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The potential of tomato extract as a companion to anti-hypertensive drugs in obstetric services for hypertension in pregnancy

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ABSTRACT

Hypertension in pregnancy has been treated for decades with pharmacological therapy, but it can result in side effects. Non-pharmacological therapy is most commonly used as an alternative drug as well as a companion therapy to reduce the side effects. Tomato extract, which contains potassium and lycopene, is a non-pharmacological therapy that can lower maternal blood pressure in patients with hypertension.

Purposes*:* This study aimed to analyze the potential of a tomato extract (solanum lycopersicum) as an anti-hypertensive drug companion to help repair blood pressure and potassium levels in pregnant women with hypertension.

Methods*:* This study is a quasi-experiment with a pretest-posttest with control group design. Purposive sampling technique was employed, with 32 respondents divided into intervention and control groups. A Friedmann Test and a Paired Sample T-Test were employed in the statistical analysis.

Result*:* Systolic blood pressure drops by 16.8 mmHg in the intervention group and 4.0 mmHg in the control group, with a p-value 0.000. Diastolic blood group intervention decreases by 9.6 mmHg and control group decreases by 7.9 mmHg, with a p-value 0.000.

Keywords*:* Tomato extract, pregnant women, hypertension, potassium.

INTRODUCTION

Maternal mortality is one of the health issues that the international community should be concerned about, and one of the factors that cause it is hypertension during pregnancy (1). Pregnancy hypertension is defined as blood pressure exceeding ≥140/90 mmHg (2). Pregnant women who have hypertension are four times more likely to have a miscarriage than those who do not. Hypertension is the major cause of death for pregnant women in the world, accounting for 36% of all cases. (1). Pregnant women with hypertension are typically treated with pharmacological therapy; even in cases of preeclampsia, a combination of anti-hypertensive drugs is administered to optimize blood pressure control. However, using a combination of anti-hypertensive drugs

can cause several side effects, such as stomach pains, headaches, fatigue, nausea, and vomiting (3). Non-pharmacological therapy can be used in conjunction with anti-hypertensive drugs to reduce the risk of adverse drug reactions (4).

One of the non-pharmacological therapies for lowering blood pressure is to control your diet by reducing foods high in cholesterol and salt and to increase your consumption of healthy foods high in minerals and antioxidants. One of the fruits which is widely available in Indonesia and high in potassium and antioxidants is tomato. Tomato contains 222 mg of potassium and 7.74 mg of natural antioxidant (lycopene) per 100 grams (5).

Potassium helps to lower blood by inhibiting angiotensin I and angiotensin II release, resulting in a decrease in aldosterone hormone and an increase in sodium and water retention (6). Antioxidants help to lower blood by reducing oxidative stress and increasing nitric oxide levels, which support in blood vessels vasodilation (7).

METHODS

This study employed a quasi-experimental design with a pretest-posttest with control group design. Purposive sampling technique was employed, with 32 pregnant women with preeclampsia, divided into intervention and control groups. The control group received nifedipine 10 mg and placebo 1x1 for 14 days. The intervention group received nifedipine 10 mg and non-pharmacological complementary therapy tomato extract 250 mg 1x1 per day for 14 days. The data analysis method used to assess changes in blood pressure is Friedmann Test. The smapling technique was purposive sampling with the following criteria:

Inclusion Criteria

- ≥ 20weeks pregnant
- Systolic Bp ≥ 140-160 mmHg
- Diastolic Bp ≥ 90-99 mmHg
- Protein in the urine +1

Exclusion Criteria

- Pregnant women who have hypertention, diabetes, kidney disease, and heart disease
- Protein in the urine +2

RESULT

Systolic Blood Pressure Analysis

Table 1: Analysis of Dfferences Systolic Blood Pressure Between Control Group and Intervension Group

Variables	Control Group				Intervention Group			
	Mean±SD	**Min±Max**	***p***	***Chi-square***	**Mean±SD**	**Min±Max**	***p***	***Chi-square***
Systolic BP (mmHg)			0,000	97,06 (df14)			0,000	211.4 (df14)
Pre	144,9±2,14	141±149			145,4±1,78	142±147		
Post 3	142,4±2,02	140±146			142,3±2,35	136±145		
Post 5	141,1±2,54	138±145			137,2±2,85	132±143		
Post 7	140,1±2,02	138±145			135,0±3,86	128±141		
Post 14	140,9±1,52	138±142			128,6±1,36	126±132		
Δ *mean*	4,0		0,001	16,8			0,001	

In Table 1, there are changes in systolic blood pressure in the control and intervention groups, using the Friedmann Test analysis. In the pretest, the average systolic blood pressure in the control group was 144.9±2.14 mmHg, and on the posttest day 14, the average systolic blood pressure in the control group decreased to 140.9±1.52 mmHg, with a difference mean 4 mmHg P-value 0.000. While the intervention group's average systolic blood pressure pretest was 145.4±1.78 mmHg, and in the pretest day 14, the intervention group's average systolic blood pressure decreased to 128.6±1.36 mmHg, with a more decreasing difference, that is, 16.8 mmHg p-value 0.000.

Table 2: Analysis of Dfferences Diastolic Blood Pressure Between Control Group and Intervension Group

Variables	Control Group				Intervention Group			
	Mean±SD	**Min±Max**	***p***	***Chi-square***	**Mean±SD**	**Min±Max**	***p***	***Chi-square***
Diastolic BP (mmHg)			0,000	208.137			0,000	218.368
Pre	94,7±2,02	91±98			95,4±3,99	89±99		
Post 3	95,2±4,00	90±99			94,2±5,15	87±99		
Post 5	93,1±5,26	86±99			92,5±5,26	85±98		
Post 7	91,3±4,93	85±97			91,1±5,44	83±96		

Post 14	86,8±5,11	81±92		85,8±4,78	80±91	
Δ *mean*	7,9		0,001	9,6		0,001

In Table 2, there are changes in average diastolic blood pressure in the control and intervention groups, using the Friedmann Test analysis for 14 days. In the pretest, the average diastolic blood pressure in the control group was 94.7±2.02 mmHg, and on the posttest day 14, the average diastolic blood pressure in the control group decreased to 86.8±5.11 mmHg, with a difference mean 7.9 mmHg P-value 0.000. While the intervention group's diastolic blood pressure pretest was 95.4±3.99 mmHg, and in the pretest day 14, the intervention group's average diastolic blood pressure decreased to 85.8±4.78 mmHg, with a more decreasing difference compared to the control group, that is, 9.6 mmHg p-value 0.000.

DISCUSSION

Pharmacological treatment of hypertension is carried out by providing anti-hypertensive chemical drugs. The control group in this study received nifedipine, a calcium channel blocker. Its mechanism in lowering blood pressure is by preventing calcium ions from entering cardiac muscle cells and smooth muscle cells of blood vessels. By preventing calcium, it is expected that the entry of sodium and air will decrease, resulting in blood vessels vasodilation (8). Mild preeclampsia cases should be treated with anti-hypertensive drugs in combination with other anti-hypertensive drugs to obtain optimum blood pressure, but this can cause severe side effects such as nausea, vomiting, headaches, easily tired, sleepy, and a lack of energy (8).

To mitigate these side effects, the pharmacological drugs combination can be replaced with non-pharmacological ones. The National Center of Complementary and Integrative Health of The National Institute of Health classifies various types of treatment and therapy systems, one of which is *Biological Based Therapies* (BBT) (4). It is a type of complementary therapy that makes use of natural ingredients. The use of natural ingredients as drugs can be a proponent or companion with fewer side effects, compared to pharmacological drugs (9).

In this study, tomatoes were used as a complementary therapy to lower blood pressure in pregnant women with mild preeclampsia. Tomatoes are fruits which are high in vitamins, minerals, and antioxidants that can help prevent a variety of diseases, including hypertension. Tomatoes were prepared in the form of a 250 mg extract containing 117 mg potassium and 5 mg lycopene for this study.
Potassium reduces blood pressure by regulating fluid balance and sodium content in the body; if sodium and water retention are reduced, blood vessels will dilate (10). Lycopene decreases blood pressure by functioning as a natural antioxidant capable of immobilizing free radicals of Reactive Oxygen Species (ROS), balancing blood cholesterol levels, and flexing stiff heart nerve cells caused by cholesterol deposits in the blood (11).

CONCLUSION

Complementary therapy in the form of tomato extract of 250 mg 1x1 for 14 days has proven to reduce systolic blood pressure by an average difference of 16.8 mmHg and diastolic blood pressure by an average difference of 9.6 mmHg in cases of pregnant women with mild preeclampsia with a P-Value of 0.000.

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