in blood pressure in postpartum mothers with hypertension.

### METHODS

This research is a quantitative study with a quasi-experimental design with a pre-test and post-test controlled group design. The number of samples is 30 respondents. The respondents of the intervention group were 15 respondents and the control group was 15 respondents. In the intervention group the administration of red gedi leaf extract (*Abelmoschus manihot* L) dose of 480 mg, 1x2 capsules (each capsule 240 mg) and antihypertensive drugs nifedipine dose 10 mg, 3x1 tablets for 7 days in the intervention group. Whereas in the control group administration of antihypertensive drugs nifedipine dose 10 mg, 3x1 tablets and placebo 1x2 capsules for 7 days.

### Data Analysis

In univariate analysis, the data displayed are frequency distributions of sample characteristics, average values, standard deviations, maximum and minimum values of blood pressure. To see the effect of red eddy leaf extract on postpartum maternal blood pressure with hypertension bivariate analysis was performed.

## RESULT

### Univariate Analysis

**Table 1 Characteristic frequency distribution Respondents based on age, parity, type of labor, history of labor, history of hypertension, family history in the treatment and control groups**

Variable	Group				*p value	
	Intervention (n=15)		Control (n=15)			
	n	%	n	%		
Age						
a.	<20 years	0	0	0	0	0.157
b.	20-35 years	11	73.3	9	60	
c.	>35 years	4	26.7	6	40	

Paritas						
a.	Primipara	0	0	0	0	0.075
b.	Multipara	13	86.7	11	73.3	
c.	Grandemultipara	2	13.3	4	26.7	
Types of Childbirth						
a.	Normal	12	80	12	80	1.000
b.	SC	3	20	3	20	
Childbirth History						
a.	Complication	10	66.7	8	53.3	0.224
b.	Not Complications	5	33.3	7	46.7	
History of Hypertension						
a.	PER	8	53.3	8	53.3	1.000
b.	PEB	0	0	0	0	
c.	Eklampsia	0	0	0	0	
d.	Normal	7	46.7	7	46.7	
Family history						
a.	There is	11	73.3	9	60	0.157
b.	There is no	4	26.7	6	40	

Table 1 frequency distribution of the characteristics of the group respondents treated maternal age at the average age of 20-35 years, multiparate mean parity, normal type of delivery, average labor history with complications, history of average hypertension PER, mean family history.

From the results of the homogeneity test the value of the pvalue of maternal age, partas, type of labor, history of labor, history of hypertension, family history > 0.05 means that there is no (homogeneous) difference between the treatment and control groups.

## BIVARIATE ANALYSIS

**Table 2 Differences in systolic blood pressure and diastolic blood pressure in the treatment and control groups after intervention**

Variable	Mean±SD		P value*
	Intervention (n=15)	Control (n=15)	
<b>Systolic blood pressure</b>			
Pre	159.27±1.79	158.93±2.21	0.595 <sup>b</sup>
Day 1	158.07±2.15	157.47±2.23	0.460 <sup>a</sup>
Day 2	155.07±2.31	155.47±2.06	0.806 <sup>b</sup>
Day 3	153.87±3.18	155.67±2.55	0.099 <sup>a</sup>
Day 4	150±2.85	153.93±2.28	0.000 <sup>a</sup>
Day 5	148.6±3.04	154.07±2.18	0.000 <sup>a</sup>
Day 6	147.80±3.91	152.8±1.85	0.005 <sup>b</sup>
Day 7	146.53±2.82	153.13±2.53	0.000 <sup>b</sup>
Post	144.47±3.29	153.60±2.19	0.000 <sup>a</sup>
<b>Diastolic blood pressure</b>			
Pre	99.93±1.62	100±1.13	0.897 <sup>a</sup>
Day 1	98.93±1.79	99.67±1.39	0.222 <sup>a</sup>
Day 2	96.80±2.33	98.27±1.90	0.070 <sup>a</sup>
Day 3	94.73±2.43	97.87±1.45	0,000 <sup>a</sup>
Day 4	93.40±2.69	98.13±1.84	0.000 <sup>b</sup>
Day 5	93.07±2.37	98.53±2.58	0.000 <sup>b</sup>
Day 6	91.80±2.11	97.73±1.90	0.000 <sup>b</sup>

Day 7	91.87±1.80	96.73±2.43	0.000 <sup>b</sup>
Post	91.20±1.47	95.47±2.13	0.000 <sup>b</sup>

Table 2 The results of bivariate analysis of the value of pvalue of systolic blood pressure before treatment were  $p = 0.595 (> 0.05)$ , meaning that there was no difference in systolic blood pressure in the treatment and control groups. There were differences in systolic blood pressure in the two groups after being given intervention on day 4 of  $p = 0.000 (<0.005)$ . The bivariate analysis of the p

value of Diastolic blood pressure before being given treatment  $p = 0.897 (> 0.05)$  means that there is no difference in Diastolic blood pressure in the treatment and control groups. There were differences in Diastolic blood pressure in the two groups after being given intervention on day 3 the value of  $p = 0.000 (<0.005)$ .

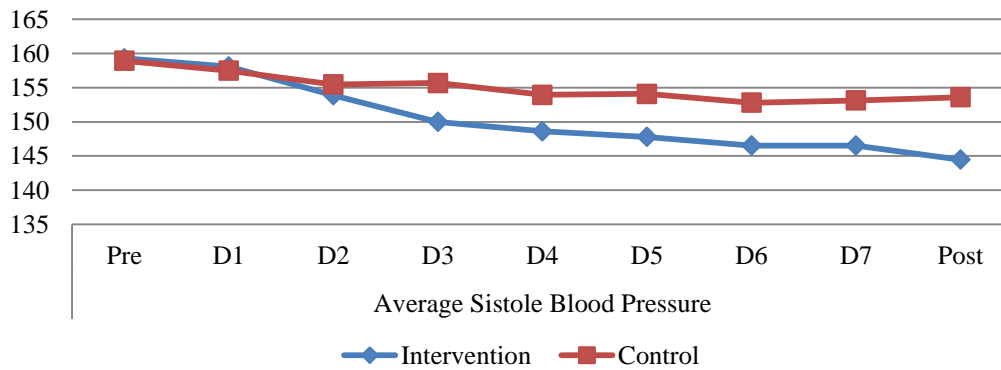


Figure 1 Average systolic blood pressure in the treatment and control groups.

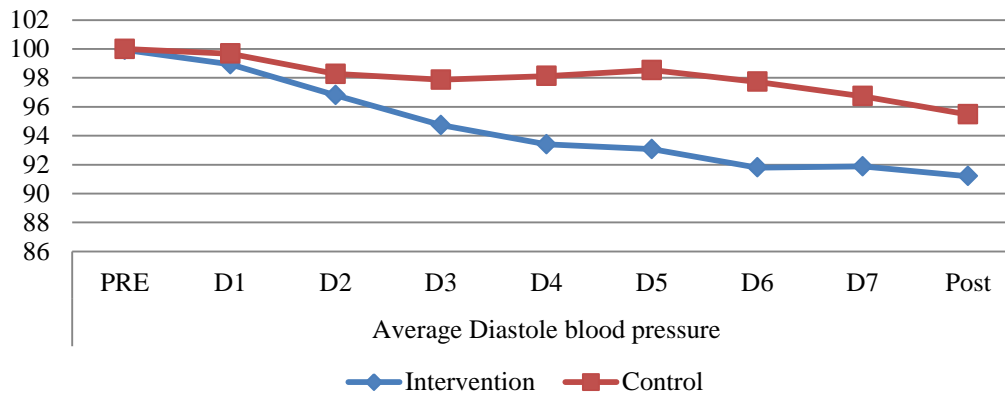


Figure 2 Average diastolic blood pressure in the treatment and control groups.

## DISCUSSION

### Analysis of changes in systolic and diastolic blood pressure in the group given antihypertensive drugs (nifedipine) in postpartum mothers (control group)

The results of the Gipson study of the mechanism of Nifedipine include blockade of type L Ca<sup>2+</sup> channels, influenced by K<sup>+</sup> channels

activated by Ca<sup>2+</sup>, beta adrenergic receptors and sex hormones. Uterine contractions are regulated by increasing Ca<sup>2+</sup> concentration, binding to Calmodulin and activating MLCK which results in serine 10 phosphorylation in the myosin light chain and initiates cross bridge cycling. Nifedipine works by using a calcium voltage dependent blockade channel on myometrial cells which can cause a

decrease in the number of intracellular calcium ions[16],[17].

Nifedipine also lowers calcium to myocytes and releases intracellular calcium. The overall cellular mechanism results in reduced myosin actin interactions and myometrial cell relocation. The administration of nifedipine in postpartum mothers is recommended according to oral doses of 10-20 mg, strongly supported by clinical evidence in adequately overcoming preterm labor. Nifedipine has side effects of general vasodilation including a decrease in mild to moderate blood pressure with an increase in pulse as a compensation mechanism. In some circumstances hypotension can be significant with secondary tachycardia especially in patients who have low preload due to dehydration[17],[18].

Complications caused by hypertension during puerperium include blood vessel damage, cerebral hemorrhage, kidney abnormalities, kidney failure, heart problems, strokes, retinal injuries, eye abnormalities, and liver necrosis. Handling of hypertension aims to prevent the occurrence of complications through pharmacological treatment. Pharmacological treatment is carried out by giving antihypertensive chemical drugs. Based on Eight Joint National Committee (JNC 8) antihypertensive drugs are divided into several groups including: ACE inhibitors, receptor blockers,  $\beta$  blockers, calcium channel blockers and thiazide type diuretics[19].

### **Analysis of changes in systolic and diastolic blood pressure in groups given red gedi leaf extract (*Abelmoschus manihot* L) and antihypertensive drugs (nifedipine) in postpartum mothers (Treatment Group)**

This study is in line with the research conducted by Prado (2014), that the combination of antihypertensive drugs with flavonoid intake significantly reduced systolic / diastolic blood pressure from 5/4 mmHg to 7/5 mmHg. Flavonoids are natural antioxidants needed by the body, where the body needs flavonoids of 23 mg / day[20]. Research conducted by Mercy Taroreh (2015) about extraction of gedi leaves sequentially and its antioxidant activity showed that the content of flavonoids in gedi leaves was 2,33mg / 100gr. The results of the study by Suoth (2013) showed that the total content of red gedi leaf polyphenols was very high, where total phenol was 1003.5 mg / kg, total flavonoids were 722.5 mg / kg and total

tannins were 1029 mg / kg. Red gedi leaf extract contains flavonoids from flavanones and flavanols [13].

Flavonoids are a class of natural compounds with a phenolic structure, usually found in plants. Flavonoids have long been consumed by humans, and have the biological ability to maintain health and help reduce various diseases. Flavanol compounds have the ability to reduce oxidative stress, inhibit angiotensin converting enzymes, increase relaxation of blood vessel endothelium, regulate cells and gene expression [21].

Antioxidants are compounds that slow or inhibit the oxidation of other molecules. Low levels of antioxidants can cause oxidative stress that will damage or kill cells. Oxidative stress is a condition in which antioxidants in the body are unable to neutralize the concentration of free radicals resulting in damage to cell components. Antioxidants can help protect the blood vessels of patients who have hypertension or diabetes who experience damage due to blood sugar levels that are too high[11].

The results of the bivariate analysis conducted in this study before and after the administration of red gedi leaf extract (*Abelmoschus manihot* L) dose of 480 mg showed that the decrease in postpartum systolic and diastolic blood pressure levels with hypertension that occurred in this study was due to a positive role in the administration of extracts red gedi leaves dose of 480 mg to postpartum mothers with hypertension. Red gedi leaf extract (*Abelmoschus manihot* L) had a significant effect on changes in systolic and diastolic blood pressure.

The mechanism that controls the constriction and relaxation of blood vessels is located in the vasomotor center, in the medulla of the brain. From this vasomotor center begins the sympathetic nerve pathway, which continues downward to the spinal cord and out of the column of the spinal cord sympathetic ganglia in the thorax and abdomen. Vasomotor central stimulation is delivered in the form of an impulse that moves downward through the sympathetic nerve to the sympathetic ganglia. At this point the preganglionic neurons release acetylcholine, which will stimulate post-ganglion nerve fibers to the blood vessels, where the release of norepinephrine results in constriction of blood vessels[22].

At the same time where the sympathetic nervous system stimulates blood vessels in

response to emotional stimuli, the adrenal gland is also stimulated resulting in additional vasoconstricting activity. The adrenal medulla excretes cortisol and other steroids which can strengthen blood vessel vasoconstrictor responses. Vasoconstriction which results in decreased blood flow to the kidneys, causes renin release. Renin stimulates the formation of angiotensin I, which is then converted to angiotensin II, a strong vasoconstrictor, which in turn stimulates the secretion of aldosterone by the adrenal cortex. This hormone causes retention of sodium and water by the kidney tubules, causing an increase in intravascular volume. All of these factors tend to trigger a state of hypertension[22].

Based on the description above, it can be concluded that the intervention of red gedi leaf extract (*Abelmoschus manihot* L) and antihypertensive drugs (nifedipine) for seven days

has a higher potential effect compared to pharmacological therapy alone, this is evidenced by the greater decrease in blood pressure in the group intervention compared to the control group.

## CONCLUSIONS

Giving red gedi leaf extract (*Abelmoschus manihot* L) for 7 days has the potential to reduce systolic and diastolic blood pressure.

## Recommendation Future

Able to do more similar research with respondents and varying doses, can also check hormone levels that play a direct role in changes in blood pressure such as the hormone cortisol, betaendorphin or aldosterone. Future studies can control external factors that affect changes in blood pressure.

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