The Effect of Lavender Aromatherapy on Dysmenorrhea Pain Among Adolescent Girls at SMPN 1 Rengat Barat, Indragiri Hulu Regency, 2026

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Abstract

Dysmenorrhea is a health problem among adolescent girls that can make it difficult to concentrate during learning activities. One treatment approach is aromatherapy using essential oils. This study aimed to determine the effect of lavender aromatherapy on dysmenorrhea pain among adolescent girls at SMP Negeri 1 Rengat Barat, Indragiri Hulu Regency. This was a quantitative pre-experimental study using a one-group pretest-posttest design. The sample consisted of 28 adolescents selected using purposive sampling, with data collected using a questionnaire. Data were analyzed using a paired-samples t-test. The results showed that the mean dysmenorrhea pain score before lavender aromatherapy was 6.46, while after lavender aromatherapy it was 1.25. The paired-samples t-test yielded $t = 12.262$ and $p = 0.000$; because $p < 0.05$, there was a significant difference before and after lavender aromatherapy. Lavender aromatherapy therefore reduced dysmenorrhea pain among adolescent girls at SMPN 1 Rengat Barat, Indragiri Hulu Regency.

Keywords: Lavender Aromatherapy, Dysmenorrhea, Lavender, Adolescent Girls.

Introduction

Adolescence is a transitional period involving physical, emotional, and mental adjustment. Puberty is the period of maturation of the human reproductive organs and

generally occurs between 10 and 19 years of age. During adolescence, girls frequently experience menstrual problems [1]. Menstrual cycle length may vary from month to month and can be associated with various problems, including premenstrual syndrome, dysmenorrhea, menstrual bleeding, hypermenorrhea, and other disorders [2].

Common health problems experienced by adolescent girls during menstruation include dysmenorrhea associated with dietary behavior, lack of exercise, heavy menstrual bleeding, infertility, family history, and psychological factors. Female students experiencing dysmenorrhea may have difficulty following lessons and studying and may have a higher risk of absenteeism [3]. Menstrual disorders can cause physical pain and affect daily activities. Dysmenorrhea is lower abdominal pain occurring before, during, or after menstruation [4]. Dysmenorrhea is classified as primary or secondary. Primary dysmenorrhea involves menstrual cramps without abnormalities in the reproductive organs, whereas secondary dysmenorrhea is caused by gynecological problems such as endometriosis, fibroids, and adenomyosis [5].

More than 50% of women worldwide report menstrual cramps. The prevalence of dysmenorrhea ranges from 45% to 95% among women of reproductive age [6]. The document cites WHO data indicating that 1,769,425 women (90%) experience dysmenorrhea and 10–15% experience severe dysmenorrhea. Worldwide, dysmenorrhea is reported in 25%–97% of cases, with an average of 50%, and nearly 20% of cases involve concerning pain [7]. In Indonesia, the reported prevalence is 107,673 cases (64.25%), consisting of 59,671 cases (54.89%) of primary dysmenorrhea and 9,496 cases (9.36%) of secondary dysmenorrhea [8]. Severe menstrual cramps may interfere with exercise, concentration, daily activities, and quality of life [9].

Government efforts to address adolescent health, including dysmenorrhea, include Law Number 36 of 2009 concerning Health. Article 77 paragraph (3) states that reproductive health problems are addressed through health promotion, prevention, treatment or therapy, and recovery. The Adolescent Care Health Program (PKPR), launched in 2003, is one government effort to help students live healthily through the School Health Unit (UKS) program.

Management of dysmenorrhea can involve pharmacological and non-pharmacological approaches. Pharmacological treatment may include prostaglandin inhibitors and nonsteroidal pain-relieving drugs. One non-pharmacological approach is

aromatherapy using essential oils. Lavender is a widely known aromatherapy agent because it contains linalool (26.12%) and linalyl acetate (26.32%). Lavender is a flowering plant commonly used in aromatherapy, and its major components include linalyl acetate and linalool. In Indonesia, lavender is widely used in herbal tea, bath soap, beauty products, and aromatherapy oils [10].

Aromatherapy is a recovery method characterized by relaxation and the use of pleasant fragrances, generally derived from plants and animals and known as essential oils. Common oils include Salvia sclarea, Eucalyptus globulus, geranium (Pelargonium graveolens), lavender (Lavandula vera), lemon (Citrus limon), and peppermint. Lavender oil is one of the most popular essential oils. Lavender aromatherapy is used as a therapeutic approach to improve physical and psychological conditions [11].

Previous studies have investigated natural approaches for dysmenorrhea pain. Purwati (2018) found an effect of effleurage massage combined with lavender aromatherapy on dysmenorrhea pain [12]. Savitri and Hardyanti (2019) found a significant difference in menstrual pain scores before and after lavender administration among grade X and XI students [13]. Fransiska (2023) found that inhaling three drops of lavender aromatherapy applied to a tissue for 10 minutes reduced primary dysmenorrhea pain among adolescent girls at SMA Negeri 1 Godean [14]. Maulidiyah et al. (2023) also reported an effect of lavender aromatherapy on dysmenorrhea [15].

Based on dysmenorrhea visit records at the adolescent clinic of Puskesmas Rengat Barat in 2023, 10 adolescent girls from SMP Negeri 1 Rengat Barat, 7 from SMK Negeri 1 Indragiri Hulu, and 5 from MTsN Indragiri Hulu visited the clinic. A preliminary survey at SMP Negeri 1 Rengat Barat found that among six students interviewed, four experienced dysmenorrhea; three managed it by resting, and one took pain medication. Two students reported being absent from school because of menstrual pain. Lavender aromatherapy had never been implemented at the school, which led the researchers to examine its effect on dysmenorrhea pain.

Method

1. Research design

This study used a quantitative pre-experimental approach with a one-group pretest-posttest design. A pretest was administered before the intervention and a posttest after

the intervention, allowing comparison of conditions before and after treatment. The study aimed to determine the effect of lavender aromatherapy on dysmenorrhea pain among adolescent girls at SMP Negeri 1 Rengat Barat, Indragiri Hulu Regency. The specific research design used, such as correlational, experimental, quasi-experimental, cross-sectional, and others. Provide relevant descriptions regarding the design applied in the study.

2. Setting and samples

The study was conducted at SMP Negeri 1 Rengat Barat, Indragiri Hulu Regency, in May–June 2026. The population consisted of all grade VIII female students experiencing menstrual pain (dysmenorrhea), totaling 39 students. Based on the Slovin formula, 28 adolescent girls were selected as the sample.

3. Measurement and data collection

The instruments were a questionnaire and a Numeric Rating Scale (NRS) accompanied by facial illustrations. Respondents marked a point on the 1–10 scale representing the intensity of pain before and after lavender aromatherapy.

4. Data analysis;

Univariate analysis described the study variables using median, standard deviation, and percentages. Bivariate analysis began with the Shapiro–Wilk normality test. A significance value >0.05 indicated normally distributed data, whereas <0.05 indicated non-normal data. The bivariate analysis aimed to determine differences in mean dysmenorrhea pain before and after lavender aromatherapy.

The document also describes the Wilcoxon Signed-Rank Test for comparing pretest and posttest data. However, because the reported normality test results were >0.05, the reported inferential result used the paired-samples t-test.

Results

A. Respondent Characteristics

A total of 28 adolescent girls from grade VIII participated in the study.

Table 1. Respondent Characteristics

Characteristic	Category	n	%
Class	VIII A	12	42.9
Class	VIII B	10	35.7
Class	VIII C	6	21.4
Family history	Yes	17	60.7
Family history	No	11	39.3
Age at menarche	Early adolescence (12–13 years)	15	53.6
Age at menarche	Middle adolescence (14–15 years)	13	46.4
Menstrual cycle	Polymenorrhea (15–20 days)	10	35.7
Menstrual cycle	Normal (21–35 days)	16	57.1
Menstrual cycle	Oligomenorrhea (>35 days)	2	7.1
Menstrual duration	Irregular bleeding (<3 days)	0	0.0
Menstrual duration	Normal (3–7 days)	18	64.3
Menstrual duration	Menorrhagia (>7 days)	10	35.7
Menstrual characteristics	Normal (blood only)	20	71.4
Menstrual characteristics	Abnormal (clot)	8	28.6

Most respondents were from class VIII A (12; 42.9%), had a family history of dysmenorrhea (17; 60.7%), experienced menarche at 12–13 years (15; 53.6%), had a normal menstrual cycle of 21–35 days (16; 57.1%), had a normal menstrual duration of 3–7 days (18; 64.3%), and had normal menstrual characteristics consisting of blood only (20; 71.4%).

B. Distribution of Dysmenorrhea among Respondents

Table 2. Distribution of Dysmenorrhea among Respondents

Distribution	Category	n	%
Pain scale	No pain	0	0.0
Pain scale	Mild pain	5	17.9
Pain scale	Moderate pain	7	25.0
Pain scale	Controlled severe pain	12	42.9
Pain scale	Uncontrolled severe pain	4	14.3
Menarche	First menarche and thereafter	15	53.6
Menarche	Within 1 year after menarche	6	21.4
Menarche	After 1 year	4	14.3

Menarche	After 2 years or more	3	10.7
Severe menstrual pain	1 day before menstruation	0	0.0
Severe menstrual pain	First day	18	64.3
Severe menstrual pain	Second day	10	35.7
Adequate rest	Yes	17	60.7
Adequate rest	No	11	39.3
Skipping meals	Yes	13	46.4
Skipping meals	No	15	53.6
Medication without prescription	Yes	12	42.9
Medication without prescription	No	16	57.1
Pain-relief action	Hot or cold compress	10	35.7
Pain-relief action	Massage	5	17.9
Pain-relief action	Rest	12	42.9
Pain-relief action	No action	1	3.6
Exercise	Yes	19	67.9
Exercise	No	9	32.1
Action during class	Tell and ask teacher for help	6	21.4
Action during class	Tell and ask friend for help	12	42.9
Action during class	Manage situation independently	4	14.3
Action during class	Ask permission to go to the School Health Unit (UKS)	5	17.9
Action during class	No action	1	3.6

Most respondents (12; 42.9%) experienced controlled severe pain. Severe menstrual pain was most commonly experienced on the first day (18; 64.3%). Seventeen respondents (60.7%) reported adequate rest, 15 (53.6%) did not skip meals, and 16 (57.1%) did not take medication without a prescription. Rest was the most common pain-relief action (12; 42.9%), 19 (67.9%) reported exercising, and during class the most common response was asking a friend for help (12; 42.9%).

C. Mean Dysmenorrhea Pain before Lavender Aromatherapy

Table 3. Dysmenorrhea Pain before Lavender Aromatherapy

Measurement	n	Min	Max	Mean	SD
Before lavender aromatherapy	28	2	10	6.46	2.673

Before the intervention, most respondents experienced controlled severe pain (12; 42.9%). The mean pain score was 6.46 (SD 2.673), with a minimum of 2 and a maximum of 10.

D. Mean Dysmenorrhea Pain after Lavender Aromatherapy

Table 4. Dysmenorrhea Pain after Lavender Aromatherapy

Measurement	n	Min	Max	Mean	SD
After lavender aromatherapy	28	0	5	1.25	1.624

After the intervention, most respondents reported no dysmenorrhea pain (15; 53.6%). The mean pain score was 1.25 (SD 1.624), with a minimum of 0 and a maximum of 5.

E. Bivariate Analysis

1. Normality Test

Table 5. Normality Test

Measurement	Shapiro–Wilk Statistic	df	Sig.
Before lavender aromatherapy	0.902	28	0.088
After lavender aromatherapy	0.901	28	0.083

The Shapiro–Wilk test showed significance values of 0.088 before and 0.083 after lavender aromatherapy. Both values were >0.05, indicating normally distributed data.

2. Paired-Samples t-Test

Table 6. Paired-Samples t-Test

Comparison	Mean Difference	SD	SE	95% CI Lower	95% CI Upper	t	df	p
Before vs. after lavender aromatherapy	5.214	2.25	0.425	4.342	6.087	12.262	27	0.0

The paired-samples t-test yielded t = 12.262 and p = 0.000. Because $p < 0.05$, there was a significant difference in dysmenorrhea pain before and after lavender aromatherapy. H1 was accepted, indicating an effect of lavender aromatherapy on dysmenorrhea pain among adolescent girls at SMPN 1 Rengat Barat, Indragiri Hulu Regency, in 2026.

Discussion

The mean dysmenorrhea pain score before lavender aromatherapy was 6.46. Aromatherapy may be used as an alternative approach to reduce pain. Women with

primary dysmenorrhea commonly experience abdominal cramps, malaise, weakness, lower back pain, anxiety, nausea, headache, and, in severe cases, fainting. Secondary dysmenorrhea may present according to its underlying gynecological cause [16]. Aromatherapy can produce relaxation and calmness and may improve circulation. It is described as an inexpensive and safe approach for dysmenorrhea [17].

Inhaled aromatic plant extracts stimulate the olfactory system. Odor molecules reach the olfactory epithelium and are transmitted through the olfactory bulb to brain structures including the limbic system, thalamus, and cerebral cortex. These pathways may stimulate neurotransmitters associated with anxiety reduction, mood regulation, relaxation, and sleep quality [18]. Olfactory projections involve the anterior olfactory nucleus, olfactory tubercle, piriform cortex, amygdala, entorhinal cortex, hippocampus, thalamus, orbitofrontal cortex, and prefrontal cortex [19,20]. Such signaling may be associated with the release of serotonin or endorphins [21, 22].

The findings are consistent with previous studies. Nuraeni and Nurholipah (2021) reported severe menstrual pain in 35.0% of respondents before lavender aromatherapy [23]. Megawati et al. (2022) reported severe pain in 30% of respondents before lavender flower aromatherapy [24]. Pustikawaty (2018) reported that 30% of respondents had severe menstrual pain before lavender aromatherapy. The researchers considered controlled severe pain among adolescent girls at SMPN 1 Rengat Barat to be common during dysmenorrhea, particularly on the first or second day, although it can interfere with classroom activities and concentration [25].

After lavender aromatherapy, the mean pain score decreased to 1.25. The adolescent girls reported feeling relaxed and calm, which may reduce pain perception. Lavender oil contains linalool, which is associated with a relaxing effect and may help reduce anxiety and stress and promote relaxation [26].

Aromatherapy acts through physiological pathways involving the circulatory and olfactory systems. Volatile odor molecules enter the nasal cavity during inhalation and are processed as olfactory stimuli [27]. The signal reaches the olfactory center and limbic system, which is involved in pain and emotional processing, and is then transmitted to the hypothalamus. Calming odors may stimulate the raphe nucleus to release serotonin and produce relaxation by inhibiting neuronal excitation [28].

The findings are consistent with Sikumbang et al. (2023), who reported

decreased pain intensity after lavender flower aromatherapy [29]. Tusyukriyah and Aisah (2022) also reported reduced dysmenorrhea pain after aromatherapy [30], while Maharianingsih and Poruwati (2021) found decreased pain intensity after aromatherapy [31].

After lavender aromatherapy, 15 respondents (53.6%) reported no pain, and no respondents remained in the severe pain categories. The researchers considered that greater relaxation and concentration during lavender inhalation contributed to the reduction in dysmenorrhea.

The statistical analysis showed $p = 0.000$ ($p < \alpha = 0.05$), indicating an effect of lavender aromatherapy on dysmenorrhea pain. This was reflected in the reduction of pain from predominantly moderate and severe categories to mild pain and no pain.

Lavender aromatherapy may reduce dysmenorrhea pain by stimulating relaxation through its characteristic aroma, which is inhaled through respiration. The odor may influence brain activity and promote relaxation, refreshment, and calmness [32]. Inhaled lavender oil sends signals to emotional centers in the limbic system and may be associated with the release of endorphins that promote relaxation and calmness. Lavender aromatherapy may increase parasympathetic activity and relaxation within at least 10 minutes. Thus, inhaled aromatherapy may influence emotional responses to pain by modulating the limbic system [33].

The results are consistent with a literature review showing that lavender aromatherapy can effectively reduce menstrual pain intensity [10]. Nasution and Manullang (2023) reported that lavender aromatherapy reduced primary dysmenorrhea ($p = 0.010$) [34]. Maulidiyah et al. (2023) also found that lavender aromatherapy affected dysmenorrhea among adolescent girls at SMP Assaidiyah Buduran ($p = 0.000$) [15]. The researchers concluded that lavender aromatherapy had a significant effect on reducing menstrual pain intensity among adolescent girls at SMPN 1 Rengat Barat.

Limitation

This study has several limitations. First, the study used a pre-experimental one-group pretest-posttest design without a control group. Therefore, changes in dysmenorrhea pain intensity cannot be attributed exclusively to lavender aromatherapy, as other factors may have contributed to the observed changes. Second, the sample size

was relatively small, involving only 28 adolescent girls from a single junior high school, which may limit the generalizability of the findings to other populations and settings. Third, dysmenorrhea pain was assessed using a self-reported Numeric Rating Scale (NRS), which may be influenced by individual perceptions and subjective responses to pain. Finally, the study assessed the immediate change in pain intensity before and after the intervention and did not evaluate the long-term effects or sustainability of lavender aromatherapy. Further studies using randomized controlled designs, larger and more diverse samples, objective or complementary outcome measures, and longer follow-up periods are recommended.

Conclusion

1) The mean dysmenorrhea pain score before lavender aromatherapy among adolescent girls at SMPN 1 Rengat Barat, Indragiri Hulu Regency, in 2026 was 6.46. Most adolescent girls experienced controlled severe pain before the intervention.
2) The mean dysmenorrhea pain score after lavender aromatherapy was 1.25. Most adolescent girls reported no pain after the intervention.
3) Lavender aromatherapy had an effect on dysmenorrhea pain among adolescent girls at SMPN 1 Rengat Barat, Indragiri Hulu Regency.

Ethical Considerations

This study was conducted in accordance with the ethical principles for research involving human participants. Ethical approval was obtained from the Health Research Ethics Committee of Poltekkes Kemenkes Riau, with ethical approval number LB.02.03/EA/KEPK-PKR/2119/2025. Prior to data collection, the participants were informed about the purpose and procedures of the study, their rights as participants, and the confidentiality of their personal information. Participation was voluntary, and informed consent was obtained from the participants before their involvement in the study. The collected data were used solely for research purposes and were maintained confidentially.

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Conflict of Interest

No conflict of interest among authors.

Author contribution

Yulianto: Conceptualization, methodology, data collection, formal analysis, investigation, and manuscript preparation. Deswita: Conceptualization, supervision, interpretation of results, manuscript review and editing, and final approval of the manuscript.

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