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Alternative control of blood pressure with tomatoes using the freeze drying method

Erni Juniartati^{1*}, Ari Suwondo², Mursid³

¹Poltekkes Kemenkes Semarang / Semarang, Indonesia

²FKM Universitas Diponegoro / Semarang, Indonesia

³Universitas Diponegoro / Semarang, Indonesia

*Corresponding Author: Erni Juniartati

Email id: erni78.juniartati@gmail.com

ABSTRACT

Background

Hipertension is one of the causes of maternal and fetal death. Handling hypertensive pregnant woman have been done with pharmacological drugs but can caused side effect. Tomatoes containing potassium and lycopene are good for reducing blood pressure and malondialdehyde levels in pregnant women with hypertension.

Objective

To prove that dried tomatoes affect the decrease in blood pressure in pregnant women with hypertension.

Methods

Quasy Experiment with pretest and posttest with control group design. The sample amounted to 32 pregnant woman divided intervention and control group. In the intervention group, antenatal care was given and dried tomatoes at a dose of 55 grams for 14 days and patients in the control group were given antenatal care only. Measurement of systolic and diastolic blood pressure were carried out every day as long as research.

Results

The analysis showed significant differences in systolic blood pressure between the intervention and control group with p value 0,001 and diastolic p value 0,001. In the intervention group experienced a decrease in systolic of 16,812 mmHg and diastolic 17,062 mmHg. There was a decrease in systolic and diastolic blood pressure on day 5 with a value 0,000.

Conclusions and Recommendations

Consuming dried tomatoes with Freeze Drying methods 55 grams for 14 days is effective for lowering blood pressure in pregnant women with mild gestational hypertension. Expected to be one of the interventions in midwifery care SOPs in pregnant women with mild gestational hypertension so that dry tomatoes can be used as an alternative as a natural therapy that can reduce blood pressure of pregnant women with hypertension in pregnancy

Keyword: Tomatoes, Blood Pressure, Hypertension in pregnancy.

INTRODUCTION

Hypertension in pregnancy is a special syndrome, namely the lack of blood flow to each organ due to narrowing and endothelial activity characterized by an increase in blood pressure, usually occurring in pregnancies over 20 weeks. The incidence of hypertension causes 5–10% of complications in pregnancy and is associated with the incidence of maternal mortality (AKI) [1].

According to WHO data in 2017, maternal mortality rates were recorded at 216 per 100,000 live births. The incidence of hypertension in pregnancy is around 14% in 2015 [2]. In Indonesia, according to the results of the 2015 inter-census survey (SUPAS), the maternal mortality rate was 305 per 100,000 live births, caused by 13% of preeclampsia/ eclampsia [3]. Province of Central Java in 2017 maternal deaths of 88.58 per 100,000 live births and hypertension in pregnancy were the biggest causes of maternal mortality and experienced a percentage increase of 32.97% compared to 2016 which was 27.08% [4]. In Banyumas District, in 2017 there were 54 / 100,000 live births recorded in the year, but in 2018 there were 18 cases with 26,612 live births so that the MMR in 2018 had reached 67.64 / 100,000 live births. Of the 18 cases as many as 10 mothers (55.5%) died due to preeclampsia [5].

Handling hypertension of pregnant women that has been done so far is by giving medicines such as methyldopa 250 mg and nifedipine 10 mg. But many pharmacological therapies have side effects such as dizziness, nausea, bloating, constipation, depression. The baby will experience Intra Uterine Growth Retardation (IUGR). Therefore, non-pharmacological therapy is very necessary because the natural ingredients used are safe, cause minimum side effects or even have no side effects at all and can improve the body's resistance and are easily obtained [6].

The administration of 200 mg of tomato juice containing 0.6 grams of potassium and 0.3 grams of flavonoid for 14 days obtained the effect size of

cystole 0.144 and diastole 0.325. This shows that tomatoes have better effectiveness compared to other non-pharmacological therapies [7].

Carotenoid, potassium, omega 3 fatty acids and fiber nutrients can support health and prevent hypertension. The content of vitamin C, beta-carotene, and vitamin E in tomatoes act as antioxidants that can lower blood pressure [8].

From some of these problems, researchers are interested in conducting research with the title "Alternative Control of Blood Pressure with Tomatoes (*Lycopersium Commune*) Using the Freeze Drying Method" in Pregnant Women with Hypertension

Study Objectives

To prove that dried tomatoes affect the decrease in blood pressure in pregnant women with hypertension.

Methods

Quasy Experiment with pretest and posttest with control group design. The sample amounted to 32 pregnant woman divided intervention and control group. In the intervention group, antenatal care was given and dried tomatoes at a dose of 55 grams for 14 days and patients in the control group were given antenatal care only. Measurement of systolic and diastolic blood pressure were carried out every day as long as research.

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 dried tomatoes on blood pressure bivariate analysis was carried out. The first test carried out was the data normality test for systolic blood pressure, diastolic blood pressure, the results obtained $p \text{ value} > 0.05$ means that the data are normally distributed, $p \text{ value} < 0.05$ means that the data is not normally distributed.

RESULT

Univariat Analysis

Table 1. Distribution Of Respondent Characteristics Based On Education, Employment, Family History, Past Pregnancy/Childbirth/Postpartum History, And Gestational Age Of Intervention Groups and Control groups

Characteristics	Groups		P value
	Intervention (n=16)	Control (n=16)	

Education			
Primary school	31,2 %	25 %	1,000
Junior high school	12,5 %	18,8 %	
Senior High School	43,8 %	50 %	
College	12,5 %	6,2 %	
Work			
Work	18,8 %	18,8 %	1,000
Does not work	81,2 %	81,2 %	
Family history			
History of father	37,5 %	31,2 %	0,851
History of mother	12,5 %	18,8 %	
Nothing	50,0 %	50 %	
Past pregnancy/childbirth/ postpartum history			
There	12,5 %	12,5 %	1,000
Nothing	87,5 %	87,5 %	
Age of Pregnancy			
Gestational age (mean \pm SD) Sunday	26,69 \pm 3,807	27,19 \pm 5,180	0,758

Table 1 explains that the the frequency distribution of respondents' educational characteristics is grouped into 4, namely the elementary, junior high, high school and tertiary groups. The results of the frequency distribution of the intervention group's majority were 43.8% of the last senior secondary education, the control group respondents were also the majority of senior secondary education at 50%.

The results of the characteristics of respondents based on work are grouped into 2 namely work and not work. The majority of respondents in the intervention group 81.2% did not work, while in the control group the majority did not work at 81.2%.

The frequency distribution of the history of hypertension characteristics in the family in the intervention group 50% had no history, while in the control group there was no history of hypertension in the family by 50%.

The results of the intervention group's characteristics were 87.5% with no history of hypertension in pregnancy, childbirth and previous postpartum, whereas in the control group the majority had no history of hypertension in the previous pregnancy, childbirth and postpartum by 87.5%.

The frequency distribution of respondents' characteristics of gestational age in the intervention group averaged 26.69 weeks, while in the control group the average gestational age was 27.19 weeks.

After the homogeneity test was obtained, the p value was good for education, employment, family history, past history of pregnancy, childbirth and childbirth, gestational age showed a value of > 0.05 meaning Homogeneous/no significant differences in the characteristics of respondents between the intervention and control groups.

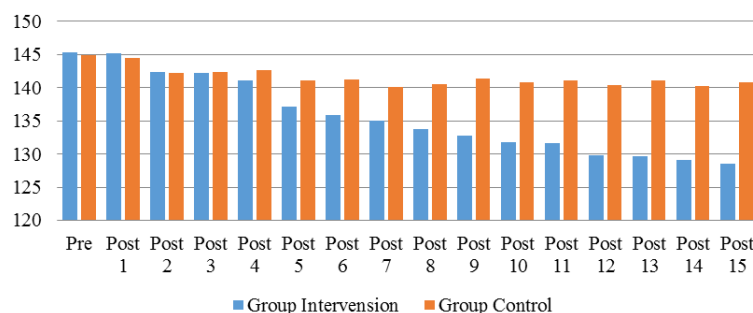


Figure 1. Changes In Mean Systolic Blood Pressure In The Treatment And Control Groups

Figure 1 above shows that the change in the average systolic blood pressure at pre to day 15 for the intervention group and group experienced a

decrease, but in the intervention group there was a more significant decrease compared to the control group.

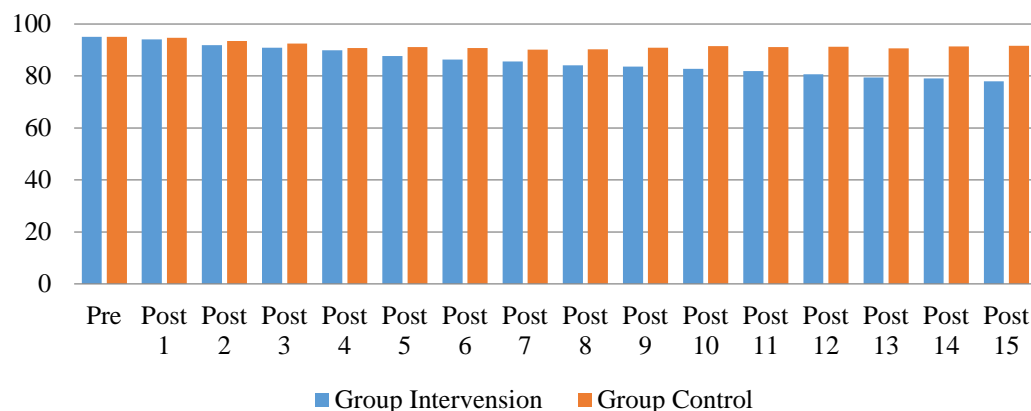


Figure 2. Changes In Mean Diastolic Blood Pressure In The Intervention And Control Groups

Figure 2 above shows that the change in the average diastolic blood pressure at pre to day 15 for the intervention group and group experienced a

decrease, but in the intervention group there was a more significant decrease compared to the control group.

Bivariate Analysis

Table 2. The difference In The Value Of Systolic Blood Pressure Between The Intervention and Control Groups

Variabel	Group		P value*
	Intervensi (n=16)	Control (n=16)	
	Mean±SD	Mean±SD	
Pre	145.38±1.78	144.94±2.14	0.445 ^a
Post 1	145.19±2.13	144.5±2.16	0.373 ^b
Post 2	142.38±2.47	142.19±2.34	0.827 ^b
Post 3	142.25±2.35	142.38±2.02	0.926 ^a
Post 4	141.13±3.24	142.63±2.41	0.254 ^b
Post 5	137.19±2.85	141.06±2.54	0.000 ^b
Post 6	135.88±3.13	141.19±2.16	0.000 ^a
Post 7	135.0±3.86	140.13±2.02	0.001 ^a
Post 8	133.81±2.94	140.50±2.55	0.000 ^a
Post 9	132.81±3.46	141.31±2.30	0.000 ^b
Post 10	131.75±2.81	140.75±2.01	0.000 ^a
Post 11	131.63±3.00	141.06±2.38	0.000 ^b
Post 12	129.75±2.64	140.44±26.58	0.000 ^b
Post 13	129.63±2.55	141.06±1.87	0.000 ^a
Post 14	129.06±2.11	140.19±1.83	0.000 ^a
Post 15	128.56±1.36	140.75±1.57	0.000 ^a

Table 2. Results of Repeated Measures Anova shows that the difference in systole blood pressure obtained p value > 0.05, that is at pre-post day 4 means that there is no difference in systolic blood pressure in the treatment and control groups.

Whereas after intervention on day 5 the p value of 0,000 < 0.05 means that there is a difference in the decrease in systolic blood pressure between the intervention group and the control group.

Table 3. Differences In Diastolic Blood Pressure Values Between The Intervention And Control Groups

Variabel	Group		P value*
	Intervensi (n=16)	Control (n=16)	
	Mean±SD	Mean±SD	
Pre	95±1.59	95±1.09	1.000 ^b
Post 1	94.06±1.80	94.69±1.35	0.277 ^b
Post 2	91.88±2.47	93.44±1.93	0.056 ^b
Post 3	90.81±2.45	92.44±1.93	0.056 ^b
Post 4	89.88±2.41	90.69±1.40	0.184 ^a
Post 5	87.69±2.84	91.13±1.82	0.000 ^a
Post 6	86.31±2.49	90.69±2.52	0.000 ^a
Post 7	85.56±2.68	90.13±2.24	0.000 ^b
Post 8	84.13±2.94	90.19±2.25	0.000 ^b
Post 9	83.63±2.50	90.88±2.06	0.000 ^b
Post 10	82.75±2.51	91.50±1.86	0.000 ^a
Post 11	81.88±2.80	91.13±1.70	0.000 ^a
Post 12	80.63±2.50	91.25±1.61	0.000 ^a
Post 13	79.38±2.24	90.63±1.85	0.000 ^b
Post 14	79.06±2.35	91.31±1.13	0.000 ^a
Post 15	77.94±2.14	91.56±0.72	0.000 ^a

The results of the analysis of diastolic blood pressure differences obtained p value > 0.05, that is at pre-post 4, meaning that there was no difference in diastolic blood pressure in the treatment and control groups. Whereas after treatment on day 5-15 the value of p value < 0.05 means that there are significant differences in diastolic blood pressure in the intervention group and the control group.

DISCUSSION

Tomatoes that contain potassium and lycopene (antioxidants) are very important to control blood pressure. Potassium plays a role in inhibiting renin secretion by increasing excretion of sodium and water. Circulation of renin in the blood and function by catalyzing changes in angiotensin to angiotensin I. With the help of angiotensin converting enzyme (ACE), angiotensin I changes to its active form, angiotensin II. Sodium and water retention will decrease with the presence of potassium so that plasma volume decreases, cardiac output and peripheral pressure also decrease so that blood pressure will also decrease [9].

Decrease in aldosterone secretion will reduce sodium in urine and water as a vasodilator in regulating blood pressure by inhibiting reabsorption of sodium in the proximal renal tube, preventing the narrowing of capillary walls and arteries which causes blood pressure to increase

and suppress renin secretion as an inhibitor of vascular smooth muscle contractions. With a decrease in membrane potential it will cause blood vessel muscles to relax so that blood pressure will decrease [9].

Comparison with previous research, one of which is Theresia Anita by giving 200 grams of tomato juice/day containing 0.6 grams of potassium and 0.3 grams of flavonoids showing a decrease in systolic blood pressure [7]. This shows that the administration of dried tomatoes is more significant in lowering blood pressure compared to tomato juice, because dried tomatoes at a dose of 55 grams contain 980 mg of potassium and lycopene 48,619 mg.

In a study conducted by Beata Krasinka et al, tomato extract was used as a preventive therapy for blood clotting which could result in hypertension and heart disease. The results showed that after administration of tomato extract as much as 213 mg / day and Acetylsalicylic acid (ASA) can reduce systolic and diastolic blood pressure [10].

Research conducted by Mineka Yoshimura et al, tomatoes have the effect of gamma amino butyric acid (GABA) which can reduce blood pressure in mice with hypertension. Giving dry tomatoes at a dose of 10 grams / kg body weight (containing 17.9 mg GABA) significantly lowered blood pressure at 4-6 hours after administration compared to a dose of 2 grams / kg body weight (containing 3.6 mg

GABA) which gave antihypertensive effects at 6-8 hours after administration [11].

CONCLUSIONS

Giving dried tomatoes with freeze drying method as much as 55 grams / day is effective for reducing systolic blood pressure and diastolic blood pressure in pregnant women with mild gestational hypertension.

Recommendation Future

Expected to be one of the interventions in midwifery care SOPs in pregnant women with mild gestational hypertension so that dry tomatoes can be used as an alternative as a natural therapy that can reduce blood pressure of pregnant women with hypertension in pregnancy

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