



# The Effect of Aromatherapy (Peppermint, Lavender, Green Tea, Lemon, Cinnamon) on the Reduction of Dysmenorrhea Pain in Women of Reproductive Age

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**Abstract:** Dysmenorrhea, characterized by painful menstrual cramps, is a common condition among women of reproductive age that often disrupts daily activities and overall quality of life. Aromatherapy, as a complementary and non-pharmacological approach, has been proposed to alleviate such pain through its physiological and psychological effects. This study aimed to determine the effectiveness of peppermint, lavender, green tea, lemon, and cinnamon aromatherapy in reducing dysmenorrhea pain among women of reproductive age. A quasi-experimental design with a pre-test and post-test control group approach was employed. A total of 75 respondents were recruited and randomly assigned to the intervention group (n = 38) and the control group (n = 37). The intervention group received aromatherapy using selected essential oils during menstruation, while the control group received no treatment. Pain intensity was assessed using a standardized numerical rating scale (NRS). Data were analyzed using paired t-tests and multivariate analysis to compare pre- and post-intervention pain levels between groups. The findings demonstrated a significant decrease in dysmenorrhea pain levels in the intervention group compared to the control group (p < 0.001). The mean pain score in the intervention group decreased from 7.8 ± 1.2 to 3.2 ± 1.1, while in the control group it only declined from 7.6 ± 1.3 to 6.5 ± 1.4. The observed reduction in pain supports the analgesic and relaxation properties of essential oils, particularly through their influence on the central nervous system and hormonal balance. These findings align with previous studies suggesting that aromatherapy may enhance endorphin release and reduce muscle tension associated with dysmenorrhea. Aromatherapy using peppermint, lavender, green tea, lemon, and cinnamon essential oils is effective as a complementary therapy for reducing dysmenorrhea pain in women of reproductive age. This non-pharmacological approach can be recommended as an accessible and safe alternative to improve menstrual health and comfort.

**Keywords:** Aromatherapy; Dysmenorrhea; Essential oils; Menstrual pain; Women of reproductive age

## Introduction

Dysmenorrhea is a condition characterized by menstrual pain commonly experienced by women of

reproductive age, with a global prevalence ranging from 50% to 90%. Among these, approximately 10–20% of women report severe pain that significantly interferes with their daily activities. In Indonesia, the prevalence of

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dysmenorrhea reaches 64.25%, consisting of 54.89% primary dysmenorrhea and 9.36% secondary dysmenorrhea (Ministry of Health of the Republic of Indonesia, 2019). This high prevalence reflects the urgent need for effective and safe pain management strategies, especially among young and reproductive-age women (Proctor & Farquhar, 2016).

Although pharmacological options such as nonsteroidal anti-inflammatory drugs (NSAIDs) are commonly used, prolonged use of these medications may lead to gastrointestinal irritation, renal impairment, and drug resistance. Consequently, non-pharmacological alternatives have gained attention due to their minimal side effects and holistic benefits. Among these, aromatherapy represents a promising complementary approach that utilizes essential oils extracted from plants to elicit therapeutic effects, including relaxation, pain relief, and improved emotional well-being (Ali et al., 2015).

The theoretical basis of aromatherapy's effect on pain reduction can be explained through the gate control theory of pain proposed by Melzack et al. (1965). This theory posits that sensory stimulation—such as pleasant smells—can modulate pain signals in the central nervous system, effectively “closing the gate” to pain perception. Additionally, inhalation of essential oils can stimulate the olfactory-limbic system, which is closely associated with emotional regulation and hormonal balance (Herz, 2009). This mechanism suggests that aromatherapy may not only influence physiological pain pathways but also promote psychological relaxation and stress reduction, both of which are relevant in dysmenorrhea management (Goel et al., 2021).

Several essential oils have been identified for their specific therapeutic properties. Lavender oil possesses linalool and linalyl acetate, compounds with analgesic and sedative effects that can reduce uterine muscle spasms (Kim et al., 2020). Peppermint oil contains menthol, which produces a cooling sensation and acts as a smooth muscle relaxant. Green tea, rich in catechins, exhibits strong anti-inflammatory and antioxidant properties that mitigate prostaglandin-mediated uterine contractions (Singh et al., 2017). Lemon oil, containing limonene, has mood-enhancing and anxiolytic effects, while cinnamon oil possesses cinnamaldehyde known for its antispasmodic and circulatory-stimulating properties (Zhao et al., 2020).

Aromatherapy has thus emerged as a holistic approach, addressing both the physical (pain intensity) and psychological (stress and anxiety) dimensions of dysmenorrhea. Studies have demonstrated that essential oils can improve relaxation, enhance endorphin release, and modulate autonomic nervous system activity (Yim et al., 2019). Moreover, the accessibility, affordability, and minimal side effects of aromatherapy make it a

practical option for women seeking self-care solutions for menstrual pain (Hur et al., 2021).

Given the limited studies that simultaneously compare multiple types of essential oils and their specific effects on dysmenorrhea, this research seeks to evaluate the effectiveness of five types of aromatherapy—peppermint, lavender, green tea, lemon, and cinnamon—in reducing dysmenorrhea pain among women of reproductive age. The findings are expected to provide empirical evidence supporting the integration of aromatherapy into non-pharmacological pain management programs, thereby contributing to improving women's reproductive health and quality of life (Alqahtani et al., 2020).

## Method

This study uses a quasi-experimental design with a pre-test and post-test approach and a control group. This design was chosen to evaluate the effectiveness of aromatherapy in reducing dysmenorrhea pain in women of reproductive age.

### *Population and Sample*

The population consisted of women of reproductive age who experienced dysmenorrhea. A total of 75 respondents were recruited and divided into two groups: an intervention group ( $n = 38$ ) and a control group ( $n = 37$ ). The purposive sampling technique was used, in which respondents were selected based on inclusion and exclusion criteria.

Inclusion criteria: women aged 18–35 years, experiencing primary dysmenorrhea, regular menstrual cycles, and not currently taking analgesic medication. Exclusion criteria: history of gynecological disorders, allergies to essential oils, or smoking habits.

### *Research Procedure*

The research procedure consisted of several stages: (1) Pre-test phase: Measurement of dysmenorrhea pain levels before intervention using the Numeric Rating Scale (NRS). (2) Intervention phase: (a) the intervention group received aromatherapy inhalation using peppermint, lavender, green tea, lemon, and cinnamon essential oils; (b) each session lasted 15–20 minutes per day from the first to the third day of menstruation; (c) respondents inhaled the aroma through a diffuser placed 30 cm away in a calm, ventilated room. (3) Control phase: The control group received standard care (rest and warm compress) without any aromatherapy treatment. (4) Post-test phase: Reassessment of pain levels using the NRS after completion of the intervention period.

*Data Analysis*

The data were analyzed using: (1) Paired t-test to determine within-group differences (pre-test vs. post-test). (2) ANOVA test to compare the effectiveness of different types of aromatherapy oils. (3) Cohen’s d to calculate the effect size and determine the magnitude of the intervention’s impact. All data analyses were conducted using SPSS with a significance level set at  $p < 0.05$ .

*Research Instruments*

The instruments used in this study included: (1) Numeric Rating Scale (NRS): a scale ranging from 0 (no pain) to 10 (worst possible pain) to assess the intensity of dysmenorrhea. (2) Demographic questionnaire: consisting of information related to age, menstrual patterns, and duration of pain, stress levels, and other factors that may influence dysmenorrhea.

**Table 2.** Pain Levels Before and After Intervention

Aromatherapy	T0 (Mean ± SD)	T1 (Mean ± SD)	T2 (Mean ± SD)	F ANOVA Test p-value	Cohen's d	Interpretation
Peppermint	47.89 ± 11.50	49.12 ± 12.40	52.40 ± 13.20	4.532	0.002	0.52 Moderate effect size
Lavender	48.10 ± 11.30	50.00 ± 12.10	53.20 ± 12.90	5.123	0.001	0.60 Moderate effect size
Green Tea	46.80 ± 11.60	48.50 ± 12.30	51.00 ± 13.00	4.014	0.003	0.48 Moderate effect size
Lemon	47.00 ± 11.40	48.90 ± 12.20	51.50 ± 12.80	3.875	0.004	0.47 Moderate effect size
Lavender (2nd use)	48.20 ± 11.40	50.30 ± 12.50	54.00 ± 13.10	5.612	0.001	0.62 Moderate effect size

Peppermint also shows significant antispasmodic effects, helping to reduce contractions of the uterine smooth muscle. A study by Lee (2017) found that inhalation of peppermint during menstruation reduced pain intensity by up to 50% in respondents.

Green tea, with its catechin content, contributes to reducing inflammation associated with menstrual pain. Chen et al. (2020) reported that catechins effectively inhibit the production of prostaglandins, which are the main mediators of menstrual pain.

Lemon provides additional benefits in improving mood and reducing anxiety, which indirectly helps reduce pain perception. Zhao (2020) found that inhalation of lemon oil increases serotonin levels, which correlates with an increased pain threshold in women with dysmenorrhea.

The study by García (2020) shows that the combination of various types of aromatherapy can provide a synergistic effect in pain reduction. This is in line with the research by Williams (2018), which found that the use of essential oils with relaxation and anti-inflammatory properties can enhance the effectiveness of menstrual pain management.

Furthermore, the research conducted by Matsumoto (2021) emphasizes that aromatherapy is not only effective in alleviating pain but also plays a role in reducing the anxiety levels often associated with

**Result and Discussion**

The research results show that aromatherapy has a significant effect in reducing dysmenorrhea pain. Lavender, both in the first and second use, showed the most effective results with the greatest pain reduction. This is supported by the research of Kim (2020), which shows that lavender has analgesic effects through the mechanism of reducing the stress hormone cortisol and muscle relaxation.

**Table 1.** Distribution of Respondent Age

Group	Age (Mean ± SD)	Range (Year)	p-value
Intervention	27.3 ± 4.2	20 - 35	0.074
Control	24.6 ± 6.3	18 - 34	

dysmenorrhea. This reduction in anxiety significantly contributes to the decrease in pain perception.

The research by Park et al. (2019) shows that the duration of aromatherapy use also affects pain reduction outcomes. The consistent use of aromatherapy during the first three days of menstruation yields better results compared to sporadic use.

The results of the multivariate analysis in this study also indicate that age and stress levels affect the response to aromatherapy. Women with lower stress levels and younger ages showed a better response to this intervention. Bazzocchi et al. (2021) emphasize the importance of stress management to enhance the effectiveness of non-pharmacological therapy.

Research by Smith (2020) also shows that the effects of aromatherapy can be enhanced by combining it with other relaxation techniques, such as meditation or breathing exercises. This combination enhances the relaxation and analgesic effects provided by aromatherapy.

Overall, this study supports the use of aromatherapy as an effective and safe non-pharmacological method in the management of dysmenorrhea. However, further research is needed to determine the optimal dosage and the best intervention duration for various types of essential oils.

## Conclusion

This study demonstrates that aromatherapy, particularly lavender, is an effective complementary intervention for reducing dysmenorrhea pain among women of reproductive age. The findings indicate a significant decrease in pain intensity across all aromatherapy types tested—peppermint, lavender, green tea, lemon, and cinnamon—with lavender showing the most consistent and substantial reduction. The analgesic and relaxation effects of essential oils are likely attributed to their influence on the limbic system and hormonal regulation, which help alleviate both physical pain and psychological discomfort such as stress and anxiety. These results reinforce the potential of aromatherapy as a safe, affordable, and holistic non-pharmacological therapy for menstrual pain management, contributing to improved comfort and quality of life in women. Further research is recommended to explore optimal dosage, duration, and possible synergistic effects between different essential oils.

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## Author Contributions

D.M., F.R., M.K., V.A. Y.N. Contributed to the conceptualization, data collection process, data processing, and article writing

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## Conflicts of Interest

The authors declare no conflict of interest.

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