



Original Article

## The effectiveness of red ginger compress to prevent breast engorgement, reduce breast pain and prostaglandin hormone levels in postpartum mothers

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### ABSTRACT

**Background:** The active ingredients of ginger, such as gingerol, shogaol, zingerone, and paradol, are compounds that play a significant role in anti-inflammatory and analgesic properties. Previous studies that have been carried out using red ginger showed significant results on the severity of breast engorgement; however, these studies have not measured the decrease in levels of the hormone prostaglandin, which is an indicator of engorgement and pain. Previous studies have also shown the impracticality of the intervention. This study has made red ginger "param" (medicinal powder to rub on the body), but the param formulation needs to be tested.

**Purpose:** Analyze the effectiveness of red ginger compress in preventing breast engorgement and reducing breast pain and prostaglandin hormone levels in postpartum mothers.

**Methods:** This is experimental research with a post-test only with a control group design. Respondents in this study were postpartum mothers. Respondents were randomly allocated into two groups, control groups (n=15) and intervention groups (n=15). The intervention group receives red ginger compresses twice daily for five consecutive days. The variables observed were breast engorgement, breast tenderness, and levels of prostaglandins. Data were analyzed using the independent T-test and Mann-Whitney test.

**Results:** There was an effect of a red ginger compress to prevent breast engorgement ( $p < 0.05$ ) and reduce breast pain ( $p < 0.05$ ); however that is not significant reduce prostaglandin hormone levels ( $p > 0.05$ ).

**Conclusions:** Red ginger compress effectively prevents breast engorgement and reduces breast pain, but not significant in reducing prostaglandin hormone levels.

### INTRODUCTION

Breast engorgement is one of the main reasons for the low coverage of exclusive breastfeeding.<sup>1</sup> According to the Indonesian Demographic and Health Survey (IDHS), from 2012 to 2013, as many as 55% of breastfeeding mothers in Indonesia experience breast engorgement.<sup>2</sup> Breast engorgement can continue to have more severe complications if not treated properly. Breast engorgement can be pathological as the breast feels firm, complete, and painful.<sup>3,4</sup> Untreated breast engorgement will lead to more severe complications such as breast abscess and mastitis.<sup>5</sup> Medical and non-medical therapies can be used to treat

breastfeeding problems. Medical therapy that is commonly given to nursing mothers includes metoclopramide and domperidone. These drugs are safe for babies but can affect the quality of breast milk and cause side effects.<sup>6</sup>

Breastfeeding mothers who used drug therapy reported side effects as much as 15.4% when taking the drug, such as headache, diarrhea, stomach cramps, dry mouth, breast discomfort, tingling, and changes in appetite and mood.<sup>7</sup> The side effects caused by medicinal chemicals make researchers look for alternative treatments that are easy and effective. One therapy that is easy to do at home is breast compressing. Compress is a breast treatment

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that is simple, practical, and can be done independently.<sup>8</sup> Ginger has anti-inflammatory, anti-pain, anti-bacterial, and antipyretic properties.<sup>9</sup> The active ingredients of ginger, such as gingerols, shogaol, zingerone, and paradol, are compounds that play a significant role in anti-inflammatory and analgesic properties.<sup>10</sup>

A previous study regarding ginger compresses on the severity of breast engorgement in postpartum mothers showed a significant effect on the severity of breast engorgement. The compress temperature was 43°C–46°C and maintained at this temperature throughout the intervention by placing the compress in hot water every 2 min.<sup>11</sup> Research on the effect of herbal compresses on maternal breast engorgement also showed a significant effect; the interventions in this research used herbal compress balls weighing 250 g and containing dry herbs. Before treatment, the herbal balls are steamed in a stacked steamer for 20 minutes.<sup>12</sup> Two previous studies showed the impracticality of the intervention. Research on the effect of topical curcumin for mastitis treatment also showed significant results; however, these studies have not measured the decrease in levels of the hormone prostaglandin, an indicator of engorgement and pain.<sup>13</sup>

This impracticality makes researchers try to make a ginger compress using ginger param so postpartum mothers can easy to use it. However, the param formulation has never been tested, so this study aims to make param formulations and test the effectiveness of the red ginger param. In order to overcome this gap, the researcher intends to analyze the effectiveness of red ginger compresses in preventing breast engorgement, reducing breast pain, and reducing prostaglandin hormone levels in postpartum mothers.

## METHOD

### *Study Design*

This is an experimental study, with a post-test only with a control group design.<sup>14</sup>

### *Setting and Respondents*

This research was conducted in the Depok III and the Ngemplak I Public Health Center working areas between May and June 2021. The population in this study was all postpartum mothers. The number of the samples is 30 respondents. The sample was randomly divided into intervention groups (n=15) and control groups (n=15). The intervention in the treatment group was giving red ginger compresses twice daily, 20 minutes for five days.<sup>15</sup> The researchers only conducted health education on breastfeeding techniques in the control group. The inclusion criteria in this study were all mothers who were breastfeeding on the first day of postpartum, mothers who received Inde-

pendent Breastfeeding Initiation (IMI), a history of standard delivery, and hospitalization with the baby. The exclusion criteria were sick babies and babies being treated separately from their mothers.

### *Making the Param*

Researchers made red ginger param using fresh red ginger. Fresh ginger cleaned and thinly sliced crosswise. The sliced ginger is then dried in the sun to dry. The ginger that has gone through the drying process is ground into ginger powder. Ginger param is made by mixing 100 grams of ginger powder and 10 grams of rice flour.<sup>11</sup> The two ingredients are mixed and given 25 ml of water. Param is then formed into small pieces, each weighing 10 grams.<sup>16</sup> Param pieces are dried in the sun for about one day or until dry.

### *Experimental Procedure*

The intervention group was given a red ginger compress. Breast compression was done by mixing one param with 5cc of water; for one breast, it took one piece of ginger param weighing 10 gr, then blended param in all parts of the breast except the areola and nipple. Compressing the breast is done twice daily for 20 minutes for five days. The control group received breastfeeding health education.

### *The Variables, Instrument, and Measurement*

The variables observed in this study were breast engorgement, breast pain, and prostaglandin hormone levels. Breast engorgement was directly observed and measured using an instrument checklist breast engorgement. The severity of breast engorgement was assessed using the total score obtained for the symptoms of engorgement (Severity Index = Erythema + Breast Tension + Breast Pain, with scores ranging from 0 to 19).<sup>17</sup> Breast pain was measured using the Numeric rating scale (NRS),<sup>18</sup> while the levels of the hormone prostaglandin were measured using Enzym-linked immunosorbent assay (ELISA). Measurement of breast engorgement and breast pain was carried out on the third and fifth day after treatment, while the measurement of prostaglandin hormone levels was carried out on the fifth day after the intervention.

### *Data Analysis*

The analysis used Independent T-test to determine the mean score of breast engorgement between two groups and the Mann-Whitney test to determine the mean score of breast tenderness and prostaglandin hormone levels.

### *Ethical Consideration*

The ethical license was obtained from the Health Polytechnic Health Research Ethics Commission, Ministry of Health Semarang No. 135/EA/KEPK/2021.

## RESULTS

Figure 1 is an example product of the red ginger param. Breastfeeding mothers in the intervention group received red ginger compresses using param for five consecutive days. Param is made using fresh red ginger that has been dried and then turned into a powder. Ginger param is made by mixing 100 grams of ginger powder and 10 grams of rice flour. The red ginger param in this study followed the dose of the previous study, which was to use 10 grams of ginger powder in one breast with breast engorgement.<sup>16</sup> Tabel 1 shows the characteristics of the depression level of the respondents included in the category of not having a risk of depression in both groups. Most respondents have a good level of support and a sound breastfeeding frequency.



Figure 1. Red Ginger Param

Table 1. Characteristics of Respondent (n=30)

Characteristics	Result
<b>Age</b>	
<20	2 (6.7%)
20-35	26 (86.6%)
>35	2 (6.7%)
<b>Anxiety Level</b>	
Depression not likely	26 (86.6%)
Depression possible	4 (13.3%)
High possibility of depression	0 (0%)
Depression	0 (0%)
<b>Support Level</b>	
Good support	28 (93.3%)
Medium support	2 (6.7%)
Less support	0 (0%)
<b>Breastfeeding Frequency</b>	
Good	24 (80%)
Medium	6 (20%)
Less	0 (0%)

Figure 2 shows that the average score of breast engorgement in the intervention group on the third day was 2.73, while in the control group was 6.87 ( $p<0.001$ ). On the fifth

day, the average score of breast engorgement in the intervention group was 1.73, while in the control group was 4.13 ( $p<0.05$ ). The calculation of the effect size value on the fifth day obtained a result of 1.196. Figure 3 shows that the breast pain score in the intervention group on the third day was 1.2, while in the control group was 3.67 ( $p<0.001$ ). On the fifth day, the breast pain score in the intervention group was 0.8, while in the control group was 1.8 ( $p<0.05$ ). The calculation of the effect size value on the fifth day obtained a result of 0.851 which means that the red ginger compress has a moderate effect in preventing breast pain. The graph shows that the average breast engorgement and pain score in the intervention group was lower than in the control group, which means that red ginger compresses can prevent the incidence of breast engorgement and pain instead of reducing it.

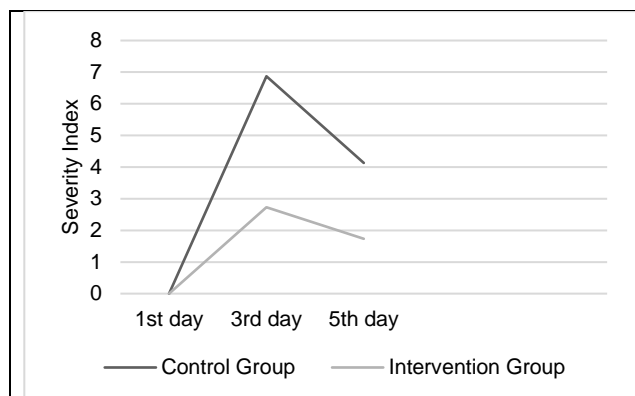
Table 4. The Difference in Prostaglandin Hormone Level on the Fifth Day

Prostaglandin Hormone Level	Mean±SD	p-value	Effect Size
<b>Intervention</b>	621.87± 254.43	0.191	0.530
<b>Control</b>	793.13± 378.98		

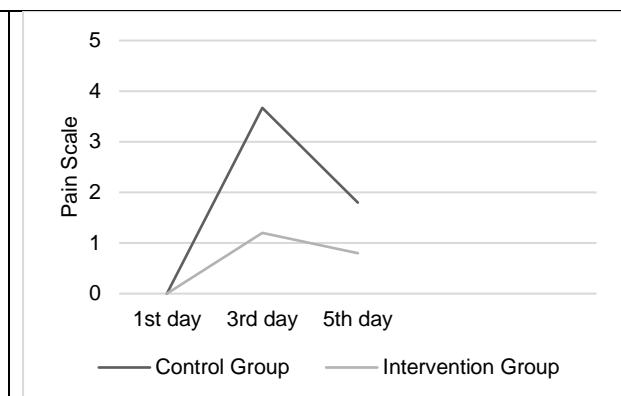
Table 4 shows no significant difference between the levels of prostaglandin hormones between the control and intervention groups ( $p>0.05$ ). However, the average levels of prostaglandins in the control group are more significant than the average levels of the intervention group. The calculation of the effect size value shows the result of 0.530, which means that the red ginger compress has a moderate effect on decreasing levels of the hormone prostaglandin.

## DISCUSSION

In this study, giving red ginger compresses twice a day for five consecutive days effectively prevented the incidence of breast engorgement and breast pain in postpartum mothers. Similarly, a previous study that reported the effectiveness of ginger compresses compared with warm compresses showed that ginger compresses were more significant in reducing breast engorgement and pain than warm compresses.<sup>11</sup> Ginger contains active compounds such as gingerols, shogaol, and paradol which have anti-inflammatory and analgesic effects.<sup>19</sup> These compounds are fat-soluble, can be absorbed through the skin, and provide pain relief. Another study on the effects of medical plants also reported significant effects in reducing breast engorgement and breast pain. Research on curcumin cream shows effective results in significantly reducing pain, tension, and erythema among breastfeeding women without any side effects.<sup>13</sup> Curcumin belongs to the ginger family; therefore, the study results align with ours.



**Figure 2.** Average Breast Engorgement Rate



**Figure 3.** Breast Pain

This study found that the intervention of red ginger compresses on the third and fifth days effectively prevented the incidence of breast engorgement and breast pain in postpartum mothers. However, the average post-test value of the intervention group on the fifth day was lower than on the third day, which means that the red ginger compress intervention was more effective for five days than only three days. Red ginger contains phenolic compounds, which have been shown to have an anti-inflammatory effect similar to the mechanism of mefenamic acid and ibuprofen, which are NSAIDs.<sup>20</sup>

Inflammation is a body's defense mechanism and immune response to fight infection.<sup>21</sup> One of the signs of inflammation is an increase in oxygenation of arachidonic acid, which is metabolized through two enzyme pathways, cyclooxygenase, and 5-lipoxygenase, to produce prostaglandins and leukotrienes.<sup>22</sup> Red ginger has an effect that is influenced by gingerol compounds. These compounds work by inhibiting the synthesis of cyclooxygenase and lipoxygenase and preventing the metabolism of arachidonic acid.<sup>19</sup>

Prostaglandins play a role in the formation of the inflammatory response. The biosynthesis of prostaglandins is significantly increased in inflamed tissues. During the inflammatory response, both levels and production of prostaglandins change dramatically. Prostaglandin production is generally deficient in noninflamed tissues but increases immediately following acute inflammation.<sup>23</sup> Red ginger can reduce levels of the hormone prostaglandin because ginger contains compounds that can inhibit prostaglandin biosynthesis. The compounds involved are gingerols and diarylheptanoids, which work by inhibiting the biosynthesis of leukotrienes, namely arachidonic 5-lipoxygenase. Diarylheptanoid is ginger's most active component, inhibiting the formation of 5-lipoxygenase.<sup>24</sup>

In this study, red ginger did not show significant results on prostaglandin hormone levels. This is because the study has several limitations, such as not controlling the factors affecting prostaglandin hormone levels. The increase or

decrease in prostaglandin hormone levels is influenced by various factors, namely anxiety levels, nutritional status, and Body Mass Index (BMI). Nutritional status is related to the presence of food that enters the body. A person's nutritional status will affect metabolism in the body related to hormone metabolism.<sup>25</sup> The results showed that the composition of fatty acids derived from food increased prostaglandin biosynthesis.<sup>26</sup> Women with an index more significant than average had higher levels of prostaglandins. The more fat, the more prostaglandins are formed.<sup>27</sup>

The results of previous studies comparing the effectiveness of red ginger extract with mefenamic acid showed that red ginger extract and mefenamic acid could significantly reduce prostaglandin hormone levels and pain scores. Even though using red ginger and mefenamic acid effectively reduced hormone prostaglandin levels, the mean difference in the two groups showed no significant result ( $p > 0.05$ ).<sup>24</sup> The difference between this study and previous studies is that in previous studies, ginger was given in the form of extracts three times a day. In contrast, in this study, ginger was only given topically. In addition, this study has several limitations, such as not controlling the factors that can affect prostaglandin hormone levels.

## CONCLUSIONS AND RECOMMENDATION

The application of red ginger compress twice a day for five days has been shown to prevent breast engorgement and breast pain significantly but does not significantly reduce prostaglandin hormone levels. Interventions should be carried out as early as possible after delivery; in addition to breast compressing, postpartum mothers are also expected to breastfeed their babies frequently. The researcher recommends that further researchers make a more practical formula so postpartum mothers can use red ginger compresses easily.

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