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ORIGINAL RESEARCH

ISSN: 2477-4073

EFFECT OF CONSUMING TOMATO (LYCOPERSIUM COMMUNE) JUICE IN LOWERING BLOOD PRESSURE IN PREGNANT MOTHERS WITH HYPERTENSION

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Abstract

Background: High blood pressure during pregnancy can pose significant problems such as preeclampsia, eclampsia, and premature birth. Thus, early prevention is needed. Consuming tomato (*lycopersium commune*) juice is considered effective to reduce blood pressure in pregnant women.

Objective: This study aims to examine the effect of tomato juice on the decrease in blood pressure of pregnant women with hypertension in pregnancy.

Methods: This study was a quasi-experiment with pretest-posttest control group. This research was conducted at the working area of the Community Health Center of Magelang Indonesia in July 2016 - January 2017. The target population of this study was pregnant women in trimester I, II, and III with high blood pressure. There were 30 samples selected using consecutive sampling, with 15 assigned in the experiment and control group. Wilcoxon test was performed for data analysis.

Results: There was a statistically significant difference in systolic and diastolic blood pressure before and after given tomato juice with $p = 0.001$ (<0.05).

Conclusion: Consuming tomato juice can be one of the efforts to reduce blood pressure in pregnant women with hypertension.

Keywords: hypertension; pregnancy; tomato; *lycopersium commune*

INTRODUCTION

Maternal Mortality Rate (MMR) is the number of maternal deaths resulting from the process of pregnancy, labor and delivery per 100,000 live births in a given period ([Dinkes, 2014](#)). In Central Java Province of Indonesia, maternal mortality rate in the postpartum period was 57.95%, at the time of pregnancy was 27.00% and at the time of delivery was 15.05%. While based on age group, most maternal death incidence was in productive age (20-34 years) of 62.02%, followed by age group > 35 years with 30.52%, and age group

<20 years with 7.45%. The causes of maternal deaths in Central Java Province were hypertension including preeclampsia and eclampsia (26.44%), bleeding (22.9%), circulatory system disorders (4.64%), infections (3.66%) and other causes (unspecified) (42.33%) ([Dinkes, 2014](#)).

The first cause of maternal deaths was caused by preeclampsia and eclampsia during pregnancy, labor and childbirth. The presence of preeclampsia and eclampsia begins with

the ongoing increase in blood pressure during pregnancy. Increased blood pressure is often considered normal in pregnant women and less performed an early stabilization and intensive monitoring ([Rukiyah & Yulianti, 2010](#)).

Preeclampsia often occurs suddenly, so early detection is necessary during pregnancy. Early detection is performed by regular blood pressure checks at the time of antenatal care. Routine pregnancy examination is absolutely necessary to ensure that the risk of preeclampsia is detected immediately so that no more fatal complications occur. Examination of blood pressure during pregnancy should be done carefully and try to be done by the same person such as midwife or doctor ([Rukiyah & Yulianti, 2010](#)). In addition to blood pressure monitoring, early prevention of preeclampsia can be done with nutritional diet therapy such as consumption of green vegetables, side dishes and fruits. One fruit that can be used in therapy to lower blood pressure is tomatoes. Tomatoes have various vitamins and anti-disease compounds that are good for health, especially lycopene. Tomatoes contain low amounts of fat and calories, cholesterol-free, and are a good source of fiber and protein. In addition, tomatoes are rich in vitamins A and C, beta-carotene, potassium and lycopene antioxidants ([Ismalia & Zuraida, 2016](#); [Ramadhian & Hasibuan, 2016](#)).

From January to June 2016, the total number of pregnant women in the working area of the Community Health Center of Muntilan II was 169 people, while the high-risk cases of hypertension and preeclampsia in pregnant women trimester I & II were 9 people, pregnant women trimester III as many as 3 people and postpartum mothers were 5 people. Based on the interview with midwife coordinator in the community health center of Muntilan II stated that there were 506 pregnant women who had elevated blood pressure with systolic <140 mmHg and diastolic <90 mmHg during pregnancy, which is still considered normal and can return to normal without doing pharmacological therapy. Therefore, based on this condition and the benefits of tomatoes, this study aimed to examine the effect of tomatoes in lowering

blood pressure in pregnant women with hypertension.

METHODS

Study Design

A quasi-experimental study with pretest-posttest control group design

Setting

This research was conducted at the working area of the Community Health Center of Magelang in July 2016 - January 2017.

Sample

The target population of this study was pregnant women in trimester I, II, and III with high blood pressure at the working area of the Community Health Center of Magelang. There were 30 samples selected using consecutive sampling, divided into experiment (15 samples) and control group (15 samples). The inclusion criteria of the sample included: pregnant women with systolic blood pressure ≥ 140 mmHg to <150 mmHg and diastolic blood pressure ≥ 90 mmHg to <100 mmHg; pregnancy trimester I, II, II pregnancy and willing to be a respondent. The exclusion criteria of the sample included: pregnant women who have diabetes, heart disease, kidney, and thyroid, and have bleeding history during pregnancy.

Intervention

A fresh red tomato fruit (*lycopersium commune*) with potassium levels of 610.14 mg / kg and antioxidant of 5.68 mg / ml was used based on the results of laboratory tests conducted at the Integrated Research and Testing Laboratory of Gajah Madah University Yogyakarta (LPPT UGM) on October 12, 2016 - November 2, 2016. The red tomato was formed into 250 ml of juice made from 200 grams of tomato, 100 ml water, 5 grams of dietary sugar. The tomato juice was given 1 time daily for 14 consecutive days; while control group was not given intervention.

Instruments

The research instrument used observation sheets and Omron digital brand tension meters. Blood pressure measurements were performed at the beginning and end of the study. Measurement of blood pressure was

done after the respondent rested 10 minutes. Systolic and diastolic blood pressure is stated to be normal when diastolic was 70 - \pm 80 mm Hg and systolic was 110 - \leq 120 mmHg; while the value of blood pressure of pregnant women with hypertension in pregnancy is with diastolic pressure of 90 - \leq 100 mmHg and systolic of 140 - \leq 150 mmHg.

Ethical Consideration

The ethical approval was obtained from the Health Research Ethics Committee of Poltekkes Kemenkes Semarang. The researchers have confirmed that all respondents have obtained appropriate informed consents.

Data Analysis

A normality test was performed using Shapiro Wilk test because the number of respondents was 30 respondents. The results showed non-normal data distribution. Thus, Wilcoxon and Mann Whitney Test were performed for data analysis.

RESULTS

Characteristics of the respondents

Table 1 shows that the majority of the respondents aged between 20-35 years, multigravida, and multipara. Most of them were during pregnancy trimester III and had a history of pre-eclampsia.

Table 1 Characteristics of respondents based on age, gravida, parity, pregnancy span, and preeclampsia history

Characteristics	Control (n=15)		Experiment (n=15)	
	N	%	N	%
Maternal age (year)				
20 – 35	11	73.3	12	80.0
>35	4	26.7	3	40.0
Gravida				
Primigravida	3	20.0	2	13.3
Multigravida	12	80.0	13	86.7
Parity				
Nullipara	4	26.7	3	20.0
Primipara	4	26.7	6	40.0
Multipara	7	46.7	6	40.0
Pregnancy span				
Trimester I	1	6.7	1	6.7
Trimester II	4	26.7	5	33.3
Trimester III	10	66.7	9	60.0
Preeclampsia history				
Yes	8	53.3	6	40.0
No	7	46.7	9	60.0

Difference of systolic blood pressure before and after given intervention

Table 2 Difference of systolic blood pressure before and after given intervention in the experiment and control group using Wilcoxon test

Group	Pretest		Posttest		Difference between pretest-posttest		p-value
	Mean	SD	Mean	SD	Mean	SD	
Control (n=15)	142.60	1.882	139.47	4.207	3.13	4.627	0.028
Experiment (n=15)	143.91	1.985	135.11	4.724	8.26	5.227	0.001

Table 2 shows that the mean of systolic blood pressure in the experiment group before given intervention was 143.91 and decreased to 135.11 after given intervention; while the mean of systolic blood pressure in the control group before given intervention was 142.60 and decreased to 139.47 after given

intervention. There was a statistically significant decrease of systolic blood pressure in both experiment group and control group with p-value <0.05. However, the experiment group showed a higher reduction of systolic blood pressure (8.26) compared to systolic in the control group (3.13).

Difference of diastolic blood pressure before and after given intervention**Table 3** Difference of diastolic blood pressure before and after given intervention in the experiment and control group using Wilcoxon test

Group	Pretest		Posttest		Difference between pretest-posttest		p-value
	Mean	SD	Mean	SD	Mean	SD	
Control (n=15)	95.9	2.439	92.9	3.873	2.81	4.530	0.023
Experiment (n=15)	95.63	2.249	87.16	2.554	8.06	3.242	0.001

Table 3 shows that the mean of diastolic blood pressure in the experiment group before given intervention was 95.63 and decreased to 87.16 after given intervention; while the mean of diastolic blood pressure in the control group before given intervention was 95.9 and decreased to 92.9 after given intervention. There was a statistically significant decrease of diastolic blood pressure in both experiment group and control group with p-value <0.05. However, the experiment group showed a higher reduction of diastolic blood pressure (8.06) compared to systolic in the control group (2.81).

DISCUSSION

Blood pressure is the pressure that works against the walls of blood vessels. Blood pressure is the amount of force given by the blood inside the arteries when blood is pumped throughout the blood circulation system. Each time the muscles contract, the blood is pressed against the blood vessel wall and counted as systolic blood pressure (upper number). When the heart relaxes between pulses, the pressure on the blood vessel wall is calculated as diastolic blood pressure (bottom number) ([American Heart, 2017](#)).

The results of this study using Wilcoxon test showed a decrease in systolic and diastolic blood pressure of pregnant women in the treatment group after given tomato juice intervention with dose 250 ml / day for 14 days with p-value 0.001 (<0.05), which indicated that there was a significant difference of blood pressure before and after given intervention.

Systolic blood pressure is the peak pressure that is reached when the heart contracts and pumps blood out through the arteries, diastolic

blood pressure is after the heartbeat or the time between pulses, the pressure in the arteries will decrease. Provision of tomato juice can help lower blood pressure for people with hypertension. According to the American dietetic association, it is stated that potassium contained in tomatoes if given longer can lower blood pressure even more. Potassium is the main ion in the intra-cellular fluid. Consumption of large amounts of potassium increases its concentration in the intra-cellular fluid, which tends to attract fluid from the cellular portion and lower blood pressure ([Besford & Maw, 1975](#)).

Tomato is one type of vegetables and fruits rich in vitamin C, vitamin E, potassium, fiber and protein. Potassium in tomatoes can reduce sodium in urine and water by diuretics, so it can lower blood pressure. Mature tomatoes contain bioactive nutrients such as tocopherols, phenolics, glycoalkaloid and flavonoids ([Sharma et al., 2003](#)). Thus, during pregnancy, it is advisable to consume foods containing potassium sources such as bananas, watermelons, melons, oranges, and tomatoes. Potassium plays a role in supporting the function of muscles, nerves and cells. It also plays a role to maintain fluid balance and regulate blood pressure. Pregnant women are advised to consume potassium as much as 2,000 mg per day ([Rukiyah, 2009](#)).

In addition, tomatoes also contain lycopene. Lycopene lowers blood pressure through its role as an antioxidant. Lycopene prevents free radicals ROS (reactive oxygen species) cause oxidative stress, then triggers the production of nitric oxide in the endothelium and improves vascular function, resulting in a decrease in blood pressure. Antioxidants also have an effect on preeclampsia ([Chauhan, Sharma, Agarwal, & Chauhan, 2011](#); [Paran &](#)

Engelhard, 2001). However, this study provides the evidence that tomatoes juice is effective in lowering blood pressure in pregnant mothers with hypertension

Limitation of the study

This study only examined the levels of antioxidants and potassium, which considered as the limitation of the study. Besides, the psychological factors and daily diet were not assessed that may affect maternal blood pressure. In addition, the measurement techniques were only done at the beginning and end of study, not recorded every day, which was unable to know the development of changes in blood pressure of respondents every day. Further study is needed to deal with these issues.

CONCLUSION

It is concluded that there was a significant reduction in systolic and diastolic blood pressure of pregnant women in the treatment group after given tomato juice. This can be an alternative treatment for midwife in lowering blood pressure in pregnant women.

Declaration of Conflicting Interest

None declared.

Funding

This study was supported by Postgraduate Midwifery Program, Politeknik Kesehatan Kementrian Kesehatan Semarang, Indonesia.

Author Contribution

All authors contributed equally in this study.

References

American Heart, A. (2017). *What is high blood pressure?* Retrived from *South Carolina State*

Documents Depository. <https://dc.statelibrary.sc.gov/handle/10827/25132>

- Besford, R. T., & Maw, G. A. (1975). Effect of potassium nutrition on tomato plant growth and fruit development. *Plant and Soil*, 42(2), 395-412.
- Chauhan, K., Sharma, S., Agarwal, N., & Chauhan, B. (2011). Lycopene of tomato fame: Its role in health and disease. *International Journal of Pharmaceutical Sciences Review and Research*, 10(1), 99-115.
- Dinkes. (2014). *Health profile of Central Java Province*. Central Java, Indonesia: Department of Health of Central Java.
- Ismalia, N., & Zuraida, R. (2016). Efek tomat (*Lycopersion esculentum* Mill) dalam menurunkan tekanan darah tinggi [Effect of tomato (*Lycopersion esculentum* Mill) in lowering blood pressure]. *Jurnal Majority*, 5(4), 107-111.
- Paran, E., & Engelhard, Y. (2001). P-333: Effect of tomato's lycopene on blood pressure, serum lipoproteins, plasma homocysteine and oxidative stress markers in grade I hypertensive patients. *American Journal of Hypertension*, 14(S1), 141A-141A.
- Ramadhian, M. R., & Hasibuan, N. C. (2016). Efektivitas kandungan kalium dan likopen yang terdapat dalam tomat (*Solanum lycopersicum*) terhadap penurunan tekanan darah tinggi [Effect of calium and likopen in tomato (*Solanum lycopersicum*) on the decrease of high blood pressure]. *Jurnal Majority*, 5(3), 124-128.
- Rukiyah, A. Y. (2009). *Asuhan kebidanan II (persalinan) [Midwifery care II (labor)]*. Jakarta: Trans Info Media
- Rukiyah, A. Y., & Yulianti, L. (2010). *Asuhan kebidanan IV (patologi kebidanan) [Midwifery care IV (midwifery patologi)]*. Jakarta: Trans Info Media.
- Sharma, J. B., Kumar, A., Kumar, A., Malhotra, M., Arora, R., Prasad, S., & Batra, S. (2003). Effect of lycopene on pre-eclampsia and intra-uterine growth retardation in primigravidas. *International Journal of Gynaecology Obstetrics*, 81(3), 257-262.

Cite this article as: Anita, T., Suwandono, A., Ariyanti, I., Pramono, N., Kumorowulan, S. (2017). Effect of consuming tomato (*lycopersium commune*) juice in lowering blood pressure in pregnant mothers with hypertension. *Belitung Nursing Journal*, 3(6), 707-711. <https://doi.org/10.33546/bnj.296>