

## RESEARCH ARTICLE

## Effectiveness of Red Ginger (*Zingiber officinale* var. *Rubrum*) Foot Hydrotherapy in Lowering Blood Pressure among Pregnant Women with Hypertension

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### Abstract

Pregnancy hypertension is one of the complications of pregnancy. One nonpharmacological treatment to reduce hypertension is the foot hydrotherapy method with red ginger (*Zingiber officinale* var. *rubrum*). The essential oil content of red ginger provides a warm effect and spicy aroma so that blood vessels widen and blood flow becomes smooth. The research aims to determine the effectiveness of red ginger foot hydrotherapy in lowering blood pressure among pregnant women with hypertension. This one-group pretest-posttest pre-experimental study design was conducted at the Talaga Community Health Centre, West Java, from May 2023 to July 2023. The sample was 32 pregnant women with hypertension. Bivariate analysis test using paired t-test. The average systolic blood pressure measurement results for pregnant women before the intervention were 154.09 mmHg, and after the intervention was given 140.22 mmHg, there was a decrease of 13.87 mmHg. The average diastole for pregnant women before the intervention was 100.22; after the intervention, it was 91.62, resulting in a reduction of around 8.6 mmHg. The paired t-test with a p-value <0.001 shows the effectiveness of foot hydrotherapy with red ginger in reducing blood pressure in pregnant women with hypertension. Red ginger using the foot hydrotherapy method has been proven effective in lowering blood pressure in pregnant women. To reduce the risk factors for pregnancy with hypertension, pharmacological and nonpharmacological therapy is a solution that needs to be considered. This research can become a reference for evidence-based midwifery practice in providing midwifery care.

**Keywords:** Foot hydrotherapy method, hypertension, pregnant women, red ginger

### Introduction

The prevalence of hypertension in women of reproductive age is estimated to be 7.7%. Hypertensive disorders of pregnancy are one of the complications that occur during pregnancy, with the classification of chronic hypertension, hypertension in pregnancy, as well as preeclampsia and eclampsia; it is a significant cause of maternal and perinatal morbidity and mortality.<sup>1,2</sup>

Maternal mortality rates are increasing every year. In 2021, there were 7,389 maternal deaths in Indonesia, compared to 4,627 in 2020. Of the 2021 deaths, 2,982 were related to COVID-19, 1,330 to bleeding, and 1,077 to hypertension in pregnancy.<sup>3,4</sup>

Management of hypertension in pregnancy can be done by pharmacological and

nonpharmacological therapy.<sup>5</sup> Pharmacological methods used by standard services are antihypertensive drugs and standard antenatal care (routine blood pressure monitoring). Pharmacological therapy in hypertension has good effectiveness, but its application can cause side effects at the beginning of use, and antihypertensive drugs that are consumed regularly will cause unwanted long-term effects and can cause headaches and shortness of breath.<sup>6</sup> Nonpharmacological efforts that can be made to reduce hypertension are by providing hyperthermia technology. One is foot hydrotherapy (soaking feet using warm water), which relies on the body's response to water and its low-tech approach.<sup>7</sup> Scientifically, soaking the foot, especially with warm water, has many benefits for the body, especially in improving blood circulation. Soaking the feet in warm water

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Received: 15 July 2024; Revised: 2 August 2024; Accepted: 2 August 2024; Published: 21 August 2024

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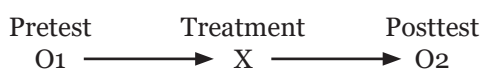
with a temperature of 37–39°C is vital because cold heat alternation can occur, which stabilizes the work of the heart and blood flow.<sup>8</sup> One of the herbal ingredients that can be combined with foot baths is red ginger (*Zingiber officinale* var. rubrum). The essential oil content in red ginger will provide a warm effect and a spicy odor so that blood vessels become wide and blood flow becomes smooth.<sup>9,10</sup>

Previous studies have explained that the provision of foot soak therapy with red ginger decoction affects lowering blood pressure in pregnant women with preeclampsia.<sup>11,12</sup> In Inayah and Anonim<sup>13</sup> in the intervention group, there was a decrease in systolic 29.35 mmHg and diastolic 16.00 mmHg, research by Malibel et al.<sup>14</sup> experimental method in rats given with nanoemulsion RGE (360 mg/200 g b/b) experienced a significant decrease in systolic blood pressure ( $p < 0.05$ ) from 142±1 mmHg to 107±6 mmHg and diastolic blood pressure from 106±1 mmHg to 84±4 mmHg.

This study aimed to determine the effectiveness of red ginger (*Zingiber officinale* var. rubrum) foot hydrotherapy in lowering blood pressure among pregnant women with hypertension.

**Methods**

This quantitative research employs a pre-experimental, one-group pretest-posttest design. Observations were made before and after the intervention.



Description: O1: blood pressure monitoring in pregnant women with hypertension before foot hydrotherapy with red ginger; X: foot hydrotherapy with red ginger; and O2: blood pressure monitoring in pregnant women with hypertension after foot hydrotherapy with red ginger.<sup>15</sup>

This study included all 256 pregnant women who visited the Talaga Community Health Centre, West Java, from May 2023 to July 2023. The total sample found was 32 pregnant women with hypertension.

The stages in this research began with identifying the research sample; a sample of 32 pregnant women with hypertension was obtained, and after giving informed consent,

the experimental intervention was carried out. The media used for foot hydrotherapy with red ginger was a water thermometer and a watch to help measure the water temperature—and warm water with a temperature of 37°C. The researchers visited every house of participants for seven days, ranging from 15 to 30 minutes in the morning. Data analysis was done univariately and bivariately using normally distributed data with a paired t-test.<sup>16</sup> Research ethics follow the rules determined by the Institute of Health Sciences Kuningan number 41/EP/Stikku/2023.

**Results**

The results of the univariate analysis in this study describe the characteristics of respondents, including age, parity, gestational age, and body mass index. The results of the analysis of the characteristics of respondents can be seen in Table 1.

**Table 1 Characteristics of Respondents**

Characteristics	n=32
Age (years)	
<20	3
20–35	13
>35	16
Parity	
Primigravida	7
Multigravida	17
Grande multipara	8
Gestational age (week)	
13–24 (trimester II)	11
25–36 (trimester III)	21
Body mass index	
Underweight	0
Normal weight	14
Obese	18

**Table 2 Overview of Systole and Diastole Blood Pressure Measurement Results of Pregnant Women with Hypertension**

Blood Pressure	Min	Med	Max
Pretest sistole	140	152.50	180
Pretest diastole	90	98.50	113
Posttest sistole	123	138.50	162
Posttest diastole	84	91.00	101

**Table 3 Overview of Average Blood Pressure Pretest and Posttest of Foot Hydrotherapy with Red Ginger**

Blood Pressure	Mean	SD	Min	Max
Pretest sistole	154.09	9.596	140	180
Pretest diastole	100.22	5.999	90	113
Posttest sistole	140.22	9.339	123	162
Posttest diastole	91.62	4.654	84	101

Table 1 shows that pregnant women with hypertension are primarily found in pregnant women aged >35 years, totaling 16 of 32 respondents. Multigravida became the most parity of pregnant women, totaling 17 of 32 respondents. Most of the third trimester gestational age was 21 of 32 respondents. The highest body mass index is obesity, totaling 18 of 32 respondents.

Table 2 describes the result of blood pressure measurements in pregnant women with hypertension in the Talaga Health Centre work area in 2023; the lowest systole before the intervention was 140 mmHg, and the highest was 180 mmHg. For diastole before treatment, the lowest was 90 mmHg, and the highest was 113 mmHg. In blood pressure measurements after treatment, the lowest systole was 123 mmHg, and the highest was 162 mmHg, while for diastole, the lowest was 84 mmHg, and the highest was 101 mmHg.

Table 3 shows that the average systole blood pressure in pregnant women before treatment was 154.09 mmHg, and after treatment, it was 140.22 mmHg, so there was a decrease of about 13.87 mmHg. The average diastole in pregnant women before treatment was 100.22; after treatment, it was 91.62, so there was a decrease of about 8.6 mmHg.

The results of bivariate analysis in this study were used to determine the effectiveness of foot hydrotherapy with red ginger on lowering blood

pressure in pregnant women with hypertension in the working area of Talaga Health Center in 2023.

Based on the paired t-test analysis results, blood pressure measurements before and after treatment were obtained at a p-value of <0.001.

## Discussion

Every pregnant woman in the age group not at risk or risk <20 and >35 years must carry out intensive pregnancy monitoring to minimize risk factors for hypertension in pregnancy through adequate and regular antenatal care visits.<sup>17</sup> Parity in pregnant women can determine the risk factors for hypertension in pregnancy, especially in primigravida. There is an immunologic disorder (blocking antibodies) where the production of inhibitory antibodies is reduced and can inhibit the maternal spiral artery's invasion rate by trophoblasts to a certain extent to interfere with the function of the placenta. Meanwhile, when looking at gestational age in trimesters I, II, and III, it can be known with the theory of placental implantation ischemia, which reads that the older the gestational age causes high blood pressure to increase. When hypertension occurs in the second trimester of pregnancy (20 weeks), pregnant women tend to experience Preeclampsia characterized by laboratory results of positive urine protein.<sup>18</sup> Calculation of body mass index, especially in pregnant women with obesity, hurts the mother and the fetus she is carrying, both during pregnancy, childbirth, and postpartum. One of the impacts of the mother is at risk of chronic hypertension because excessive body mass index can make the heart too heavy and pressure on blood vessels increases due to thick fat.

Research results by Arinda and Khayati<sup>9</sup> show that increasing blood pressure in pregnant women is a form of adaptation during pregnancy. Increased left ventricular work, left ventricular

**Table 4 Analysis of the Effectiveness of Foot Hydrotherapy with Red Ginger on Reducing Blood Pressure in Pregnant Women with Hypertension**

Blood Pressure	n=32	Mean	p
Systole blood pressure before treatment–systole blood pressure after treatment	32	15.719	0.001
Diastole blood pressure before treatment–diastole blood pressure after treatment	32	8.594	0.001

mass, and end-diastolic phase volume in pregnant women increase cardiac output. During early pregnancy, cytotrophoblast cells enter the uterine spiral arteries and replace the endothelial layer by damaging the medial elastic tissue, muscles, and nerves sequentially.<sup>19</sup> The increase in blood pressure due to the body's adaptation process during pregnancy is an increase in cardiac output due to increased left ventricular work, left ventricular mass, and volume at the end of the diastolic phase in pregnant women. Hypertension in pregnancy mainly occurs in the second to third trimester of pregnancy.<sup>9,20</sup> Increased blood pressure in pregnant women is a form of adaptation during pregnancy. There is an increase in left ventricular work, left ventricular mass, and end of diastolic phase volume in pregnant women, increasing cardiac output. During early pregnancy, cytotrophoblast cells enter the uterine spiral artery and replace the endothelial layer by damaging the medial elastic tissue, muscles, and nerves in sequence.<sup>19</sup> The increase in blood pressure due to the body's adaptation process during pregnancy is an increase in cardiac output due to increased left ventricular work, left ventricular mass, and end-of-diastolic phase volume in pregnant women. Hypertension in pregnancy mainly occurs from the second to third trimester of pregnancy.<sup>20</sup>

The average systole blood pressure in pregnant women after treatment was 140.22 mmHg, so there was a decrease of about 13.87 mmHg. While the average diastole was given a treatment of 91.62, so there was a decrease of about 8.6 mmHg. This study is in line with research conducted by Hafidz et al.,<sup>11</sup> which shows that pregnant women respondents experienced a decrease in blood pressure after being given a foot soak with warm water by as many as 16 people (100%). Foot soak therapy with a red ginger decoction is one technique to reduce blood pressure by soaking the feet in warm water containing red ginger decoction.<sup>21</sup>

The warm feeling of ginger can widen blood vessels to facilitate blood circulation and ease the work of the heart.<sup>22</sup> The widening of blood vessel diameter will be followed by a decrease in blood pressure. The mechanism of lowering blood pressure comes from the heat effect of warm water and the essential oil content in ginger, which also has a hot sensation that will hit the skin on the soles of the feet to the ankles; there is a conduction process between warm red ginger boiled water

and the skin of the feet so that vasodilation (dilation) of blood vessels occurs. The dilation of blood vessels will stimulate baroreceptors located in several parts of the body, one of which is in the carotid sinus and aortic arch. Furthermore, it will send impulses to the medulla oblongata and activate the parasympathetic nerves. In this study, foot hydrotherapy with red ginger was performed because the essential oil content in red ginger was the highest compared to other gingers.

To reduce the risk factors for pregnancy with hypertension, pharmacological and nonpharmacological therapy is a solution that needs to be considered. This research can become a reference for evidence-based midwifery practice in providing midwifery care.

## Conclusion

Red ginger using the foot hydrotherapy method has been proven effective in lowering blood pressure in pregnant women.

## Conflict of Interest

None declared.

## Acknowledgment

This research is in synergy with the Department of Biology, Faculty of Teaching Training and Education, Universitas Pasundan, in 2022/2024.

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