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The Effect of Extract Red Gingger (Zingiber Officinale Var. Rubrum) on Reducing the Blood Pressure Level among Maternal with Gestasional Hypertension

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Abstract. Gestational hypertension is a major cause of maternal and infant morbidity and mortality. Handling of hypertension is done by pharmacological therapy but provides side effects Red ginger can be used as one of the herbal therapies to reduce blood pressure. The main compound in red ginger can reduce cholesterol, reduce fat deposits in blood vessels and the risk of coronary heart disease. The study aimed to analyze the red ginger extract on reducing blood pressure level among maternal with gestational hypertension. A quasi-Experiment with pretest posttest design with equivalent control group design. Thirty-four patients were recruited and divided into experimental and control group Patients in the experimental group received the antihypertensive drugs plus red ginger extract at a dose of 500 mg for 14 days. While control group control group was given antihypertensive drugs with placebo. There was a significant difference in systolic blood pressure between the intervention and control groups with a value of p 0.000 and a diastolic p value of 0.000. In the intervention group there was a systolic decrease of 29.35 mmHg and a diastolic 16.00 mmHg. Red ginger extract has the potential to reduce systolic and diastolic blood pressure in women with gestational hypertension. Pregnant women with gestational hypertension can take advantage of red ginger extract as an alternative treatment for gestational hypertension. The next researcher can control psychological factors and check the levels of nitric oxide (NO) in blood / saliva

Keyword: Red Ginger Extract, Blood Pressure, Gestational Hypertension

INTRODUCTION

Gestational hypertension is 5-15% complicating pregnancy and is one of the three highest causes of maternal and perinatal mortality and morbidity (1). Hypertension in pregnancy is defined as systolic blood pressure ≥ 140 mmHg and diastolic blood pressure ≥90 mmHg (1), without proteinuria at pregnancy ≥20 weeks (2).

According to the World Health Organization (WHO) in 2015 around 14% of 289,000 maternal deaths were caused by gestational hypertension (3). A tenth of maternal deaths in Asia and Africa are also caused by gestational hypertension (4). Nearly 99% of deaths occur in developing and developed countries, where the ratio of maternal mortality in 2015 in developing countries is 239 out of 100,000 live births and 12 out of 100,000 live births in developed countries. This is far from the target of the Sustainable Development Goals (SDGs) of decreasing maternal mortality rates to 70 per 100.000 live births by 2030 (5,6).

Based on the results of the Indonesian health demographic survey the number of maternal deaths (MMR) decreased but it is not significant, seen from 2012 to 2015, where the number of cases decreased from 359 per 100,000 to 305 per 100,000. One of the provinces in Indonesia that made the biggest contribution to AKI was the province of Central Java (7).

The number of maternal deaths in Semarang City has increased every year. Gestational hypertension ranks second as the cause of AKI in Central Java Province. Based on reports from all Puskesmas in Semarang City the number of maternal deaths in 2013 was 107.95 per 100,000 live births, and increased in 2014 amounted to 122.25 per 100,000 live births. In 2015, there was an increase of 128.05 per 100,000 live birth (8).

According to the Riset Kesehatan Dasar (Riskesdas) in 2013 the prevalence of hypertension in pregnancy was 25.8% (9). Based on the results of the Indonesian health demographic survey the number of maternal mortality (MMR) decreased but was not significant, seen from 2012 to 2015, while the number of cases increased from 359 per 100,000 to 305 per 100,000. One of the provinces in Indonesia that donated AKI the most is the province of Central Java (7). The incidence of AKI in Central Java Province tends not to be sedentary. This can be seen from the number of MMR in 2013 as many as 118.62 out of 100,000 live births which increased in 2014 by 126.55 out of 100,000 live births (8).

Hypertension ranks second as the cause of AKI in Central Java. Maternal mortality in 2016 in Central Java Province caused by pregnancy hypertension was 26.34% (9). In 2017 hypertension cases increased to 32.97% (8). Districts / Cities in Central Java which have the highest maternal mortality cases are Brebes, which are 52 cases, then Semarang 35 cases, and Tegal 33 cases. Data obtained from the health profile of Brebes district in 2017, the number of maternal deaths decreased from 54 cases from 33,086 live births in 2016 to 31 cases from 32.594 live births. The causes of death were preeclampsia in 23 cases (74%), bleeding 4 cases (13%) and 4 other causes (13%) (8).

Complications that occur due to gestational hypertension are damage to the liver, kidneys, brain, blood clotting system, this syndrome can develop into preeclampsia or even eclampsia and can cause sudden death (sudden death) (6,10). The impact of complications in infants includes growth disorders in the uterus where in severe hypertension, utero placental perfusion decreases resulting in an increased incidence of Intra Uterine Growth Retardation (IUGR), infant death in the womb (IUFD) and prematurity (6). Mothers with gestational hypertension have a 3.225 times greater chance of giving birth to a baby (11). In the National Medical Service guidelines which summarize various studies, it is also concluded that mothers

with preeclampsia are at risk of suffering from ischemic heart disease 2 times, increased risk of hypertension 4 times, risk of cardiovascular disease, stroke and DVT (Deep Vein Thrombosis) in the future, risk of death higher including those caused by cerebrovascular disease (12).

Gestational hypertension that is not treated properly can develop into preeclampsia, where there is an increase in blood pressure of more than 140/90 mmHg at more than 20 weeks of gestation without urine protein (4). Preeclampsia is a pregnancy-specific syndrome which results from organ perfusion caused by vasospasm and endothelial activity, which is characterized by increased blood pressure and urine protein (13).

One of many herbal therapy that can reduce blood pressure is red ginger. Red Ginger (Zingiber Officinale Var. Rubrum) is a rhizome plant that is very popular as a spice and medicine. Red ginger is useful to reduce blood pressure in patients with hypertension. Some compounds in ginger oleoresin, including gingerol, shogaol, and zingeron, provide pharmacological and physiological activities such as anti-inflammatory, analgesic, and anticarcinogenic effects (14). Gingerol dalam jahe memiliki manfaat dalam sistem kardiovaskular yaitu sebagai antikoagulan dengan mencegah pembentukan prostaglandin-E2 dan thromboxane sehingga dapat mencegah penyumbatan pembuluh darah (15). Based on the results of research related to the effects of ginger extract (Zingiber Officinale) on blood pressure and heart rate in 60 adult hypertensive respondents obtained results where there was a decrease in blood pressure 2 hours after ginger extract and continued to decline after 4 hours of administration (16). Besides red ginger has other benefits such as reducing nausea and vomiting in pregnant women, as well as inhibiting the enzyme cyclooxygenase which inhibits the formation of postaglandins in reducing pain (17,18). The main compounds in red ginger have been shown to reduce cholesterol, reduce fat deposits in blood vessels and reduce the risk of coronary heart disease (16). Based on this, researchers are interested in conducting related research "Potential Of Extract Red Ginger (Zingiber Officinale Var. Rubrum) as An Alternative Reduction Of Blood Pressure Of Maternal With Gestational Hypertension

OBJECTIVE

This study aims to analyze the red ginger extract on reducing blood pressure level among maternal with gestational hypertension.

METHOD

A quasi-experiment, pretest and posttest design with equivalent control group design was applied to examine the effect of red ginger extract on reducing blood pressure level among maternal with gestational hypertension.

This research was conducted in the entire work area of the Brebes district health office from May to June 2019. The samples in this study were pregnant women with hypertension at gestational age ≥ 20 weeks - 38 weeks. Total sample in this study was 34 people and divided into two experimental groups and controls with each of the 17 respondents in each group. The inclusion criteria in this study were pregnant women with systolic blood pressure ≥ 140 mmHg and diastolic blood pressure ≥ 90 mmHg. Pregnant women aged ≥ 20 to 35 years. Pregnant women who are not under psychological pressure, pregnant women without proteinuria, pregnant women without a history of chronic hypertension, pregnant women with normal BMI and willing to become respondents. This study was divided into two groups. The intervention group was given antihypertensive drugs and red ginger extract (Zingiber officinale Var. Rubrum) at a dose of 500 mg for 14 days and the control group who were given antihypertensive drugs and placebo for 14 days.

The research instruments used in this study included: 1) Characteristic questionnaire which contains: name, age, gestational age, parity, history of pregnancy with gestational hypertension, family history of hypertension; 2) Digital spignomanometers are used to measure systolic and siastolic blood pressure; 3) The observation sheet was used to monitor the consumption of antihypertensive drugs and red ginger extract (*Zingiber officinale Var. Rubrum).*

This research was conducted after obtaining Ethical Evidence from the Health Research Ethics Commission RSUD Dr. Moewardi with numbers: 566/V/HREC/2019.

Data analysis using the SPSS software program. Univariate analysis is done by calculating the frequency of the results of research data based on variables that produce distributions and percentages descriptively (19). Then the analysis of characteristic homogeneity was carried out before the intervention to assess whether there were differences in the variance of each group. In confounding variables, the homogeneity test uses the chi square test because it uses a category scale. Bivariate analysis is used to analyze 2 variables, namely 1 independent variable and 1 dependent variable. The results of the Shapiro-Wilk analysis of the data distribution of the variables of systolic and diastolic blood pressure in the intervention group and the control group showed $p < 0.05$, which means that the data were not normally distributed so that they were non-parametric. The analysis was carried out using the Wilcoxon Test for paired groups. For the unpaired group the systolic difference between the two groups is because the data are normally distributed using independent t-test, while the diastolic difference variable uses the Mann Whitney test because the data are not normally distributed

RESULTS

Characteristic of respondents

Table 1 showed the results of the characteristic of respondents based on recent education are divided into 3 groups, namely high (college), middle (senior high school), low (elementary/junior high). The last education of respondents in the intervention group was 1 respondent (5.9%) who have higher education (college), 4 respondents (23.5%) who have secondary education (senior high school), 12 respondents (70.6%) who have low education (elementary / junior high school). Where as in the control group there were no respondents who had higher education (college), 5 respondents (29.4%) who had secondary education (senior high school), 12 respondents (70.6%) who had low education (elementary / junior high school). The proportion of education levels of respondents in both groups had a homogeneous / equivalent variant, there was no significant difference in the education level of the respondents between the intervention and control groups with a p-value of 0.574.

Data on the characteristics of respondents based on a history of gestational hypertension in the intervention group mostly had a history of gestational hypertension, which was 13 (76.5%), and did not have a history of gestational hypertension 4 (23.5%). Where as in the control group most of the respondents had a history of gestational hypertension which was equal to 9 (52.9%), and did not have a history of gestational hypertension as wide as 8 (47.1%). The history of gestational hypertension in both groups had a homogeneous / equivalent variant, there was no significant difference in the history of gestational hypertension in the respondents between the intervention and control groups with a p value of 0.151.

Data on the characteristics of respondents based on family history with hypertension in the intervention group were mostly not having a family history of hypertension, which was equal to 11 (64.7%), and had a history of gestational hypertension 6 (35.3%). Where as in the control group most of the respondents did not have a family history of hypertension, which was equal to 11 (64.7%), and had a history of gestational hypertension 6 (35.3%). Family history of hypertension in both groups had a homogeneous / equivalent variant, there was no significant

difference in the history of gestational hypertension of respondents between the intervention and control groups with p-value 1.00

Table 1. Characteristic of respondents

Characteristics	Group				p value[a]
	Intervention		Control		
	N	%	n	%	
Age					0.930*
Mean±SD	29.82±3.50		30.11±3.29		
Minimal-Maximum	21-35		24-34		
Gestational age					0.673*
Mean±SD	28.88±3,03		28.47±3.14		
Minimal-Maximum	22-34		22-33		
Parity					0.671*
Primigravida	3	17.6%	4	2.5%	
Multigravida	14	82.4%	13	76.5%	
Education					0.574*
High school	1	5.9%	0	0.0%	
Secondary school	4	23.5%	5	29.4%	
Primary school	12	70.6%	12	70.6%	
History of gestational hypertension					0.151*
Yes	13	76.5%	9	52.9%	
No	4	23.5%	8	47.1%	
Family history with hypertension					1.000*
Yes	6	35.3%	6	35.3%	
No	11	64.7%	11	64.7%	

[a] *Independent t-test*
[b] *Chi square*
** Significance level >0.05*

The difference of systolic blood pressure before and after treatment among the intervention group and control group

Table 2 illustrates the statistical results of the Wilcoxon test showed there were differences in the average differences in the decrease in systolic pre-test and post-test in the intervention group and the control group with p-value 0.000 <0.05.

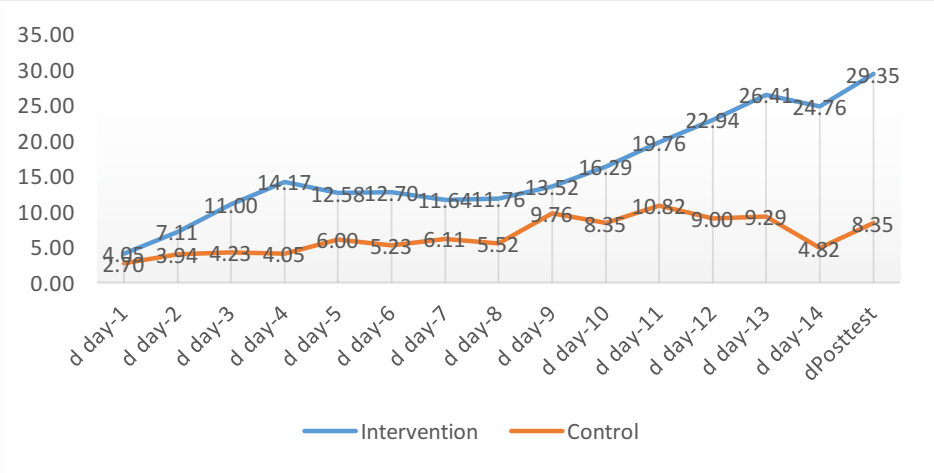
In the intervention group the average systolic blood pressure before treatment (pretest) was 145.82 mmHg, and after treatment (posttest) it dropped to 116.47 mmHg. Then in the control group the average systolic blood pressure before treatment (pretest) was 145.41 mmHg, and after treatment (posttest) it also decreased to 137.05 mmHg.

Table 2. The difference of systolic blood pressure before and after treatment among the intervention group and control group

Blood Pressure	Group		*p value*
	Intervention	Control	
Sistolic Pre test			
Mean ± SD	145.82 ± 3.67	145.41 ± 2.29	0.176
Min – Max	140-152	140-149	
Sistolic Post test			
Mean ± SD	116.47 ± 3.33	137.05 ± 2.16	0.000*
Min – Max	112-120	133-140	
The difference in average systolic blood pressure before and after treatment ***p value***[a]	0.000*	0.000*	
Average difference (Δ)			
Mean ± SD	29.35 ± 5.32	8.35 ± 3.79	0.000*
Min – Max	20-49	2-14	

Figure 1 illustrated the results of the independent t-test showed that there were differences in the average difference in systolic decline between the intervention group and the control group with p-value 0.000 <0.05. The average difference in the decrease in systole in the intervention group was 29.35 mmHg, greater than the control group, which was 8.35 mmHg.

The description of the difference in decreases in systolic blood pressure over time between the intervention group and the control group, can be seen in the picture as follows:



The difference of diastolic blood pressure before and after treatment among the intervention group and control group

Based on Table 4.5 illustrates the statistical results of the Wilcoxon test showed there were differences in the average decrease in diastolic blood pressure pre and post test in the intervention group with p-value 0.000 <0.05 and the control group with p-value 0.001 <0.05. In the intervention group the average diastolic blood pressure before treatment (pretest) was 95.64 mmHg and after treatment (posttest) decreased to 79.64. Then in the control group the average diastolic blood pressure before treatment (pretest) was 97.41 mmHg, and after treatment (posttest) also decreased to 90.70 mmHg

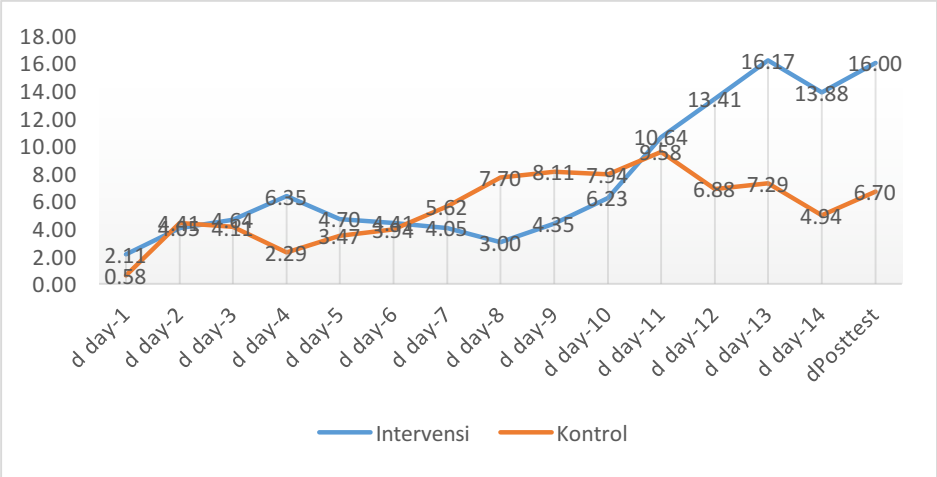
Table 3. The difference of diastolic blood pressure before and after treatment among the intervention group and control group

Blood Pressure	**Group**		***p value*[b]**
	Intervention	**Control**	
Diastolic pre test			
Mean ± SD	95.64 ± 3.63	97.41 ± 2.29	0.137
Min - Max	89-101	90-100	
Diastolic post test			
Mean ± SD	79.64 ± 0.93	90.70 ± 3,01	0.000*
Min - Max	78-81	85-97	
The difference in average diastolic blood pressure before and after treatment			
***p value*[a]**	0.000*	0.001*	
Average Difference (Δ)	16.00 ± 3.57	6.70 ± 4.36	0.000*
Mean ± SD	2.0-14.0	7.0-13.0	
Min - Max			

[a] *Wilcoxon*
[b] *Mann Whitney u*
[*] *Significance Level <0.005*

Based on table 3 the statistical results from the Mann Whitney test showed that there were differences in the average diastolic differences between the intervention group and the control group with p-value 0.000 <0.05. The average difference in diastolic decline in the intervention group was 16.00 mmHg greater than the control group, which was 6.70 mmHg.

The description of the difference in the decrease in diastolic blood pressure over time between the intervention group and the control group, can be seen in the picture as follows:



DISCUSSION

The results of this study indicate that antihypertensive drug therapy and red ginger extract have the potential to be higher in reducing systolic and diastolic blood pressure compared to antihypertensive drug therapy and placebo.

This happens because ginger has the benefit of lowering blood pressure through blockades that depend on calcium channels. Ginger can also block calcium which causes contraction of smooth muscle tissue in the organs and walls of the arteries. This reduces contractions which result in relaxation of the muscles and walls of the arteries so that the blood flow becomes smooth and there is a decrease in blood pressure (20). Red ginger also contains flovanoid compounds, non-flovanoid saponins and phenols. Flovanoid has the effect of inhibiting angiotensin converting enzyme (ACE) activity so that the formation of angiotensin II results in vasodilation, decreased cardiac output and blood pressure (21). In addition, saponins play a role in inhibiting the renin angiotensin aldosterone system (RAA) thereby reducing the formation of angiotensin II, which then results in a decrease in blood pressure (22).

Ginger is an herbal medicine and is very effective in the treatment of high blood pressure. Ginger helps reduce high blood pressure through the blockade of calcium channels that depend on voltage. Ginger blocks calcium channels which usually cause subtle contractions of muscle tissue found in the organs and walls of the arteries. Reducing contraction of smooth muscle results in a more relaxed arterial wall that allows blood to flow more freely and at lower pressure (20).

Ginger acts in two ways to lower blood pressure. Blood clots can limit blood flow in the circulatory system, which can cause hypertension. By preventing blood clots, ginger helps prevent heart attacks and blows. Basically anti-platelet aggregation or reduced blood clotting is the same action as seen in pharmaceutical blood thinners such as warfarin, but on a smaller scale. Ginger blocks calcium channels which normally trigger contractions of smooth muscle tissue found in the organs and walls of the arteries (20).

Smooth muscle contractions produce more relaxed arterial walls that allow blood to flow more freely and reduce pressure. So in this study, four grams of ginger were consumed to reduce blood pressure. Analysis based on the results of the sphygmomanometer showed a significant decrease in blood pressure after the intake of four grams of fresh ginger (21).

The content of gingerol in ginger extract is a powerful free radical molecule and can act as an antioxidant that is useful in neutralizing the damaging effects of free radicals in the body.

Gingerol in ginger is also an anticoagulant that prevents blood clots. Gingerol can widen blood vessels so that blood circulation becomes smooth and blood pressure decreases (23). In line with the opinion of Koswara, 2011 one of the benefits of ginger is lowering blood pressure. This is because ginger stimulates the release of adrenal hormones and widens blood vessels, causing blood to flow faster and smoother, and reduce the work of the heart pumping blood. Another technique also showed relaxation progressive has positive impact on reducing the blood pressure level (24).

Evidently in this study, there was a significant reduction in systolic and diastolic blood pressure after consumption of red ginger extract, because red ginger has the properties of stimulating adrenal hormones and widening of blood vessels, consequently blood flows faster and more smoothly so the heart works to pump blood down and causing blood pressure to decrease.

The limitation in this study is that researchers cannot fully control external variables that can influence the results of research, such as anxiety, socio-culture, and food factors. The evaluation in this study is still limited to only 2 times, namely before and after the intervention

CONCLUSION

Based on data analysis and discussion, the conclusion of this study was that the decrease in systolic and diastolic blood pressure in the group given antihypertensive drugs and red ginger extract was higher than the group given antihypertensive drugs and placebo, so it was proven that red ginger extract had the potential to reduce blood pressure systolic and diastolic in women with gestational hypertension".

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RECOMMENDATION

Red ginger extract can be used by pregnant women as an alternative treatment for pregnancy hypertension. Future studies are expected to be able to evaluate blood pressure every day, and control for socio-cultural factors, and maternal food factors. Future researchers can develop research related to red ginger extract by adding other variables, namely anxiety, and levels of nitric oxide (NO) in blood or salivav

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