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Original Article

The Effect of Cinnamon Aromatherapy in Reducing Primary Dysmenorrhea Among Adolescent Girls in SMA Kesatrian 1: A Quasi-Experimental Student

Tia Nurhanifah[1], Desi Soraya[1], Anifatus Sa'adah[2]
[1]Departement of Midwifery, Universitas Telogorejo Semarang, Central Java, Indonesia
[2]Departement of Pharmacy, Universitas Telogorejo Semarang, Central Java, Indonesia

Corresponding author: tia_nurhanifah@universitastelogorejo.ac.id

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ABSTRACT

Background: Primary dysmenorrhea is a common gynecological condition affecting adolescent girls, often characterized by moderate to severe menstrual pain that disrupts daily activities and reduces quality of life. The prevalence of primary dysmenorrhea among adolescents is reported to be as high as 75%. Although pharmacological interventions such as nonsteroidal anti-inflammatory drugs (NSAIDs) are widely used, concerns about side effects and accessibility have encouraged exploration of alternative, non-pharmacological approaches. Aromatherapy using cinnamon, which contains active compounds such as cinnamaldehyde and eugenol, has demonstrated antispasmodic and anti-inflammatory properties, making it a promising candidate for pain management. This study aimed to evaluate the effectiveness of cinnamon aromatherapy in reducing pain associated with primary dysmenorrhea among adolescent girls.

Methods: A quasi-experimental design with a pretest-posttest one-group approach was used. 70 high school students in SMA Kesatrian 1 Central Java, Indonesia, who experienced primary dysmenorrhea were selected through total sampling. Participants received cinnamon aromatherapy via inhalation for three consecutive days during menstruation. Pain intensity was measured using the Numeric Rating Scale (NRS) before and after the intervention. Data were analyzed using the Wilcoxon signed-rank test following a normality check via the Kolmogorov–Smirnov test.

Results: A significant reduction in pain intensity was observed following the intervention ($Z = -6.679$, $p < 0.001$), before the intervention, 36 female adolescents (51.4%) experienced moderate dysmenorrhea. After the intervention, 37 female adolescents (52.9%) experienced mild primary dysmenorrhea.

Conclusion: Cinnamon aromatherapy effectively reduces menstrual pain and can be considered a non-pharmacological alternative for managing primary dysmenorrhea in adolescents.

INTRODUCTION

Dysmenorrhea is one of the most prevalent gynecological disorders affecting women of reproductive age, particularly adolescents (Bakhsh et al., 2022; Mamun et al., 2024). Primary dysmenorrhea, defined as menstrual pain without underlying pelvic pathology, is characterized by colicky cramps in the lower abdomen that often interfere with daily activities and overall well-being(Itani et al., 2022; Alateeq et al., 2022). Symptoms may vary widely and include nausea, fatigue, headache, and gastrointestinal disturbances (Guimarães & Póvoa, 2020; Al-Husban et al., 2022; Soliman et al., 2021). Several contributing factors, such as elevated stress levels, sedentary lifestyles, and poor dietary habits—particularly the frequent consumption of fast food—have been associated with increased incidence of primary dysmenorrhea in adolescents (Gutman et al., 2022; Thasmara et al., 2020; Mansour Ibrahim et al., 2021).

The prevalence of primary dysmenorrhea among women of reproductive age ranges from 16% to 91%, with approximately 2% to 29% reporting severe symptoms. Among adolescents, the prevalence is notably higher, reaching up to 75% (Wang et al., 2022; Sima et al., 2022; Shetty et al., 2018). Although pharmacological interventions, such as nonsteroidal anti-inflammatory drugs (NSAIDs), are commonly used to manage menstrual pain, their long-term use may result in adverse effects (Zobdeh et al., 2022)(Sobhani, Li, & Cortes, 2023). Consequently, non-pharmacological alternatives have gained increasing attention. One such method is aromatherapy, which utilizes aromatherapy for therapeutic purposes (Caballero-Gallardo et al., 2025).

Cinnamon aromatherapy has been identified as a promising agent in the management of dysmenorrhea due to its active compounds—cinnamaldehyde (55–57%) and eugenol (5–18%)—which exhibit antispasmodic and anti-inflammatory properties (Xu, Yang, & Wang, 2020)(Barbarossa et al., 2022). These components function by relaxing uterine muscles and inhibiting prostaglandin synthesis, thereby reducing pain (Jaafarpour et al., 2015). Previous research by (Tarigan, 2018) demonstrated the efficacy of cinnamon aromatherapy in reducing dysmenorrhea intensity. Additionally, a preliminary survey conducted at senior high school in cetral java found that 70% of adolescent girls reported experiencing menstrual pain. In response to these findings, this study aims to investigate the effectiveness of cinnamon aromatherapy as a non-pharmacological intervention for reducing primary dysmenorrhea among adolescent girls.

METHODS

This study adopted a quantitative, quasi-experimental design employing a pretest-posttest one-group approach to assess the effectiveness of cinnamon (Cinnamomum) aromatherapy in alleviating primary dysmenorrhea among adolescent females. The research was conducted from March to August 2024 at a public senior high school located in Semarang, Indonesia.

The target population comprised female students in Grade XI who self-reported symptoms consistent with primary dysmenorrhea—defined as menstrual pain without identifiable pelvic pathology. Student in SMA Kesatrian 1 is 70 student. A total sampling technique was employed, resulting in the recruitment of 70 eligible participants. The inclusion criteria were: (1) experiencing primary dysmenorrhea, (2) not currently consuming analgesic medications, and (3) willingness to provide informed consent. Participants were excluded if they had a known history of gynecological disorders, were undergoing hormonal therapy, or had chronic comorbidities that could influence pain perception.

The intervention consisted of the administration of cinnamon aromatherapy via inhalation. The intervention used in this study was a topical cream containing cinnamon essential oil derived from the bark of plants belonging to the genus Cinnamomum. The cream was formulated using a

standard oil-in-water (O/W) emulsion method. The formulation consisted of cinnamon essential oil (1–2%) as the active component, stearic acid (12%) as an emulsifying and thickening agent, cetyl alcohol (2%) as a stabilizer, liquid paraffin (10%) as an emollient, glycerin (5%) as a humectant, triethanolamine (1–2%) as a pH adjuster and emulsifier, methyl paraben (0.1–0.2%) and propyl paraben (0.02–0.05%) as preservatives, and distilled water added to reach a final weight of 100 g. The oil phase, consisting of stearic acid, cetyl alcohol, and liquid paraffin, was heated to approximately 70°C until completely melted. The aqueous phase, containing distilled water, glycerin, and preservatives, was heated separately to the same temperature. The aqueous phase was gradually added to the oil phase with continuous stirring to form a stable emulsion. Triethanolamine was then added to stabilize the cream base. Once the temperature decreased to approximately 40°C, cinnamon essential oil was incorporated and mixed thoroughly until a homogeneous cream was obtained. The final product was stored in sterile, airtight containers at room temperature until use.

Prior to the intervention, a skin patch test was conducted on a small area of the forearm of each participant to assess potential allergic reactions or skin irritation. Participants who showed signs of redness, itching, or irritation were excluded from the intervention to ensure safety. An aromatherapy cream containing cinnamon extract was applied to the participants' wrists and necks three times daily during the first three days of the menstrual cycle. All sessions were supervised by trained personnel to ensure standardization and adherence to the intervention protocol.

Pain intensity was measured using the Numeric Rating Scale (NRS), a validated and widely used self-assessment tool ranging from 0 (no pain) to 10 (worst imaginable pain) (Modarresi et al., 2022). Pain scores were recorded at baseline (pre-intervention) and on the third day of menstruation following the intervention (post-intervention)(Por et al., 2022).

Statistical analyses were performed using SPSS version 29.02. Normality of the data distribution was assessed using the Kolmogorov–Smirnov test. The researchers performed a normality test, which yielded a p-value = 0.001 ($\rho < 0.005$), indicating that the data were not normally distributed. Consequently, the Wilcoxon signed-rank test was employed for further analysis.which indicated a non-parametric distribution. Accordingly, the Wilcoxon signed-rank test was utilized to compare pre- and post-intervention pain scores. A p-value of less than 0.05 was considered statistically significant. Ethical considerations were upheld by maintaining patient confidentiality, obtaining informed consent for the use of clinical data for educational and publication purposes, and ensuring all care provided followed hospital protocols and ethical standards.

RESULTS

The results of the study are presented in the following table:

Table 1. Frequency of Pain Levels Before and After Intervention Class XI Students Who Experienced Dysmenorrhea

Pain scale level	Pre-test		Post-test	
	f	%	f	%
No Pain	0	0	29	41.4
Mild Pain	24	34.3	37	52.9
Moderate Pain	36	51.4	4	5.7
Severe Pain	10	14.3	0	0
Total	70	100	70	100

Based on the table I, menstrual pain levels showed notable changes after the intervention. Before the intervention, most participants experienced moderate pain (51.4%), followed by mild pain

(34.3%) and severe pain (14.3%). After the intervention, the majority reported mild pain (52.9%) or no pain (41.4%), while only 5.7% still experienced moderate pain.

Table 2. Effectiveness of aromatherapy (Cinnamon) in reducing pain during menstruation (Dysmenorrhea)

Comparison	Negative Ranks	Positive Ranks	Ties	Z	Asymp. Sig. (2-tailed)
Post-Intervention vs. Pre-Intervention	55	0	15	-6.679	0.001

Based on the table II, the Wilcoxon signed-rank test showed a significant difference between pre- and post-intervention pain scores. A total of 55 participants experienced decreased pain levels (negative ranks), while no participants showed increased pain (positive ranks), and 15 reported no change (ties). The test result indicated statistical significance ($Z = -6.679$, $p = 0.001$).

DISCUSSION

This study demonstrated that cinnamon (Cinnamomum) aromatherapy significantly reduced the intensity of primary dysmenorrhea among adolescent girls. Prior to the intervention, most participants reported moderate menstrual pain, a finding consistent with previous epidemiological studies indicating a high prevalence of dysmenorrhea among women of reproductive age, particularly adolescents (Jahangirifar, Taebi, & Dolatian, 2018; Wang et al., 2022). Menstrual pain, characterized by lower abdominal cramps radiating to the back and thighs, often occurs around the onset of menstruation and can severely disrupt daily activities and academic performance (Hidayah & Fatmawati, 2020)

The observed reduction in pain following the intervention aligns with the findings of (Evayanti & Hidayat, 2019), who reported similar outcomes among female adolescents in Lampung after receiving cinnamon aromatherapy. In the present study, pain intensity decreased from moderate to mild in most participants, while a subset experienced no change. These results suggest that cinnamon aromatherapy has therapeutic potential in managing dysmenorrhea symptoms.

The efficacy of cinnamon essential oil is believed to stem from its primary active components, cinnamaldehyde and eugenol. Cinnamaldehyde exerts antispasmodic effects by relaxing uterine smooth muscles, while eugenol inhibits prostaglandin synthesis, thereby reducing inflammation and uterine contractions (Jaafarpour et al., 2015; Maloto, Hadi, & Sari, 2022) Moreover, the inhalation of aromatherapy stimulates olfactory receptors and activates the limbic system, which is responsible for emotional regulation and pain perception. This mechanism is thought to promote relaxation, reduce anxiety, and enhance circulation—factors that contribute to pain relief (Tarigan, 2018; Vivian et al., 2016).

In addition to the pharmacological properties of cinnamon, the reduction in menstrual pain may also be influenced by the relaxation effects induced through the inhalation of the aroma itself. Olfactory stimulation has been shown to modulate affective states by activating limbic structures, thereby reducing anxiety, distracting from nociceptive stimuli, and promoting parasympathetic nervous system activity, all of which can contribute to diminished pain perception (Cui et al., 2022; Thangaleela et al., 2022; Yoo & Park, 2023).

This study highlights the public health relevance of cinnamon (Cinnamomum) aromatherapy as a complementary, non-pharmacological intervention for primary dysmenorrhea among

adolescents. The significant reduction in pain intensity suggests its potential integration into school health programs and primary healthcare services to support adolescent reproductive health (Vivian Maharani et al., 2016).

Although the findings are promising, the study has limitations. The one-group pretest-posttest design, without a control group, limits the ability to infer causality. Additionally, the self-reported nature of pain measurement may introduce subjectivity. Future randomized controlled trials with larger and more diverse samples are recommended to confirm these findings and explore the biological mechanisms underlying the analgesic effects of.

Building on the insights gained from this study, future research should focus on [identify specific areas for further investigation]. Addressing the limitations identified in this study, such as [mention limitations], will contribute to a more comprehensive understanding of [health issue]. Additionally, exploring [related aspects] may unveil new dimensions and nuances that were beyond the scope of our study.

CONCLUSION

The intervention significantly reduced menstrual pain among participants. Pain levels shifted from predominantly moderate and severe before the intervention to mostly mild or no pain afterward. The Wilcoxon test confirmed a statistically significant difference between pre- and post-intervention scores ($Z = -6.679$; $p = 0.001$), indicating the effectiveness of the intervention.

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