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Effectiveness of Chayote Extract on Lowering Blood Pressure of Post Partum Hypertension

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ABSTRACT

Post partum hypertension contributes to maternal mortality. Postpartum hypertension management can be in the form of pharmacological therapy, but it causes side effects for mother and baby. Several studies have shown that chayote can play a role in lowering blood pressure.

This research aimed to prove the effect of chayote extract on reducing blood pressure in postpartum with hypertension.

Quasy experiment pretest and posttest control group design. The number of samples was 19 interventions and 19 controls. The intervention group received 400 mg of chayote extract and 10 mg of nifedipine, while the control group received only 10 mg of nifedipine. The intervention was carried out for 7 days.

The treatment group experienced significant changes in systolic blood pressure and diastolic blood pressure with p value = 0.000 compared to the control group.

The chayote extract has a significant effect on reducing blood pressure in postpartum with hypertension.

Keywords : Chayote Extract, Postpartum Hypertension, Blood Pressure

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BACKGROUND

Hypertension is a complication that occurs during pregnancy, childbirth and the puerperium, which is around 5-10%. More than some cases of gestational hypertension are accompanied by signs and symptoms of preeclampsia which is one of the causes of maternal morbidity and mortality besides bleeding and infection.(Sari, Rahayujati, & Hakimi, 2018)

According to data from the World Health Organization (WHO) MMR in 2015 there were 216 per 100,000 live births caused by bleeding, hypertension, infection and previous maternal health history..(World Health, 2017) In Indonesia the MMR in 2018 is 305 per 100,000 live births.(Indonesia, 2018) In 2018 the MMR in Riau Islands Province was 120 per 100,000 KH, it can be seen that there was a decrease in cases of death compared to 2017, which was around 127 per 100,000 KH. Districts / cities with the highest maternal mortality cases are Batam 25 cases, Karimun 12 cases, Tanjungpinang 8 cases and Lingga 4 cases.

Postpartum hypertension is an increase in blood pressure> 140/90 mmHg with or without proteinurin or edema in postpartum.(Kang et al., 2017) Postpartum mothers who have hypertension can become normotensive quickly after delivery, then hypertension can develop within 48 hours postpartum. Half to two thirds of women who experience hypertension in postpartum are diagnosed with preeclampsia and eclampsia.(N Jafar, Hippalgaonkar, & Parikh, 2018) The exact cause of hypertension in postpartum mothers is not theoretically known, hypertension in postpartum mothers is still the subject of many studies to understand its etiology and improve management detection.(Kang et al., 2017)

Hypertension complications in postpartum mothers include cerebral hemorrhage, stroke, retinal injury, eye disorders, heart problems, pulmonary edema, and liver necrosis. Other researchers also mentioned that complications of hypertension in postpartum mothers include kidney disorders, kidney failure, and damage to blood vessels. In order to reduce the incidence of morbidity and mortality in postpartum mothers with hypertension, it is necessary to administer therapy according to government programs and complementary developments. Management of hypertension in postpartum mothers aims to prevent complications through pharmacological and non-pharmacological treatments.(Sibai, 2012)

Treatment of hypertension is carried out in two ways, namely pharmacology and non-pharmacology. Pharmacology is done by providing chemical antihypertensive drugs including ACE inhibitors, Ca blockers, beta blockers, and diuretics.(American College of Obstetricians & Task Force on Hypertension in Pregnancy, 2013) Based on data, only 34% of hypertensive patients use pharmacological antihypertensive drugs, this is due to unwanted side effects. Nifedipine taken in the right dose can lower blood pressure, but has side effects such as bloating, constipation, nausea, cough and headache.(M Burnier, 2017) In addition, nifedipine has a high concentration in breast milk. Nifedipine at a dose of 90 mg per day can be transferred to breast milk at 10 mg / ml, although nifedipine has data that supports its safety for use in pregnancy and lactation.(M Burnier, 2017)

Non-pharmacological therapy is safer, easier, and has fewer side effects. Several studies have used chayote to lower blood pressure. Chayote contains nutrients such as potassium, calcium, magnesium, phosphorus, zinc, Fe, alkaloids, saponins, flavonoids, thiamin, riboflavin, fiber and protein. The content of potassium (K) in chayote serves as vasodilation in blood vessels.(Nadila, 2014) Vasodilation in blood vessels can reduce peripheral resistance and increase cardiac output so that blood pressure can be normal. Potassium can affect the central nervous system which affects blood pressure so that blood

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pressure can be controlled. In addition, chayote is a diuretic which can reduce levels of sodium in the blood through urine excretion.(Sudibyo, 2014) This study aims to determine the effect of giving chayote extract on blood pressure reduction in post partum mothers with hypertension.

METHODS

This study used a quasi-experimental research design with consecutive sampling. For this study, two groups were used, namely postpartum mothers with hypertension who were given chayote extract and a control group, namely postpartum mothers with hypertension who were given only nifedipine.

The population in this study were all hypertensive postpartum mothers who were treated by RSUD Raja Ahmad Tabib and RSUD Kota Tanjungpinang. The samples were determined using inclusion and exclusion criteria. The inclusion criteria used were post partum mothers aged 20 years to 35 years, systolic blood pressure> 140 mmHg or diastolic> 90 mmHg, postpartum mothers with full awareness and willingness to become respondents. The exclusion criteria were mothers suffering from gastritis, diabetes mellitus, heart disease, hyperlipidemia as seen from medical records. There were 38 respondents who fit the criteria and were divided into 2 groups (intervention and control). The intervention group was given 400 mg of chayote extract once a day for 7 days and postpartum care according to the standards, while the control group was given postpartum care only.

This research has been registered in the ethical cleareance of the health research ethical commission of Raja Ahmad Tabib Hospital, Riau Islands Province no.010 / Panke.KKE / 2020. The research was conducted on 18 June 2019 - 28 March 2020 in 2 hospitals, namely Raja Ahmad Tabib Regional Hospital and Tanjungpinang City Hospital.

RESULT

The characteristics of the respondents to the research results can be seen in the following table.

Table 1 Distribution of Respondent Characteristics

Characteristic	Intervention group (n=19)		Control Group (n=19)		*p
	N	%	N	%	
Age (mean ±SD)	30,42		29,26		0,947
Education					
Primary school	5	26,3	3	15,8	0,194
Junior high school	2	10,5	1	5,3	
Senior high school	7	36,8	9	47,4	
College	5	26,3	6	31,6	
Profession					
housewife	12	63,2	12	63,2	0,578
goverment employees	2	10,5	3	10,5	
provate	5	26,3	4	26,3	
Parity					
Primipara	8	42,1	7	36,8	0,532
Multipara	11	57,9	12	63,2	
Type of delivery					
Normal	2	10,5	4	21,1	0,079

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SC	17	89,5	15	78,9	
Hystory of pregnancy hypertension					
Yes	8	42,1	5	26,3	
No	11	57,9	14	73,7	0,065
Family hystory of hypertension					
Yes	12	63,2	10	52,6	0,284
No	7	36,8	9	47,4	
Stres level					
Normal	9	47,4	11	57,9	0,751
Light	5	26,3	4	21,1	
Moderate	4	21,1	2	10,5	
High	1	5,3	2	10,5	
Sodium intake					
Normal	17	89,5	16	84,2	0,350
More	2	10,5	3	15,8	
Potassium intake					
Normal	13	68,4	10	52,6	0,112
More	6	31,6	9	47,4	

*Homogeneity levene statistictest

b. Systolic Blood Pressure (SBP) Analysis

The mean systolic blood pressure in the intervention group decreased every week. Systolic blood pressure decreased by 35.69 mmHg, while in the control group it decreased by 22.58 mmHg. In the cytolic blood pressure analysis of the intervention and control groups, the results of statistical tests showed a value of p = 0.000, meaning that there were different measurements. The results of the post hoc wolcoxon test showed p value <0.05 on all measurements so that it was concluded that there was a difference in systolic blood pressure before the intervention with the first day to the seventh day.

Figure 1 Graph of changes in mean SBP in the intervention and control groups

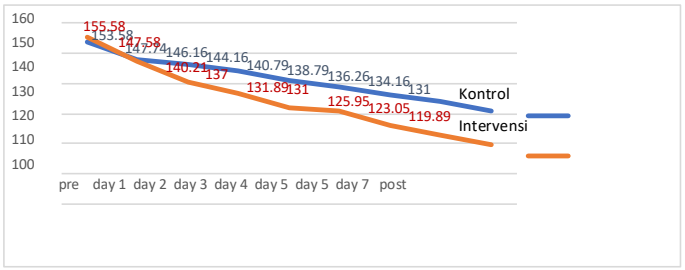

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Table 2 Differences in SBP before and after intervention in the intervention and control group

Systolic	Intervention group					Control group				
	Mean	Mean Δ	Mean difference with pre	*p**	*p***	Mean	Mean Δ	Mean difference with pre	*p**	*p***
Day-1	147,58	-8,00	-8,00	0,000	0,000	147,58	-5,85	-5,84	0,000	0,001
Day - 2	140,21	-7,37	-15,37		0,000	146,16	-1,58	-7,42		0,000
Day - 3	137,00	-3,21	-18,58		0,000	144,16	-2,00	-9,42		0,000
Day - 4	131,89	-5,11	-23,69		0,000	140,79	-3,37	-12,79		0,000
Day - 5	131,00	-0,89	-24,58		0,000	138,79	-2,00	-14,79		0,000
Day - 6	125,95	-5,05	-29,63		0,000	136,26	-2,53	-17,32		0,000
Day - 7	123,05	-2,90	-32,53		0,000	134,16	-2,10	-19,42		0,000
Post	119,89	-3,16	-35,69		0,000	131,00	-3,16	-22,58		0,000

*friedman test
**post hoc Wilcoxon test

Analysis of the difference in systolic blood pressure values between the intervention group and the control group showed a p-value <0.05 began to appear on the 2nd day of measurement, meaning that on the 2nd day there was a significant difference in the decrease in systolic blood pressure between the intervention group and the group. control. Clinically, the results show that the decrease in systolic blood pressure in the intervention group is effective in the post intervention measure, whereas in the control group it has not shown any clinical significance.

Table 3 Differences in SBP between the intervention group and the control group

Variable	Intervention (Mean±SD)	Control (Mean±SD)	*p**
Pretest	155,58±3,220	153,58±4,337	0,200
Day-1	147,58±5,975	147,74±8,082	0,607
Day-2	140,21±7,443	146,16±6,610	0,015
Day-3	137,00±9,428	144,16±5,728	0,011
Day-4	131,89±7,578	140,79±6,917	0,000
Day-5	131,00±5,725	138,79±5,503	0,000
Day-6	125,95±7,367	136,26±5,704	0,000**
Day-7	123,05±6,014	134,16±4,845	0,000
Posttest	119,89±4,569	131,00±5,011	0,000

*mann whitney test, **Independent t-test

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c. Diastolic Blood Pressure (DBP) Analysis

In the intervention group the mean diastolic blood pressure results from the pretest to posttest measurements decreased by 21.64 mmHg, while in the control group the mean diastolic blood pressure results from the pretest to posttest measurements decreased by 13.00 mmHg. Diastolic blood pressure in the intervention group decreased more than in the control group.

Analysis of the difference in diastolic blood pressure values before and after the intervention in the two groups showed that each group had a p-value of 0.000 <0.05, which means that there were different measurements. Wilcoxon post hoc test results obtained p value <0.05, meaning that on all measurements, it means that there is a difference in diastolic blood pressure from before the intervention to after the intervention.

Figure 2 Changes in mean DBP in the intervention and control groups

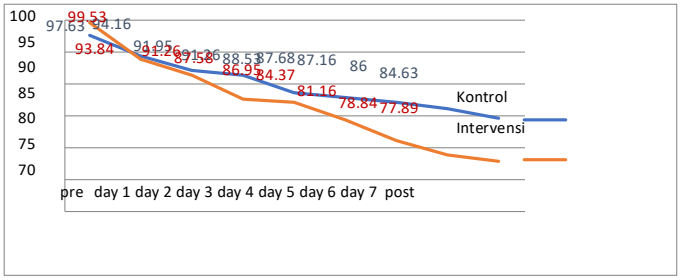

Table 4 Differences in DBP before and after intervention in the control group

Diastolic	Intervention group					Control group				
	Mean	Mean Δ	Mean Difference with Pre	*P**	*P*	Mean	Mean Δ	Mean Difference with Pre	*p**	*p***
Day-1	93,84	-5,69	-5,69	0,000	0,000	94,16	-3,47	-3,47	0,000	0,001
Day-2	91,26	-2,58	-8,27		0,000	91,95	-2,21	-5,68		0,000
Day-3	87,58	-3,68	-11,95		0,000	91,26	-0,69	-6,37		0,000
Day-4	86,95	-0.63	-12,58		0,000	88,53	-2,74	-9,10		0,000
Day-5	84,37	-2,58	-15,16		0,000	87,68	-0,84	-9,95		0,000
Day-6	81,16	-3,21	-18,37		0,000	87,16	-0,52	-10,47		0,000
Day-7	78,84	-2,32	-20,69		0,000	86,00	-1,16	-11,63		0,000
Post	77,89	-0,95	-21,64		0,000	84,63	-1,37	-13,00		0,000

*friedman test
**post hoc Wilcoxon test

Table 4 shows that the results of the analysis of the difference in diastolic blood pressure between the intervention and control groups. The results showed that there was a significant difference in diastolic blood pressure reduction on the fifth day (p <0.05). The mean value of diastolic blood pressure in the intervention group was close to clinical effectiveness on the seventh day, whereas in the control group it was not yet close to the clinical value.

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Table 5 Differences in DBP between the intervention group and the control group

diastolic	Intervention (Mean±SD)	Control (Mean±SD)	*p**
Pretest	99,53±2,318	97,63±2,967	0,025
Day-1	93,84±4,004	94,16±3,404	0,623
Day-2	91,26±3,263	91,95±4,390	0,154
Day-3	87,58±6,955	91,26±5,130	0,071**
Day-4	86,95±3,504	88,53±3,949	0,115
Day-5	84,37±5,428	87,68±4,056	0,045
Day-6	81,16±3,848	87,16±4,298	0,000
Day-7	78,84±4,180	86,00±4,853	0,000
Posttest	77,89±4,081	84,63±3,562	0,000

*Mann Whitney
**uji independent t test

c. Multivariate Analysis

The results showed that there was a significant effect between potassium intake as a covariate variable on systolic blood pressure (p = 0.020), while stress and sodium had no significant effect on systolic blood pressure.

In addition, there was no significant effect between stress, potassium intake and sodium intake on diastolic blood pressure (p> 0.05). This means that the decrease in diastolic blood pressure is not influenced by the covariate variable. In the group given chayote extract, the effect on systolic and diastolic blood pressure was greater than the group that was not given chayote extract.

Table 6 Mean SBP and DBP in the Intervention and Control Groups by Controlling Variables of Stress, Potassium Intake and Sodium Intake

Variable	Mean±SD		P value[a]			
	Intervention	Control	Group	stress	Potassium	Sodium
SBP	33,32±8,367	24,95±7,199	0,006	0,715	0,020	0,808
DBP	20,11±6,109	14,53±4,718	0,003	0,230	0,107	0,887

*ancova test

In the test between subjects, it was found that there was a significant effect of differences in the intervention and control groups on the values of systolic and diastolic blood pressure by controlling the stress variables, potassium intake and sodium intake as covariates with a significance of 0.010 <0.005.

Table 7 Differences in SBP and DBP in the intervention and control groups by controlling for stress variables, potassium intake and sodium intake as covariates

Dependent variable	Between subject effect p-value[a]			Multivariat[a]
	stress	potassium	sodium	Roy's Largest Root p-value
SBP	0,266	0,157	0,351	0,010
DBP	0,059	0,537	0,691	

[a]mancova test

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DISCUSSION

a. Characteristics of Respondents

Age affects a person's blood pressure, the theory says that mothers who are> 35 years old are at risk of developing postpartum hypertension because their cells start to regenerate and are at risk of chronic disease.(Kang et al., 2017) This is because arterial pressure increases with age, the occurrence of aortic regurgitation, as well as a degenerative process, which is more frequent in old age.(Anggara, 2013)

Postpartum hypertension was significantly associated with a history of gestational hypertension. Most of the deaths associated with postpartum hypertensive disorders with a history of preeclampsia / eclampsia pregnancy can be avoided by providing adequate time and effective care for postpartum mothers especially those experiencing complications.(Sue Pavord, 2018)

Family history of hypertension can affect blood pressure and this factor cannot be controlled. Statistics show that the problem of high blood pressure is higher in identical twins than in non-identical twins. A study has shown that there is evidence for an inherited gene for high blood pressure problems.(Zhao et al., 2017) The results of Sartik's research showed that there was a significant relationship between family history of hypertension and the incidence of hypertension with the results of statistical analysis with the value of p = 0.000 and OR = 4.60.(Sartik, 2017) This is in line with the research of Mannan et al. Showed that family history is a risk factor for the incidence of hypertension with an OR = 4.36, thus it can be concluded that a family history, one of which has hypertension, will have twice the risk of developing hypertension compared to having parents. who are not hypertensive.(Mannan, Wahiduddin, & Rismayanti, 2012)

Constant and continuous stress affects the work of the adrenal glands and thyroid in producing hormones. Adrenaline, thyroxine and cortisol as the main stress hormones will increase in number and have a significant effect on the homeostasis system. Adrenaline, which works synergistically with the sympathetic nervous system, contributes to an increase in heart rate and blood pressure.(Subramaniam, n.d.) Dyeka's research shows that there is a significant relationship between stress levels and the incidence of hypertension. From the data analysis, it was found that the value of p = 0.01 (p <0.05). Where mothers who experience stress allow to experience hypertension with a Prevalence Ratio (PR) of 4.05.(Genatha, 2018) This is inversely proportional to Rizqi's research which shows that there is no significant relationship between stress levels and the incidence of hypertension in hypertensive pregnant women with a p value of 0.271.(Ningsih, 2018)

Intake of foods that contain preservatives such as canned food, salt, seasonings, excessive fat also affects the incidence of high blood pressure, because high sodium intake can cause an increase in plasma volume, cardiac output and blood pressure.(Kautsar, Syam, & Salam, 2014) Sodium creates fluid retention in blood vessels which results in increasing the burden on the heart to pump blood.(Taslim, Kundre, & Masi, 2016) Sodium binds water when salt is consumed, it will bind water so that water will be absorbed into the intravascular, which will cause an increase in blood volume. If the volume of blood increases, it results in increased blood pressure.(Abdurrachim, Hariyawati, & Suryani, 2016) In addition, sodium is a component of dissolved substances in the blood. By consuming salt, the solute concentration will be high so that water absorption will enter and in turn cause an increase in blood pressure.(Jannah, Sulastri, & Lestari, 2013)

Low potassium intake will result in an increase in blood pressure whereas high potassium intake will result in a decrease in blood pressure. Increasing potassium intake can reduce systolic and diastolic blood pressure due to decreased vascular

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resistance.(Tulungnen, Sapulete, & Pangemanan, 2016) Vascular resistance results from dilating blood vessels and an increase in loss of water and sodium from the body, a result of sodium and potassium pump activity. The ideal potassium intake is 4.7g / day and can be obtained from fruits and vegetables that contain high potassium.(Putri & Kartini, 2014)

b. Analysis of the Effect of Chayote Extract on Lowering Blood Pressure in Postpartum Mothers with Hypertension

The results of this study indicate that there is a significant difference in the mean systolic and diastolic blood pressure in the two groups after being given the chayote extract intervention for 7 days (p value <0.05). The intervention group experienced a reduction in systolic and diastolic blood pressure greater than the control group. In the intervention group there was a decrease in systolic by 35.70 mmHg and a decrease in diastolic by 21.64 mmHg, while in the control group, there was a decrease in systolic blood pressure by 22.58 mmHg and a decrease in diastolic by 13 mmHg. Thus, it appears that the combination of chayote extract and nifedipine 10 mg is more effective at lowering blood pressure than nifedipine alone.

Chayote fruit is rich in potassium and flavonoids, where the function of potassium is to inhibit aldosterone secretion, inhibit renin secretion and reduce membrane potential which can cause relaxation of blood vessel muscles and lower blood pressure. Meanwhile, the flavonoids contained in chayote play a role in inhibiting the regulation of the RAA system with the ACE inhibitor mechanism blocking the change from angiotensin I to angiotensin II so that vasodilation occurs which reduces vascular resistance resulting in a decrease in blood pressure.(MC, 2013) The 400 mg chayote extract given to hypertensive postpartum mothers in the study contained 715.033 mg and 2,678% potassium. The role of these flavonoids and potassium content in helping reduce blood pressure in postpartum hypertensive mothers in this study.

The results of this study are in line with research conducted by Etri Yanti using chayote juice given to postpartum hypertensive mothers. The results showed that there were differences in the mean values of systolic and diastolic blood pressure before and after the intervention, with the results of the paired t-test analysis, the p-value = 0.00 <0.05. Systolic blood pressure before intervention was 151.31 mmHg and after intervention was 135.81 mmHg. The same thing happened to diastolic blood pressure with a mean before the intervention of 100.31 mmHg to 91.31 mmHg after intervention.(Yanti & SD, 2016)

Research by Nurjannah using steamed chayote combined with stroke exercises on 38 hypertensive respondents showed a difference in mean blood pressure in the intervention and control groups. Djaelani's research using chayote juice for 5 days in hypertensive elderly showed a significant difference in mean blood pressure between the intervention and control groups (p <0.05). In this study, systolic blood pressure decreased by 21.57 mmHg, while diastolic blood pressure decreased by 9.3 mmHg.(Djaelani & Eka, 2015)

Fauziah's research using chayote extract given to hypertensive pregnant women showed a significant difference in systolic and diastolic blood pressure between the intervention and control groups (p <0.05). Chayote extract was given for 11 days (500 mg per day) and consumed 2 hours after nifedipine administration, while in the control group only nifedipine was given. In the intervention group, systolic blood pressure decreased by 18.00 mmHg and diastolic by 11.90, while in the control group decreased systolic blood pressure by 2.60 mmHg, and diastolic by 6.10 mmHg. This shows that the group given

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hypertension drugs and chayote extract experienced a greater decrease in blood pressure than the group given hypertension drugs alone.(Fauziah, Hidajati, & Soejoenoes, 2019)

Several studies have been conducted to reduce the blood pressure of post partum mothers who are hypertensive, for example, giving 6 days of angelica keskei extract. In the group given the angelica keskei extract, the systolic blood pressure decreased by 24.73 mmHg and diastolic by 15.67 mmHg, while the control group experienced a decrease in systolic 13.60 mmHg and diastolic by 10.67 mmHg. The results of statistical tests showed that there were significant differences between the two groups.(Rahmi & Kartini, 2020)

In this study, celery leaf extract given to mothers with postpartum hypertension showed a significant decrease in systolic and diastolic blood pressure between the intervention group and the control group ($p < 0.05$). In the intervention group, blood pressure decreased by 25.063 mmHg and diastolic by 16.313 mmHg, while in the control group there was a decrease in systolic blood pressure of 12.125 mmHg and diastolic by 10.375 mmHg. This shows that there is a significant difference between the intervention and control groups.(Marsita, Suwondo, & Kumorowulan, 2019)

Tetty's research on Dayak onion powder given 800 mg for 14 days to postpartum hypertensive mothers showed that there was a significant decrease in systolic and diastolic blood pressure in the intervention group with $p < 0.05$. Whereas in the Sania study by giving ashitaba extract showed a decrease in the intervention group systolic blood pressure of 24.73 mmHg and diastolic 15.67 mmHg and in the control group the decrease in systolic blood pressure was 13.60 mmHg and diastolic 10.67 mmHg from the results of statistical tests. significant with p value = <0.05.

CONCLUSION

The administration of chayote extract at a dose of 400 mg once a day after meals had a significant effect on reducing systolic blood pressure by 35.69 mmHg in postpartum mothers with hypertension who received pharmacological treatment (antihypertensive drugs).

The administration of chayote extract at a dose of 400 mg once a day after meals had a significant effect on reducing diastolic blood pressure by 21.64 mmHg in postpartum mothers with hypertension who received pharmacological treatment (antihypertensive drugs).

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