



RESEARCH ARTICLE

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The Effect Of Herbal Therapy Compress Ball On Primary Dysmenorrhea Among Adolescent Girls

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ABSTRACT

Primary dysmenorrhea is a prevalent reproductive health problem among adolescent girls and may contribute to reduced quality of life and school absenteeism. In Surakarta, its prevalence reaches 89.8%, indicating a substantial public health concern. This study evaluated the effect of herbal therapy compress ball application on primary dysmenorrhea pain intensity in adolescent girls. A pretest–posttest control group design was employed in this quasi-experimental study involving 34 adolescent girls from Posyandu Remaja Puspa Muda in Surakarta. The participants were allocated to two study groups: an intervention group and a control group. The intervention consisted of a herbal compress ball containing ginger, turmeric, lemongrass, and salt, which was applied during menstruation. Pain severity was evaluated using the WaLIDD score before and after the intervention. Statistical analyses were conducted using the Wilcoxon signed-rank test, paired-samples t-test, and Mann–Whitney U test, with a significance level of 0.05. The intervention group showed a substantial reduction in mean pain score from 6.65 ± 2.234 at pretest to 2.76 ± 2.513 at posttest, a mean reduction of 3.89 points (95% CI: 2.89–4.88; $p < 0.001$), while the control group decreased from 6.71 ± 1.863 to 5.00 ± 1.658 . The between-group analysis showed a statistically significant difference in posttest pain scores ($p = 0.005$), with a moderate effect size ($r = 0.48$). In conclusion, the herbal therapy compress ball can effectively reduce primary dysmenorrhea pain intensity among adolescent girls.

Keywords: Primary dysmenorrhea; adolescent girls; herbal therapy; nonpharmacological intervention; reproductive health

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INTRODUCTION

Primary dysmenorrhea represents a prevalent gynecological condition among adolescent girls and women of reproductive age worldwide. It commonly presents with cramping pain localized to the lower abdomen occurring within the first 48–72 hours of menstruation and may be accompanied by systemic manifestations such as fatigue, nausea, and headache^{1,2}. The prevalence of primary dysmenorrhea among adolescents is estimated to range from 50% to 90%, indicating that menstrual pain is a widespread reproductive health concern². However, the burden of primary dysmenorrhea extends beyond its prevalence, as pain intensity may range from mild to severe and affect adolescents' daily functioning. Moderate to severe pain may interfere with concentration, school attendance, and routine activities^{2,3}. Beyond physical discomfort, untreated menstrual pain has been associated with sleep disturbances, emotional instability, anxiety symptoms, and reduced overall quality of life, thereby affecting adolescents' physical, psychological, and social well-being^{2,3}. Given its potential impact on adolescents' daily activities and well-being, non-pharmacological interventions may provide a practical approach to managing primary dysmenorrhea in this population^{2,3}.

In Indonesia, the prevalence of primary dysmenorrhea among adolescent girls is reported to range between 60% and 75%, reflecting a significant reproductive health concern⁴. In Central Java, the prevalence is approximately 56%, while local surveillance in Surakarta City reports a higher prevalence of 89.8% among adolescent girls⁵. These results highlight primary dysmenorrhea as a prevalent health concern among adolescents, with the severity of pain potentially interfering with daily functioning and school participation⁶. Similarly, a recent prospective cohort study of 2,698 adolescents found that menstrual pain was associated with an additional 1-2 days of school absence per year and 42% higher odds of persistent absence⁷. However, menstrual pain is often normalized within communities, which may contribute to under recognition and limited access to appropriate management, particularly in community-based adolescent health services^{4,5}. Given the high burden of dysmenorrhea among adolescents, community based adolescent health services provide an important setting for identifying and addressing menstrual health concerns. Posyandu Remaja Puspa Muda in Surakarta was selected as the study setting because it provides a community based platform for adolescent health services, offering a relevant context for implementing and evaluating interventions targeting menstrual pain. In this setting, appropriate management of menstrual pain is important to support adolescents in maintaining their daily activities and well-being.

Pharmacological management, especially nonsteroidal anti-inflammatory drugs (NSAIDs), remains the first-line therapy for primary dysmenorrhea due to its mechanism in inhibiting prostaglandin synthesis⁸. Nevertheless, the use of analgesics should be appropriately managed because prolonged or unsupervised use may increase the risk of gastrointestinal discomfort and other adverse effects prompting increasing interest in nonpharmacological approaches⁸. Heat therapy is widely recommended because it promotes vasodilation, improves pelvic blood circulation, and reduces uterine muscle spasms. Recent therapeutic innovation has introduced the herbal therapy compress ball, which integrates thermal

therapy with medicinal herbs such as ginger (*Zingiber officinale*), turmeric (*Curcuma longa* L.), and lemongrass (*Cymbopogon citratus*)⁹. These plants contain active compounds including gingerol, curcumin, and essential oils known for their anti-inflammatory, antispasmodic, and analgesic properties^{10–12}. The herbal compress ball combines localized heat with herbal bioactive compounds that may contribute to pain relief through anti-inflammatory, antispasmodic, and analgesic mechanisms^{10–12}.

Despite the documented pharmacological potential of these herbal components, previous studies have evaluated herbal therapy compress ball for dysmenorrhea among adolescent girls. However, evidence regarding a combined herbal thermal modality containing ginger, turmeric, lemongrass, and salt remains limited, particularly in community-based adolescent health settings. The combination of these herbs is scientifically relevant because their bioactive compounds, including gingerol, curcumin, and essential oils, have been reported to possess anti-inflammatory, antispasmodic, and analgesic properties^{9–11,13}. A warm compress was used as the comparator because heat therapy is an established non-pharmacological approach for relieving menstrual pain, allowing the study to evaluate whether the herbal therapy compress ball provides a greater reduction in pain intensity than heat therapy alone. Therefore, this study provides additional evidence on the effectiveness of a combined herbal and thermal intervention containing ginger, turmeric, lemongrass, and salt for primary dysmenorrhea among adolescent girls in a community-based setting. This study aimed to compare changes in pain intensity between adolescent girls receiving the herbal therapy compress ball and those receiving a warm compress.

METHOD

This study employed a quantitative quasi-experimental design using a pretest–posttest control group approach to examine the effect of herbal therapy compress ball on primary dysmenorrhea among adolescent girls. The research was conducted at Posyandu Remaja Puspa Muda, RW 12, Pucangsawit Village, Jebres District, Surakarta, Central Java, Indonesia, from July 15 to August 20, 2025. Ethical approval was granted by the Health Research Ethics Committee of RSUD Dr. Moewardi Surakarta (Approval Number: 1.521/VII/HREC/2025). The population consisted of all registered adolescent girls at the study site ($N = 36$). Sample size was calculated using a two-proportion comparison formula with a 95% confidence level and 80% statistical power, assuming proportions of moderate to severe dysmenorrhea of 0.73 in the control group and 0.27 in the intervention group¹⁴. The two proportion approach was based on the expected proportion of participants with moderate to severe dysmenorrhea reported in the reference study and was used to estimate the minimum sample required for the planned comparison. The minimum required sample was 15 participants per group; after accounting for a 15% anticipated dropout rate, 18 participants per group were planned. Of the 36 eligible adolescent girls, two declined to participate before group allocation. Thus, 34 participants who provided informed consent were included in the study and divided equally into the intervention ($n = 17$) and control ($n = 17$) groups. Because the two participants declined participation before allocation, no participants were lost after group allocation. Inclusion criteria were adolescent girls experiencing primary dysmenorrhea, having

regular menstrual cycles (21–35 days), and consenting to participate. Exclusion criteria included a history of hormonal or chronic disorders affecting menstruation, current hormonal therapy use, and the use of other pharmacological or herbal pain treatments during the study period. Primary dysmenorrhea was determined based on a history of menstrual pain in the absence of reported hormonal or chronic disorders affecting menstruation. Participants with conditions or treatments that could contribute to secondary dysmenorrhea or influence menstrual pain were excluded according to the predetermined exclusion criteria.

The 34 eligible participants who provided informed consent were first stratified according to baseline dysmenorrhea severity measured using the WaLIDD score. Within each severity stratum, participants were randomly allocated to the intervention or control group using Microsoft Excel. A random number was generated for each participant using the RAND() function, and participants were then ranked according to the generated numbers and allocated in a 1:1 ratio to the intervention and control groups. Randomization and group allocation were performed by the researcher. This stratified randomization procedure was used to ensure comparable baseline dysmenorrhea severity between the two groups. The WaLIDD instrument (Working ability, Location, Intensity, and Days of pain) consists of four items scored on a 0–3 scale, with total scores ranging from 0 to 12, and has demonstrated acceptable validity and reliability (Cronbach's $\alpha = 0.723$)¹⁵. The Indonesian version of the WaLIDD instrument was used in this study, with the original scoring system retained. WaLIDD scores were categorized as no pain (0), mild pain (1–4), moderate pain (5–7), and severe pain (8–12). Pain intensity was assessed twice, on the first day of menstruation before intervention (pretest) and after intervention (posttest). The pretest was conducted on the first day of menstruation before the first compress application. The intervention was then administered on the first and second days of menstruation according to the prescribed schedule. The posttest was conducted after completion of the intervention on the second day of menstruation. Thus, pain measurements were performed at the same stages of the menstrual period in both the intervention and control groups. The intervention group received a 7 cm diameter herbal compress ball containing *Zingiber officinale* (61.5%), *Curcuma longa* (15.4%), *Cymbopogon citratus* (15.4%), and salt (7.7%). The percentages represented the weight proportions of each component in the herbal compress ball. The compress was steamed to a temperature of 40–45°C and applied to the lower abdomen for 20–30 minutes on the first and second days of menstruation, two to three times daily with a minimum four-hour interval. The temperature was measured before application to maintain the prescribed temperature range and to minimize excessive heat exposure. Participants were instructed to follow the prescribed frequency of application during the intervention period. The control group received a warm cotton compress of identical size, temperature, duration, and frequency but without herbal components. Thus, the study compared herbal compress therapy combined with heat with heat therapy alone. Data were analyzed using IBM SPSS version 26. The Shapiro–Wilk test was used to assess normality. The Wilcoxon Signed Rank Test was applied for non-normally

distributed data in the control group, while the Paired Sample t-test was used in the intervention group. The different within-group tests were selected according to the distribution of the pretest and posttest data in each group. Differences between groups were examined using the Mann–Whitney U Test, with statistical significance set at $p < 0.05$. The Mann–Whitney U test was used to compare posttest pain scores between the intervention and control groups.

RESULTS

The majority of respondents in both groups were aged 14–16 years and had menarche at ≥ 12 years. Most participants had normal or underweight body mass index (BMI). A family history of dysmenorrhea was reported by the majority of respondents in both groups. The proportion of respondents aged 14–16 years was higher in the control group (70.6%) than in the experimental group (47.1%), while the distribution of BMI and family history of dysmenorrhea also showed some differences between groups. Overall, the characteristics of the participants showed some variation between the experimental and control groups. These descriptive differences should be considered when interpreting the findings. The characteristics of the respondents are presented in Table 1.

Table 1. Distribution of Respondents' Characteristics (n = 34)

Category	Experimental Group		Control Group	
	(n)	(%)	(n)	(%)
Age of Respondents				
10-13 years	4	23.5	2	11.8
14-16 years	8	47.1	12	70.6
17-19 years	5	29.4	3	17.6
Age at Menarche				
< 12 years	3	17.6	1	5.9
≥ 12 years	14	82.4	16	94.1
Body Mass Index (BMI)				
Underweight (<18,5)	9	52.9	7	41.2
Normal (18,5-22,9)	6	35.3	9	52.9
Overweight (23-24,9)	1	5.9	1	5.9
Obese (>25)	1	5.9	0	0.0
Family History of Dysmenorrhea				
Yes	12	70.6	11	64.7
No	3	17.6	3	17.6
Do not know	2	11.8	3	17.6

Table 2. Wilcoxon Signed Rank Test of Primary Dysmenorrhea Level in the Control Group

Variabel	N	Negative ranks	Positive ranks	Ties	Z Score	p-value
Pretest	17					
Posttest	17	11	2	4	-2.920	0.004

Based on the Wilcoxon Signed Rank Test, a Z score of -2.920 with a p value of 0.004 ($p < 0.05$) indicated a significant difference between pretest and posttest pain scores in the control group. Of the 17 respondents, 11 showed decreased pain (negative ranks), two showed increased pain (positive ranks), and four had no change (ties), indicating a significant reduction in primary dysmenorrhea intensity in the control group.

Table 3. Paired t Test Analysis of Primary Dysmenorrhea Level in the Experimental Group

Variabel	N	Mean $\pm$ SD	p-value
Pretest	17	6.65 ± 2.234	<0.001
Posttest	17	2.76 ± 2.513	

The results of the paired t-test showed that the mean pain score decreased from 6.65 ± 2.234 at pretest to 2.76 ± 2.513 at posttest, with a mean change of 3.89 points and a p-value of <0.001 , indicating a significant reduction in dysmenorrhea intensity following the intervention. The 95% confidence interval for the mean change was 2.89 to 4.88 points.

Table 4. Mann-Whitney U Test for Control and Experimental Groups

Group	N	Mean Rank	Z-Score	p-value
Control	17	22.21	-2.797	0.005
Experiment	17	12.79		

The Mann–Whitney U test was performed on posttest dysmenorrhea pain scores and showed a significant difference between the experimental and control groups ($Z = -2.797$, $p = 0.005$). The experimental group had a lower median and mean rank than the control group. The effect size was moderate ($r = 0.48$).

DISCUSSION

The analysis of dysmenorrhea pain levels in the control group, which received warm compress therapy without herbal ingredients, demonstrated a reduction in pain intensity following the intervention. Prior to treatment, the majority of respondents were categorized as experiencing moderate to severe pain. After the intervention, most participants showed a decrease in pain scores, although a small proportion remained in the moderate pain category or experienced a slight increase. The Wilcoxon Signed Rank Test results indicated that out of 17 respondents, 11 experienced pain reduction, two reported increased pain, and four showed no change, with a p-value of 0.004 . This finding indicates that warm compress therapy alone was associated with a statistically significant reduction in dysmenorrhea pain intensity. However, this within-group finding does not establish that the intervention was more effective than the control treatment. The additional benefit of the herbal ingredients should therefore be determined based on the between-group comparison of changes in pain scores.

The effectiveness of warm compress therapy may be explained by several mechanisms. Heat application may promote vasodilation, improve blood flow, and facilitate muscle relaxation, thereby

reducing uterine spasms and pain^{4,16,17}. Heat stimulation also enhances endorphin secretion, functioning as a natural analgesic and modulating pain perception in the periaqueductal gray area of the brain, influencing sensory, emotional, and cognitive aspects of pain^{18,19}. Previous studies have reported that warm compress therapy can reduce dysmenorrhea intensity among adolescent girls, supporting its use as a non-pharmacological approach to pain management^{4,17,20}.

In the experimental group, the mean dysmenorrhea pain score decreased from 6.65 (SD 2.234) before intervention to 2.76 (SD 2.513) after receiving the herbal therapy compress ball, with a mean reduction of 3.89 points (95% CI: 2.89–4.88; $p < 0.001$). The between-group analysis showed a statistically significant difference in posttest pain scores between the experimental and control groups ($p = 0.005$), with a moderate effect size ($r = 0.48$). These findings indicate that participants who received the herbal therapy compress ball experienced a substantial reduction in dysmenorrhea pain following the intervention. The significant difference between groups also indicates that the experimental group had a more favorable post-intervention pain outcome than the group receiving warm compress therapy alone. Changes were also observed across the individual components of the WaLIDD score in the experimental group. Regarding the ability to perform daily activities, the number of participants reporting no interference increased from 0 before the intervention to 8 after the intervention, while those reporting that their activities were almost always disturbed decreased from 10 to 3 participants. Regarding pain location, participants reporting pain at 2–3 locations decreased from 9 to 2 participants, while 7 participants reported no pain after the intervention compared with none before the intervention. For pain intensity, the number of participants reporting severe pain decreased from 5 to 0, while those reporting little pain increased from 6 to 9 and those reporting no pain increased from 0 to 6 participants. Regarding pain duration, participants reporting pain for more than 5 days decreased from 3 to 0, while those reporting no pain increased from 1 to 9 participants.

The effectiveness of this intervention may be explained by the combined effects of heat and the bioactive components of the herbal ingredients^{17,21}. Gingerol, the principal bioactive compound in ginger, has been reported to possess anti-inflammatory and analgesic properties and may reduce prostaglandin-mediated uterine contractions through inhibition of COX activity and PGE₂ production^{22,23}. Curcumin, the primary active compound in turmeric, has been reported to exhibit anti-inflammatory and antispasmodic properties through modulation of inflammatory pathways, including NF- κ B and COX-2, and has been reported to reduce dysmenorrhea severity²⁴. Citral in lemongrass (*Cymbopogon citratus*) may contribute through its antispasmodic and anti-inflammatory effects, including modulation of COX enzymes and pro-inflammatory markers such as TNF- α ²⁵. These mechanisms are based on previous evidence and were not directly measured in the present study. Rather, these components may have contributed collectively to the overall effect of the herbal compress^{1,26–29}. These findings are in line with previous studies demonstrating that herbal compress therapy effectively reduces menstrual pain among adolescent girls^{4,8}.

The Mann–Whitney U test showed a significant difference in posttest scores between groups ($p = 0.005$), with the experimental group demonstrating a lower mean rank (12.79) than the control group (22.21), indicating lower posttest pain scores in the experimental group. The negative Z-score reflects the direction of the difference, with lower posttest pain scores observed in the experimental group. Although both groups experienced pain reduction, the more favorable posttest outcome in the experimental group suggests a potential additional benefit of the herbal components when combined with heat therapy. This finding suggests that the herbal therapy compress ball may provide a more favorable post-intervention pain outcome than warm compress therapy alone.

CONCLUSIONS AND RECOMMENDATIONS

This study found that adolescent girls who received the herbal therapy compress ball experienced a substantial reduction in dysmenorrhea-related pain, with posttest scores showing a significant difference compared with participants who received warm compress therapy alone. These findings suggest that the herbal therapy compress ball may provide a more favorable post-intervention pain outcome than warm compress therapy alone. The observed effect may be related to the combined application of heat and the previously reported analgesic, anti-inflammatory, and antispasmodic properties of the herbal ingredients. However, the specific contribution of individual herbal components and their potential interactions could not be determined in the present study. The findings indicate that herbal therapy compress ball has potential for application as a complementary non-pharmacological approach within community-based adolescent health services. Further studies with larger and more diverse populations, comparisons based on changes in pain scores, and longer follow-up are recommended to strengthen the evidence regarding its effectiveness and potential application in routine practice.

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