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The Efficacy of Red Ginger (*Zingiber officinale var. rubrum*) Decoction in Attenuating Primary Dysmenorrhea Intensity in Adolescents: A Quasi-Experimental Study

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ABSTRACT

Primary dysmenorrhea is a common gynecological complaint among adolescents, often characterized by lower abdominal pain. Lower abdominal pain typically occurs during or before menstruation and is occasionally accompanied by weakness, nausea, vomiting, and dizziness. Gingerol, shagaol, and zingerol, which are found in red ginger decoction, work to inhibit the prostaglandin hormone that causes pain. The purpose of this study is to find out how much red ginger decoction (Zingiber officinale var. rubrum) can help teenage females at SMPN 1 Pariaman experience less severe primary menstrual pain. This quasi-experimental study with a pretest-posttest control group design included 30 adolescents (15 per group) selected via purposive sampling. The data collection tool was the NRS (Numeric Rating Score) observation sheet. utilizing the Mann-Whitney test to analyze data. According to univariate analysis, the intervention group's pain decreased from moderate (60%) to mild (66.7%), while the control group's pain did not reduce. The intervention group exhibited a reduction in mean pain scores, with a post-intervention mean rank of 9.33 compared to the control group's mean rank of 21.67 ($p < 0.05$). The results showed a statistically significant difference between menstrual pain intensity in the intervention and control groups. This means that administering red ginger decoction significantly reduced menstrual pain intensity compared to the untreated group. The findings indicate that red ginger decoction may be an effective non-pharmacological option for managing primary dysmenorrhea in adolescents.

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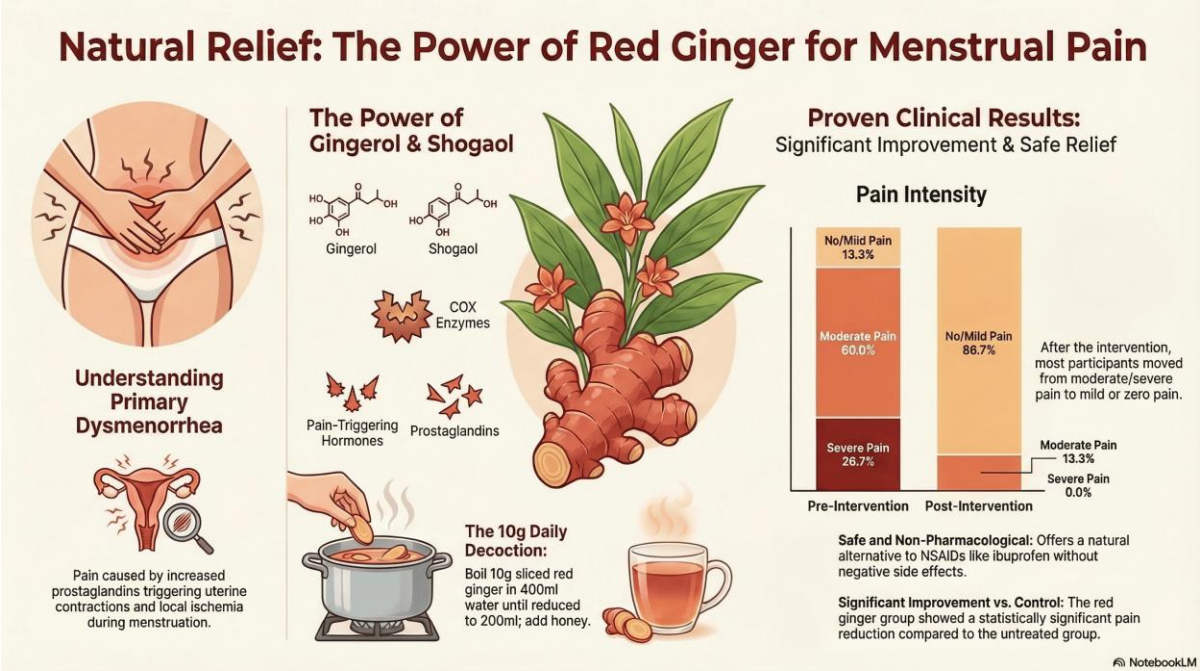
Key Messages:

- Red ginger (Zingiber officinale var. rubrum) decoction serves as a clinically effective non-pharmacological intervention for significantly attenuating the intensity of primary dysmenorrhea in adolescent females, evidenced by a statistically significant reduction in pain scores compared to untreated control groups.
- The analgesic and anti-inflammatory properties of red ginger are primarily attributed to its bioactive compounds, gingerol and shogaol, which inhibit the cyclooxygenase (COX) enzyme and suppress the synthesis of prostaglandins, the principal mediators of uterine contractions and menstrual pain.

GRAPHICAL ABSTRACT



INTRODUCTION

Dysmenorrhea is pain during menstruation that is generally caused by increased levels of prostaglandins, especially prostaglandin F2α, which is produced by the endometrium and triggers uterine contractions and vasoconstriction of uterine blood vessels, resulting in local ischemia and pain. This condition peaks in the first 24–48 hours of menstruation, when prostaglandin levels are highest(1). Dysmenorrhea is divided into two types: primary dysmenorrhea, which occurs without organic abnormalities and is generally experienced by adolescents before the age of 20, and secondary dysmenorrhea, which appears at an older age (usually over 30) and is caused by pathological conditions such as endometriosis or uterine fibroids(2)(3).

Menstrual pain without any underlying medical problem is known as dysmenorrhea. One of the most common problems among women is dysmenorrhea. Despite not being life-threatening, dysmenorrhea frequently interferes with a person's everyday routine. Dysmenorrhea in teenage females can have a major effect on how well they learn. They may become less enthusiastic, have difficulty focusing, and experience reduced concentration as a result of this illness. Consequently, it may be challenging to comprehend or assimilate the offered educational content (4).

According to the ASEAN report (2018), the prevalence of dysmenorrhea in Southeast Asia is quite high, at 10–15% in Singapore, 35–40% in Malaysia, and 65% in Thailand. In Indonesia, dysmenorrhea was reported to be experienced by 107,673 women (64.24%), with primary dysmenorrhea accounting for 54.89% and secondary dysmenorrhea for 9.36%. Data from Jakarta shows that 87.5% of women experience primary dysmenorrhea, with pain distribution consisting of 14.76% severe pain, 64.76% moderate pain, and 20.48% mild pain, while secondary dysmenorrhea is experienced by 12.5% of women (5). Nationally, dysmenorrhea affects approximately 55% of Indonesian women, with primary dysmenorrhea predominating. The impact on activity is quite significant, particularly among adolescent girls: 59.2% feel less active, 5.6% miss school or work, and only 35.2% experience no disruption to their activities (6). These data demonstrate that dysmenorrhea is a reproductive health issue that requires attention, given its high prevalence and impact on women's quality of life.

Both pharmaceutical and non-pharmacological treatments are available for the management of dysmenorrhea. Pharmacological treatments for dysmenorrhea include non-steroidal anti-inflammatory medicines (NSAIDs), which include aspirin, mefenamic acid, and ibuprofen. Warm compresses, dietary changes, drinking warm beverages, rest, getting enough sleep, massage, and herbal therapies like ginger

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are some non-pharmacological ways to manage dysmenorrhea (7).

Menstrual pain must be promptly and appropriately treated in order to preserve both physical and emotional well-being and lessen the suffering that it causes. Because they don't have negative side effects, non-pharmacological remedies, including red ginger decoction, may be an option (8).

An example of a herbaceous plant is the red ginger plant, Zingiber officinale Roxb. Var. Rubra, with a green pseudostem about 40–50 cm tall, shaped like a rhizome. It contains 2-3% essential oils, which include zingiberin, kemferia, limonene, borneol, cineol, zingiberal, linalool, geraniol, kavikol, zingiberol, gingerol, and shogaol (9).

Red ginger contains key active compounds, such as gingerol and shogaol, with anti-inflammatory and analgesic properties. Gingerol, which is dominant in fresh ginger, and shogaol, which is formed during heating or drying, inhibit the cyclooxygenase enzymes (COX-1 and COX-2). This enzyme plays a crucial role in the synthesis of prostaglandins, substances that trigger pain and uterine muscle contractions during menstruation. By inhibiting the COX pathway, gingerol and shogaol reduce prostaglandin production, making them effective in relieving dysmenorrhea pain, as evidenced by studies showing a decrease in dysmenorrhea intensity after ginger consumption (10)(11).

Red ginger is a plant widely available and easy to grow. Red ginger's use as an alternative natural remedy, including attempts to effectively and reasonably alleviate the pain associated with dysmenorrhea, is enhanced by its ease of acquisition and processing. Students interviewed for a preliminary study said they had never eaten cooked red ginger when they were experiencing menstrual pain. This is because pupils who have menstrual pain may become less motivated, find it harder to focus, and become less attentive. Because of this, some people may find it difficult to comprehend or assimilate the offered learning material, while others may even find it impossible to follow the course. Considering this, the purpose of this study is to investigate if giving cooked red ginger (*Zingiber officinale var. rubrum*) to teenage girls will lessen the severity of their primary monthly discomfort, or dysmenorrhea.

METHODS

This kind of study uses a control group and a quantitative, quasi-experimental pretest-posttest design. The study was conducted in 2024, from March to August. at Pariaman's SMP Negeri 1. Using a purposive sampling technique, the study's population comprised 245 female students in grades VII, VIII, and XI who had menstrual pain. Of these, 15 were assigned to the intervention group and 15 to the control group, with a 10% reserve sample. Female students between the ages of 13 and 15 who were experiencing primary dysmenorrhea, not taking any medications or other treatments that might affect menstrual pain during the study period, willing to participate in the research, and having parental or guardian consent, and free of red ginger allergies or intolerances were eligible to be included. Female students who do not have menstrual pain or who have menstrual pain as a result of specific medical issues are excluded. Students who are female and have a history of hormonal imbalances or chronic illnesses that can impact menstrual pain, are currently receiving additional treatment or medication that may impact the study's findings, unwilling to take part in the full set of studies, or to leave before the study is finished, experience adverse reactions or allergies to red ginger while the intervention is underway.

Standard operating procedures (SOP) for preparing red ginger drinks and NRS (Numeric Rating Score) observation sheets served as the study's instruments.

Researchers used 400 milliliters of water and 10 grams of red ginger to produce red ginger-infused water. The preparation process involves peeling the red ginger, washing it well under running water, then boiling the sliced ginger in 400 milliliters of water until only 200 milliliters remain, and finally adding 1 teaspoon (±5 milliliters) of water. When the decoction is heated (±40°C), honey is added to prevent high temperatures from damaging the honey's nutrients and enzymes. Put it in a bottle once it's cool. Respondents may drink the red ginger boiling water once daily for three days in a row, after breakfast, beginning on the first day of their period. Physiologically, the most intense menstrual pain occurs in the first one to three days of menstruation due to increased production of prostaglandins, which cause uterine muscle contractions and pain (12).

The findings of assessments of dysmenorrhea in female students before and after the intervention

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are displayed on observation sheets with a category-based NRS interval pain scale: 0: Absolutely no pain, 1–3: Activities are not much disrupted, mild pain is still bearable, 4–6: Moderate discomfort that is beginning to interfere with activity and focus; medication or other assistance may be necessary. 7–10: Severe to extremely severe pain, severely disrupted activities, typically necessitates prompt medical attention.

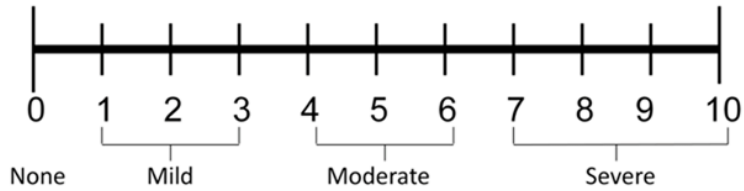

Figure 1: Numeric rating scale (NRS)

Bivariate analysis was conducted initially, followed by univariate analysis to characterize respondent characteristics and menstrual pain scores at the pretest and posttest. The Shapiro-Wilk test was used to check for normality. A nonparametric test (the Mann–Whitney U Test) was employed because the data were not normally distributed. Under license number 083/II/KE.PS/2024, the research has been ethically assessed and approved by the Piala Sakti Health College Ethics Committee.

RESULTS

Table 1 shows that the most common age group in the intervention group was 13 years old, specifically 8 female students (53.3%), the most common menstrual cycle was 28-35 days, specifically 11 female students (73.3%), the most common menstrual duration was 6-7 days, specifically 12 female students (80%), and the most common menstrual pain was >2 days, specifically 9 female students (60%). In contrast, the most common age group in the control group was 13 years old, specifically 7 female students (46.7%), the most common menstrual cycle was 28-35 days, the most common menstrual duration was 6-7 days, specifically 10 female students (66.7%), the most common menstrual duration was 6-7 days, specifically 8 female students (53.3%), and the most common menstrual pain was >2 days, specifically 10 female students (66.7%).

Table 1. Respondent Characteristics

Respondent Characteristics	Intervention group		Control group	
	n	%	n	%
Age (years)				
13 years	8	53.3	7	46.7
14 years	5	33.3	4	26,7
15 years	2	13.3	4	26,7
Menstrual cycle				
<28 days	4	26.7	5	33.3
28-35 days	11	73.3	10	66.7
Menstrual period				
4-5 days	3	20	7	46.7
6-7 days	12	80	8	53.3
Duration of menstrual pain				
1-2 days	6	40	5	33.3
>2 days	9	60	10	66.7

Table 2 shows the differences in levels of menstrual pain (dysmenorrhea) in the intervention and control groups before and after treatment. In the intervention group given red ginger (Zingiber officinale var. rubrum) decoction, a significant reduction in menstrual pain intensity was observed. Before the intervention, most respondents experienced moderate (60.0%) or severe (26.7%) pain, but after the intervention, this increased to mild (66.7%) or no pain (20.0%). In contrast, in the control group that did not receive treatment, the proportion of pain levels did not change significantly; most respondents continued to experience moderate pain (60.0%) both before and after treatment. The analysis using the Wilcoxon test showed a Z-value of -3.886 with a p-value of 0.000 ($p < 0.05$). This indicates that there is a

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highly statistically significant difference between the intensity of menstrual pain in the intervention group and the control group. This means that administering red ginger decoction significantly reduced the intensity of menstrual pain (primary dysmenorrhea) compared to the group that did not receive treatment.

Table 2. The Efficacy of Red Ginger (Zingiber officinale var. rubrum) Decoction in Attenuating Primary Dysmenorrhea Intensity in Adolescents

Menstrual pain	Intervention Group				Control Group				Statistical Test	
	Pretest		Posttest		Pretest		Posttest			
	n	%	n	%	n	%	n	%	Z	*P*-value
No pain	0	0	3	20,0	0	0	0	0		
Mild pain	2	13,3	10	66,7	3	20,0	4	26,7		
Moderate pain	9	60,0	2	13,3	9	60,0	9	60,0		
Severe pain	4	26,7	0	0	3	20,0	2	13,3		
Total	**15**		**15**		**15**		**15**			
Min – Max	0 - 4				2 - 7					
Mean Rank	9.33				21.67				**-3.886**	**0.000**

DISCUSSION

According to the study's analytical results, prior to the intervention, respondents in both the intervention group and the control group reported experiencing moderate menstrual pain, with 60% of them falling into this category. This suggests that the starting circumstances of both groups were essentially the same. Menstrual pain with cramps that are concentrated in the lower abdomen is known as dysmenorrhea (13). Dysmenorrhea, another name for cramps, pain, and other discomfort related to menstruation, affects most women to varying degrees (14). Menstrual pain or dysmenorrhea is a symptom, not an illness.

Increased uterine secretion of prostaglandin F2α (PGF2α) and prostaglandin E2 (PGE2) during endometrial shedding is the pathophysiological mechanism underlying dysmenorrhea. Prostaglandins contribute to the development of anaerobic metabolism and uterine ischemia by promoting vasoconstriction and uterine muscle contractions. As a result, pain fibers become hypersensitive, leading to lower abdominal pain (15).

The severity of primary dysmenorrhea is thought to be influenced by a number of other factors in addition to important ones, including age, menstrual cycle, length of menstruation, and duration of menstrual discomfort. Low amounts of physical activity can increase discomfort and contractions by obstructing blood flow to the uterus (16). Menstrual discomfort is exacerbated by an imbalance in the hormone prostaglandin, which is a result of both malnutrition and obesity (17). Given that susceptibility to prostaglandins can be inherited, a family history of dysmenorrhea is a genetic component (18). While emotional stress and sleep disturbances can lower the pain threshold and increase the perception of menstrual pain (19), excessive tea or coffee consumption can cause vasoconstriction, which exacerbates pain (20).

The majority of respondents experienced mild pain, with as many as 10 (66.7%) reporting a decrease in menstrual pain, according to the findings of the Post-Test study of 15 respondents who experienced dysmenorrhea following a red ginger decoction intervention. The majority of respondents, up to 9 respondents, or 60%, experienced moderate discomfort, while the control group, which received no treatment, did not notice any change in pain. Gingerol and shogaol, two active compounds in red ginger (Zingiber officinale var. rubrum) that act as natural analgesics and anti-inflammatory agents, are responsible for the decrease in pain in this intervention group. This drug works by blocking the COX-2 enzyme, which produces prostaglandins, the primary chemicals responsible for menstrual pain and excessive uterine contractions. Red ginger has been shown to lessen dysmenorrhea, which is in line with study by Betty & Ayamah (2021) (21).

This study also supports the findings of Rini et al. (2025) (22), which demonstrate that giving red ginger extract or combining it with rosella tea can lessen the severity of dysmenorrhea. Red ginger has a substantial impact on the physiology of menstrual pain, according to the data, regardless of the method

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used. Red ginger can be administered topically or orally in various ways, as demonstrated by Harmawati et al. (2018) (23), who also showed that warm compresses containing red ginger can effectively reduce discomfort.

The results of statistical testing indicated a difference between the two groups, with a p-value of 0.000 ($p < 0.05$) and a Z value of -3.886. This suggests that there is a statistically significant difference between the intervention group's and the control group's menstrual pain levels. This indicates that, compared with the group that did not receive treatment, the administration of red ginger decoction significantly reduced the severity of monthly discomfort (primary dysmenorrhea). The findings of this study are corroborated by research by Aprilya Sinta and Trisrestuti Chrisna, which showed that respondents experienced an effect following the administration of red ginger decoction (24).

Ginger is thought to have natural warming, analgesic, antipyretic, and anti-inflammatory qualities, making it a viable non-pharmacological treatment for dysmenorrhea. Ginger contains high levels of essential oils, including gingerol, shogaol, and natural curcumin, which are useful for reducing the intensity of dysmenorrhea. Ginger functions as an anti-inflammatory by inhibiting the cyclooxygenase (COX) enzyme, which is involved in the production of prostaglandins and causes inflammation, by decreasing its activity. This will lessen the production of prostaglandins, which are inflammatory mediators. As a result, ginger is strongly advised for women suffering from dysmenorrhea, particularly those in their teens (25).

Respondents reported less menstrual discomfort because of ginger extract's warming impulses, which targeted the lower abdomen, the uncomfortable location. Skin nerve endings that are sensitive to temperature react to the warmth of ginger. By raising awareness of local temperature and initiating an adaptive response to maintain normal body temperature, this stimulation transmits impulses from the periphery to the hypothalamus (26).

Based on the study's findings and the researchers' hypotheses, there was a difference in respondents' pain experiences before and after the red ginger decoction. The students' dysmenorrhea pain subsided after consuming the red ginger drink during their periods, enabling them to go about their everyday lives without interfering with their academic work. The hormone prostaglandin, which triggers uterine contractions, is the source of the pain. Red ginger mixtures are one example of a non-pharmacological therapy that can be used to relieve menstrual pain. Red ginger's rhizomes are red and contain tiny 2-3% essential oils, as it is a herbal plant. Given that red ginger's components are highly effective as a non-pharmacological treatment for dysmenorrhea (menstrual pain), this suggests a link between its use and reduced menstrual discomfort.

This study has limitations, namely the quasi-experimental design without randomization, the relatively small sample size, and subjective pain measurement using a self-reported pain scale. These limitations are expected to be considered in future research, including the use of a randomized controlled trial (RCT) design to minimize bias and enhance internal validity. Furthermore, studies with larger sample sizes and more diverse populations, as well as those that explore the long-term effects of red ginger decoction and determine the optimal, safe, and effective dose for reducing dysmenorrhea pain, are warranted.

CONCLUSION

This study highlights the potential efficacy of red ginger (*Zingiber officinale var. rubrum*) decoction in significantly attenuating the intensity of primary dysmenorrhea among adolescent females. The potential therapeutic mechanism is attributed to bioactive compounds, specifically gingerol and shogaol, which act as natural analgesics and anti-inflammatory agents by inhibiting cyclooxygenase (COX) and suppressing prostaglandin synthesis.

These findings suggest that red ginger decoction has the potential to serve as a viable, accessible, and cost-effective non-pharmacological intervention for managing menstrual pain in adolescent populations. However, acknowledging the study's limitations—including its quasi-experimental design, small sample size (n=30), and reliance on subjective self-reported pain scales—further investigation through large-scale randomized controlled trials (RCTs) is essential to fully validate its clinical potential and establish standardized dosing protocols.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest

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