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Lavender Aromatherapy as a Non-Pharmacological Approach to Managing Pain During the Active Phase of the First Stage of Labor: A Pre-Experimental Study

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ABSTRACT

Introduction*: In the early active phase of labor, mothers commonly experience severe pain that can hinder the delivery process and affect psychological well-being. Non-pharmacological options like aromatherapy are increasingly sought, yet evidence on their effectiveness, especially lavender, remains limited. This study aims to evaluate the effectiveness of lavender aromatherapy in reducing pain levels during active labor.*
Methods*: This study used a pre-experimental one-group pre-test post-test design involving 32 laboring mothers selected through purposive sampling based on inclusion criteria. The intervention involved administering lavender essential oil via inhalation using an aroma diffuser placed near the patient for 15–20 minutes during the active phase of labor. The independent variable was lavender aromatherapy, and the dependent variable was the level of labor pain. Pain intensity was measured using the Numeric Rating Scale (NRS), a standardized tool for assessing subjective pain levels. Data were analyzed using the Wilcoxon signed-rank test to examine changes in pain before and after the intervention.*
Results*: Results: The results showed that after applying lavender aromatherapy, most respondents who initially felt moderate or severe pain were able to reduce the level of pain to mild pain. This change was statistically significant with a p-value of 0.000 (p <0.05).*
Conclusions*: This study proves that lavender aromatherapy is effective in managing labor pain in mothers in the active phase. Considering the findings of this study, lavender aromatherapy can be regarded as a simple and efficient non-drug method for managing labor pain.*

Introduction

Labor or childbirth is a complex physiological process that ends with the delivery of a baby and is often accompanied by intense pain, especially during the active phase of the first stage. Labor pain affects both the somatic and psychological well-being of the mother. According to WHO (2023), 80–90% of women perceive labor pain as one of the most painful experiences in their lives, influencing the course of labor and postnatal bonding with the newborn (*More than a Third of Women Experience Lasting Health Problems after Childbirth, New Research Shows*, n.d.).

In Indonesia, maternal health services have not fully addressed the need for effective labor pain relief. The 2024 Basic Health Research (Riskesdas) reports that more than 65% of postpartum mothers experience moderate to severe labor pain (Kedaton et al., 2023)(Dr Tedros Adhanom Ghebreyesus, 2023). Pain management in many healthcare facilities still predominantly uses pharmacological methods, which are often accompanied by side effects and require physician intervention. This situation opens opportunities for nurses to implement safe and accessible non-pharmacological interventions (Shi & Wu, 2023)(Alorfi, 2023).

Lavender aromatherapy is one such non-pharmacological approach. Lavender (*Lavandula angustifolia*) contains linalool and linalyl acetate, compounds believed to exert mild sedative and analgesic effects (Saeed et al., 2023)(Batiha et al., 2023). Aromatherapy may activate the parasympathetic nervous system and promote uterine muscle relaxation, reducing pain during

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labor(Caballero-Gallardo et al., 2025). Despite its potential, lavender aromatherapy is not yet integrated into standard operating procedures (SOPs) for maternity care in Indonesia, limiting its application in clinical settings.

Previous studies have shown that lavender aromatherapy can reduce labor pain, but findings are inconsistent due to differences in study design, timing, and dosage. Moreover, most research has been conducted outside Indonesia, with limited data reflecting the effectiveness of this intervention in local hospital settings. This highlights a research gap regarding the applicability of lavender aromatherapy within Indonesian maternal care.

At RSUD Indramayu, preliminary observations indicate that over 70% of laboring mothers report unmanaged labor pain, yet non-pharmacological pain relief methods, such as aromatherapy, are rarely practiced (Dinas Kesehatan Kabupaten Indramayu, 2023). This emphasizes the need to explore alternative approaches that are safe, cost-effective, and suitable for implementation by nurses. Therefore, this study aims to evaluate the effectiveness of lavender aromatherapy in reducing pain levels during the active phase of the first stage of labor among mothers at RSUD Indramayu.

As is known, active phase I pain is a common and severe form of pain endured by mothers during labor (Puspitasari et al., 2024). In the case of lavender aromatherapy, pharmacological approaches such as analgesic injections still dominate the attempts at mitigating pain during labor. (Abbaszadeh et al., 2017). Lavender aromatherapy has calming and analgesic physiological benefits proven by several international studies. (Yoo & Park, 2023). WHO promotes the use of proven non-pharmacological techniques for pain management during labor (Nori et al., 2023). International studies have reported a reduction of subjective pain levels among mothers in labor who were provided with lavender aromatherapy. (Tabatabaeichehr & Mortazavi, 2020).

Furthermore, while several countries have carried out studies on aromatherapy, there is a gap in pre-experimental research concentrating on Indonesian mothers in active first-stage labor. (Brennan et al., 2022). The bulk of previous studies either employed RCT designs or were conducted outside the scope of nursing clinics (Hariton & Locascio, 2018)It appears that there is sparse Indonesian literature evaluating lavender aromatherapy within the context of structured and formalized placements in maternity nursing services.

The goal of this research is to evaluate the effectiveness of lavender aromatherapy on pain relief for mothers in the active first stage of labor within the context of complementary approaches to evidence-based maternity nursing.

Methods

This study employed a pre-experimental method with a single-group pretest-posttest design to evaluate changes in labor pain before and after the administration of lavender aromatherapy. The target population was mothers in the active phase of the first stage of labor at RSUD Indramayu. The accessible population included mothers who met the inclusion criteria during the data collection period. Inclusion criteria were full-term gestational age (≥ 37 weeks), cervical dilatation of 4–7 cm (active phase), parity of 1–3, and voluntary participation by signing informed consent. Exclusion criteria included obstetric complications, known allergies to lavender, and prior use of pharmacological analgesics.

A total of 32 participants were selected using purposive sampling, determined through proportional calculation. Two instruments were used in this study: 1. **Numeric Rating Scale (NRS):** a validated tool to measure pain intensity, using a scale from 0 (no pain) to 10 (worst possible pain). This scale is widely used in clinical pain assessment due to its simplicity and reliability. An **Observation Sheet:** used to record participants' demographic data, initial and post-intervention pain scores, and relevant physiological characteristics.

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Research procedures included coordination with hospital staff, training of the intervention team, and equipment preparation. Eligible participants were identified, and informed consent was obtained. Pre-intervention pain levels were assessed using the NRS, followed by a 15-minute lavender aromatherapy session via inhalation. Post-intervention pain scores were recorded using the same scale. All data were coded to maintain confidentiality.

For statistical analysis, univariate analysis was used to describe participant characteristics and pain scores. Bivariate analysis was conducted using the paired t-test to compare pre- and post-intervention pain levels, as the data were numerical and measured on the same subjects. Before conducting the paired t-test, a normality test (Shapiro-Wilk) was performed to ensure the distribution of data met the assumptions required for parametric testing.

Results

Table 1. Distribution of Pain Levels Before and After Lavender Aromatherapy Intervention

Pain Level	Number of Respondents Before Intervention (n=32)	Percentage (%) before intervention	Number of respondents after intervention (n=32)	Percentage (%) After Intervention
Lightweight (1-3)	5	15.6%	15	46.9%
Medium (4-6)	18	56.3%	11	34.4%
Weight (7-10)	9	28.1%	6	18.8%

Based on Table 1 above, Pain Level Before Intervention, before the intervention, only 5 respondents (15.6%) experienced mild pain, Most of the respondents were 18 respondents (56.3%) experienced moderate intensity pain, and 9 respondents or 28.1% experienced severe pain. Meanwhile, after the intervention, the level of pain after the intervention: as many as 15 respondents or 46.9% experienced a decrease in pain to mildness, 11 respondents or 34.4% experienced a decrease in pain to moderate, and 6 respondents or 18.8% still experienced severe pain after the intervention. This table shows changes in pain levels in 32 respondents who experienced lavender aromatherapy interventions, with significant reductions in severe and moderate to mild pain levels.

Table 2. Pain Levels Before and After Lavender Aromatherapy Intervention

Pain Levels Before Intervention	Pain Level After Intervention	Number of Respondents (n=32)	Percentage (%)
Lightweight (1-3)	Lightweight (1-3)	3	9.4%
	Medium (4-6)	2	6.3%
	Weight (7-10)	0	0%
Medium (4-6)	Lightweight (1-3)	6	18.8%
	Medium (4-6)	10	31.3%
	Weight (7-10)	2	6.3%
Weight (7-10)	Lightweight (1-3)	6	18.8%
	Medium (4-6)	6	18.8%

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Pain Levels Before Intervention	Pain Level After Intervention	Number of Respondents (n=32)	Percentage (%)
	Weight (7-10)	3	9.4%

Table 2 illustrates the changes in pain levels in respondents based on the categories of pain levels before and after the lavender aromatherapy intervention. Here's a more detailed explanation: Mild Pain Before the intervention, 5 respondents experienced mild pain, and after the intervention, 3 respondents continued to experience mild pain (9.4%), 2 respondents decreased to moderate pain (6.3%), and no respondents experienced severe pain after the intervention. Moderate Pain Level Before the Intervention: 18 respondents experienced moderate pain, and after the intervention, 6 respondents decreased to mild pain (18.8%), 10 respondents remained at a moderate pain level (31.3%), and 2 respondents decreased to severe pain (6.3%). Severity of Pain Level (7-10) Before the Intervention: v9 respondents experienced severe pain. After the intervention, 6 respondents decreased to mild pain (18.8%), 6 respondents decreased to moderate pain (18.8%), and 3 respondents continued to experience severe pain (9.4%).

This table shows that lavender aromatherapy interventions can reduce pain levels in most respondents, although some still experience severe pain despite a significant decrease. These results demonstrate the effectiveness of lavender aromatherapy in reducing pain in nursing mothers, with most experiencing a decrease to mild pain levels.

Table 3. Wilcoxon Signed Rank Test Results

Test Statistics	Value
Z	-4.217
p-value	0.000

Based on the results of the Wilcoxon test, a value of $p = 0.000$ ($p < 0.05$) was obtained, which means that there was a significant difference between the level of pain before and after the lavender aromatherapy intervention. This shows that lavender aromatherapy is effective in lowering pain levels in nursing mothers.

Table 4. Descriptive Statistics of Pain Scale Before and After Lavender Aromatherapy Intervention

Variable	Pain Scale (NRS)	N	Mean	Std. Dev	Median (Range)	p-value
Pre-intervention	0–10	32	6.75	1.42	7 (3–9)	–
Post-intervention	0–10	32	4.09	1.63	4 (1–8)	0.000*

*Wilcoxon Signed-Rank Test, as the data did not meet normality assumptions

Table 4 shows the descriptive statistics of the Numeric Rating Scale (NRS) for pain before and after the lavender aromatherapy intervention. The mean pain score decreased from 6.75 (SD = 1.42) before the intervention to 4.09 (SD = 1.63) after the intervention. The median score also declined from 7 (range 3–9) to 4 (range 1–8). The Wilcoxon Signed-Rank Test revealed a statistically significant difference ($p = 0.000$), indicating that lavender aromatherapy effectively reduced pain intensity among mothers in the active phase of the first stage of labor.

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Discussion

The results of this study demonstrated that lavender aromatherapy has a significant effect in reducing labor pain among mothers during the active phase of the first stage of labor.

Overview Before Intervention

Prior to the administration of lavender aromatherapy, laboring mothers predominantly experienced moderate pain (56.3%), followed by severe pain (28.1%), and mild pain (15.6%). The mean pain score before the intervention was 6.75, with a median of 7 and a range of 3–9, indicating that most participants were undergoing considerable discomfort requiring effective management.

Overview After Intervention

Following the application of lavender aromatherapy, a notable shift was observed in the distribution of pain intensity. The number of mothers reporting mild pain increased to 46.9%, moderate pain decreased to 34.4%, and only 18.8% remained in the severe pain category. The mean pain score dropped to 4.09, with a median of 4 and a range of 1–8, reflecting a clear trend of reduced pain perception.

Effect of Intervention

This significant change was supported statistically by the Wilcoxon Signed-Rank Test, which yielded a p-value of 0.000, confirming a meaningful difference in pain levels before and after the intervention. These results reinforce the effectiveness of lavender aromatherapy as a non-pharmacological approach to managing labor pain.

These findings are consistent with prior studies conducted by (Lakhan et al., 2016)(Abbaszadeh et al., 2017)(Ren et al., 2025) REN, who demonstrated that lavender aromatherapy is effective in lowering pain perception through its calming, sedative, and anxiolytic effects. Lavender's interaction with the limbic system via olfactory stimulation may lead to the release of endorphins and a reduction in sympathetic nervous system activity, ultimately decreasing the intensity of pain perceived by laboring mothers (López et al., 2017)(Zhang et al., 2025).

However, the findings also revealed that not all respondents experienced the same degree of pain relief. Some participants remained in moderate or severe pain categories even after the intervention. This phenomenon aligns with the studies of (Malloggi et al., 2022)(Metzger et al., 2019)(Ebner & Singewald, 2017), which suggest that individual differences in anxiety levels, perception of pain, and sensitivity to aromatherapy agents can influence the effectiveness of such interventions. (Robinson, 2023)(de Souza et al., 2024) further elaborated on this by identifying two distinct respondent groups: those who perceive aromatherapy as therapeutic and calming, and those who see it merely as supplementary care.

The present study was based on the assumption that lavender aromatherapy is a safe, simple, and acceptable non-pharmacological method that can be integrated into routine intrapartum care. The novelty of this research lies in its application within the Indonesian context, particularly at RSUD Indramayu, where lavender aromatherapy has not yet been adopted into the clinical SOP. This study thus contributes valuable local evidence supporting the integration of aromatherapy in labor pain management.

Nevertheless, several challenges were encountered during the research process. These included inconsistent individual responses, a lack of standardized institutional guidelines for non-pharmacological pain relief, and limited familiarity among nurses with aromatherapy application. As a response to these challenges, the researchers propose combining lavender aromatherapy with other non-pharmacological strategies such as breathing techniques, massage, or the use of birthing balls to enhance the therapeutic effect. In addition, structured nurse training and the development of clinical SOPs are essential for the effective and safe application of aromatherapy in maternity care settings.

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Overall, this study reinforces the potential of lavender aromatherapy as a holistic, non-invasive, and cost-effective approach to labor pain management. While it shows promising results, the variability in individual responses suggests that it should be viewed as part of a multimodal strategy rather than a stand-alone method. Future research involving larger samples, control groups, and diverse settings is recommended to validate and optimize the implementation of this intervention in clinical practice.

Conclusion

From the results of the study on Lavender Aromatherapy as a Non-Pharmacological Approach to Managing Pain During the Active Phase of the First Stage of Labor: A Pre-Experimental Study, I concluded that lavender aromatherapy is effective in alleviating pain during labor in women giving birth. The majority of respondents experienced a reduction in pain level to mild after lavender aromatherapy was administered, while a few still reported moderate and severe pain. This study is consistent with prior studies that lavender aromatherapy helps mitigate anxiety and has relaxing effects, which lower the perception of pain. However, the differences in individual responses to aromatherapy need to be taken into account. Suggestion: In this case, the hospital, as the healthcare provider, should incorporate the practice of lavender aromatherapy in obstetric nursing care as one of the non-pharmacological methods of pain relief for laboring mothers. It is equally necessary to educate pregnant women on the lavender aromatherapy benefits so that it can be embraced as an alternative for pain relief.

Combining lavender aromatherapy with other techniques, such as breath or massage, could yield higher results. For this purpose, a further in-depth understanding of individual differences in response to aromatherapy needs to be studied. With proper implementation, it is hoped that aromatherapy lavender can be a more accepted option for pain relief among mothers during labor.

Ethics approval and consent to participate

This study, entitled "Lavender Aromatherapy as a Non-Pharmacological Approach to Managing Pain During the Active Phase of the First Stage of Labor: A Pre-Experimental Study," was conducted by the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The research protocol was reviewed and approved by the Ethics Committee of the STIKes Aksari Indramayu Health Research Ethics Commission, with approval number 155/ KEPK-STIKes Aksari/12/2024. All participants provided written informed consent before their inclusion in the study. Participants were assured of the confidentiality of their data, the voluntary nature of their participation, and their right to withdraw at any time without penalty.

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