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Bitter Orange Aromatherapy and Its Impact on Pain Intensity Among Multigravida Women in Active First-Stage Labor

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ABSTRACT

Labor pain is a complex physiological and psychological experience that can lead to anxiety, decreased maternal cooperation, and prolonged labor if not managed properly. Non-pharmacological approaches, including aromatherapy, have become increasingly preferred due to their safety, affordability, and minimal side effects. This study aimed to determine the effect of *bitter orange* (*Citrus aurantium*) aromatherapy on reducing labor pain intensity among multigravida women during the active phase of first-stage labor at MB Eneng Nurhayati, Serang City, in 2025. This quasi-experimental research employed a nonequivalent control group design involving 22 respondents, divided equally into intervention and control groups. The intervention group received *bitter orange* aromatherapy through inhalation using a diffuser for 60 minutes, while the control group received standard care. Labor pain intensity was measured using the Visual Analog Scale (VAS) before and after the intervention. Exact numerical findings showed that in the intervention group (n = 11), pretest pain levels consisted of 27.3% mild pain, 54.5% moderate pain, and 18.2% severe pain, whereas posttest measurements shifted to 63.6% mild pain, 36.4% moderate pain, and 0% severe pain. Statistical analysis using the Wilcoxon Signed Rank Test indicated a significant reduction in pain intensity (p = 0.003). The mean VAS score decreased from a moderate level before the intervention to a lower, more manageable level afterward.These findings demonstrate that *bitter orange* aromatherapy is effective in reducing labor pain among multigravida mothers. The intervention works through olfactory stimulation of the limbic system, triggering relaxation and reducing sympathetic responses. In conclusion, *bitter orange* aromatherapy can serve as a practical, safe, and effective complementary therapy to support maternal comfort during childbirth and is recommended for broader application in midwifery care.

Keywords: bitter orange aromatherapy, labor pain, multigravida, non-pharmacological therapy, childbirth management.

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INTRODUCTION

Childbirth is a moment long awaited by pregnant women as it represents the fulfillment of maternal expectations; however, for many women, labor is also accompanied by fear and anxiety related to the anticipation of pain (Puspitasari & Wahyuni, 2021). Labor pain arises from uterine

contractions that cause cervical dilatation, cervical effacement, and myometrial ischemia. Excessive labor pain can increase maternal anxiety, stimulate prostaglandin production, and intensify the perception of pain, thereby affecting maternal coping ability during childbirth. (Lestari & Rachmawati, 2023).

The World Health Organization estimates that millions of women worldwide experience significant labor pain every year, with many encountering psychological distress during childbirth. In Indonesia, maternal health indicators continue to require special attention due to persistent risks associated with unmanaged labor pain, which can lead to fatigue, emotional distress, and uterine dysfunction that prolongs the labor process (Yulianti & Nurhidayah, 2022). Such complications may contribute to maternal fear of vaginal birth and interfere with the physiological progress of labor (Fitriani & Mulyani, 2022).

The province of Banten, particularly Serang City, reflects a similar maternal health challenge. Regional maternal health surveillance in Serang City documented approximately 14,500 deliveries in 2024, with 62% involving multigravida mothers. Local midwifery services report that nearly 70% of laboring women experience moderate-to-severe pain during the active phase, often resulting in restlessness, poor focus, and decreased cooperation during contractions. These conditions hinder labor progress and increase the need for supportive pain-management interventions (Nugraha & Sari, 2024).

Non-pharmacological pain-management methods have increasingly gained attention due to their affordability, non-invasive characteristics, minimal side effects, and the active involvement of mothers in the birthing process (Adnyana & Hamdani, 2021). In Indonesia, methods such as breathing techniques, warm compresses, massage, and aromatherapy have been integrated into midwifery care to support comfort and relaxation among laboring women (Lestari & Rachmawati, 2023).

Aromatherapy, notably using bitter orange (*Citrus aurantium*) essential oil, is known for its calming, balancing, and analgesic effects. Through inhalation, aromatic molecules enter the olfactory pathways and stimulate the limbic system, which regulates emotional responses, memory, and pain perception (Fitriani & Mulyani, 2022). Findings from Indonesian research between 2021 and 2024 demonstrate that bitter orange aromatherapy effectively reduces labor-pain intensity and enhances maternal comfort during first-stage labor (Nugraha & Sari, 2024).

Preliminary observations at MB Eneng Nurhayati, S.Tr.Keb, Serang City, identified 178 deliveries in 2024, consisting of 118 multigravida and 60 primigravida mothers. Approximately 73% of multigravida mothers reported difficulty managing labor pain during the active phase, often showing anxiety, irritability, and reduced concentration during contractions. Despite this high caseload, the facility has never implemented bitter orange aromatherapy, presenting an opportunity for introducing safe, low-cost, non-pharmacological pain management (Adnyana & Hamdani, 2021).

The novelty of this study lies in its specific focus on multigravida mothers in Serang City, its implementation year (2025), and the introduction of bitter orange aromatherapy in a midwifery facility where it has not previously been applied. Considering the need for effective labor-pain relief in Serang's maternal health services, bitter orange aromatherapy presents a promising intervention that is practical, accessible, and appropriate for midwifery practice (Yulianti & Nurhidayah, 2022).

Based on these considerations, the researcher is motivated to conduct a study entitled "The Effect of Bitter Orange Aromatherapy on Pain Intensity Reduction Among Multigravida Women in the Active Phase of First-Stage Labor at MB Eneng Nurhayati, Serang City, in 2025".

METHOD

The present study employed a quasi-experimental approach using a nonequivalent control group design. The respondents were divided into two groups: an intervention group receiving

bitter orange aromatherapy and a control group without any aromatherapy. Both groups underwent pretest assessment before the intervention and posttest assessment afterward to identify differences in labor pain intensity. This design is commonly used when random assignment is not feasible but comparison between groups remains essential for determining the effectiveness of an intervention (Sugiyono, 2022).

The study population consisted of all multigravida mothers in the active phase of first-stage labor at MB Eneng Nurhayati, Serang City, in 2025. The sample was selected using a purposive sampling technique according to predetermined criteria to ensure that respondents adequately represented the study population (Notoatmodjo, 2022). Inclusion criteria comprised multigravida mothers in active labor (4–7 cm cervical dilatation), singleton pregnancy, cephalic presentation, intact membranes, willingness to participate, and no prior administration of analgesics or induction agents. Exclusion criteria included known allergies to bitter orange aromatherapy, predicted instrumental or operative delivery, pelvic abnormalities, and uterine contraction disorders such as primary or secondary inertia (Rahmawati et al., 2023).

The sample size calculation adopted the Federer formula, which is frequently utilized in experimental studies to determine the minimum number of subjects needed to achieve sufficient statistical power (Salim & Nurhayati, 2022). Based on the calculation outcomes, a minimum of nine respondents per group was required. An additional 10% was added to anticipate incomplete data, resulting in 11 respondents per group. Thus, the total sample consisted of 22 respondents, with 11 participants assigned to the intervention group and 11 to the control group.

This study was conducted from February to April 2025 at MB Eneng Nurhayati, Serang City. This location was selected due to its high delivery rate and its supportive environment for implementing non-pharmacological pain management interventions.

The independent variable in this research was bitter orange aromatherapy. The aromatherapy intervention was administered using a diffuser containing 20 ml of water mixed with five drops of bitter orange essential oil, positioned approximately two meters from the respondent and applied for 60 minutes during the active phase of labor. The maximum intervention duration was approximately two hours, following recommendations for safe aromatherapy application during labor (Wulandari & Putri, 2021). The dependent variable was labor pain intensity.

Labor pain intensity was measured using the Visual Analog Scale (VAS), documented through direct observation and partograph records. Pain scores ranged from 0 (no pain) to 10 (very severe pain) and were categorized into mild (1–3), moderate (4–6), and severe pain (7–9) (Pratama & Siregar, 2021).

The instruments used in this study included the Visual Analog Scale (VAS) sheet and the partograph to document labor progression. Instrument validity and reliability were ensured through expert judgment and adherence to Indonesian midwifery assessment standards (Kusumawati & Yanti, 2023).

Data collection consisted of primary data obtained directly from respondents through observation of pain levels before and after the intervention, and secondary data retrieved from clinical records at MB Eneng Nurhayati, Serang City (Hidayat, 2022). Data processing included editing, coding, data entry using Microsoft Excel, and statistical analysis using SPSS. Univariate analysis was used to describe respondent characteristics, while bivariate analysis employed the Wilcoxon Signed Rank Test to identify differences in pain scores within and between groups (Dewi & Lestari, 2024).

The research flow consisted of obtaining permission from the health facility, screening respondents according to inclusion and exclusion criteria, collecting baseline data, providing bitter orange aromatherapy to the intervention group, and measuring post-intervention pain intensity in both groups. All participants provided informed consent prior to data collection. Ethical considerations followed national standards emphasizing beneficence, nonmaleficence, autonomy, and justice. Additional administrative permission was also secured from MB Eneng Nurhayati, Serang City, to ensure compliance with institutional regulations.

RESULT

Table 1. Labor Pain Scale Among Multigravida Women in the Active Phase of First-Stage Labor in the Control Group Before and After Assessment (n = 11)

Labor Pain Scale	Pretest Frequency	Pretest Percent	Posttest Frequency	Posttest Percent
Mild Pain	3	27.3%	3	27.3%
Moderate Pain	6	54.5%	6	54.5%
Severe Pain	2	18.2%	2	18.2%
Total	11	100%	11	100%

The results in Table 1 show that labor pain intensity in the control group remained unchanged between the pretest and posttest assessments. Before the observation period, most respondents experienced moderate pain (54.5%), followed by mild pain (27.3%) and severe pain (18.2%). After the observation period without any aromatherapy intervention the distribution of pain levels remained identical, with the same proportions reported for mild, moderate, and severe pain. These findings indicate that, in the absence of intervention, labor pain intensity did not show any noticeable improvement or reduction among multigravida women during the active phase of first-stage labor.

Table 2. Labor Pain Scale Among Multigravida Women in the Active Phase of First-Stage Labor in the Intervention Group Before and After Bitter Orange Aromatherapy (n = 11)

Labor Pain Scale	Pretest F	Pretest %	Posttest F	Posttest %
Mild Pain	3	27.3%	7	63.6%
Moderate Pain	6	54.5%	4	36.4%
Severe Pain	2	18.2%	0	0.0%
Total	11	100%	11	100%

The findings in Table 2 demonstrate a significant reduction in labor pain intensity among multigravida women after receiving bitter orange aromatherapy during the active phase of first-stage labor. Before the intervention, more than half of the respondents experienced moderate pain (54.5%), followed by mild pain (27.3%) and severe pain (18.2%). After the administration of bitter orange aromatherapy, the proportion of women experiencing mild pain increased substantially to 63.6%, while moderate pain decreased to 36.4%, and severe pain was eliminated entirely. This shift indicates that bitter orange aromatherapy was effective in reducing labor pain

Table 3. Average Distribution of Labor Pain Intensity in the Intervention Group Before and After Bitter Orange Aromatherapy

Variable	Mean	Std. Deviation	N	p-value
Pretest	05.55	0,091667	11	0.003
Posttest	04.09	01.48	11	

The results in Table 3 indicate a meaningful decrease in the mean labor pain intensity following the administration of bitter orange aromatherapy. Before the intervention, the mean VAS pain score was 5.55, reflecting a moderate level of labor pain among respondents. After the intervention, the mean score decreased to 4.09, showing a clear reduction toward a milder pain category. The standard deviation also decreased from 1.72 to 1.48, suggesting less variability in pain levels after the aromatherapy was applied. The p-value of 0.003 demonstrates that the

difference between pretest and posttest pain scores is statistically significant, confirming that bitter orange aromatherapy was effective in reducing labor pain among multigravida women in the active phase of first-stage labor.

DISCUSSION

The findings of this study align with previous research showing that bitter orange aromatherapy can effectively reduce labor pain, whereas labor pain in the absence of intervention tends to remain unchanged. In the control group, the distribution of pain intensity remained identical between the pretest and posttest measurements, with 27.3% experiencing mild pain, 54.5% moderate pain, and 18.2% severe pain. This stability suggests that without therapeutic intervention, pain naturally persists during the active phase of labor. These results are consistent with reports that physiological pain during childbirth continues to intensify along with uterine contractions, cervical dilation, and tissue stretching, particularly when no relaxation-enhancing strategies are provided (Susati & Andriani, 2023).

In contrast, the intervention group showed a clear reduction in pain intensity after receiving bitter orange aromatherapy. Prior to the intervention, most mothers experienced moderate pain (54.5%), with 27.3% reporting mild pain and 18.2% severe pain. After exposure to bitter orange aromatherapy, mild pain increased to 63.6%, moderate pain decreased to 36.4%, and severe pain was eliminated entirely. This was further supported by a decrease in the mean VAS pain score from 5.55 to 4.09, with a statistically significant p-value of 0.003. These results are consistent with findings from previous Indonesian studies, which reported that bitter orange aromatherapy reduced mean labor pain scores from 6.50 to 5.70 among women in active labor (Nurhayati & Santi, 2020).

The physiological mechanism underlying this reduction in pain can be attributed to aromatic compounds contained in bitter orange essential oil, notably limonene and linalool. These compounds modulate the limbic system through olfactory stimulation, promoting the release of endorphins and enkephalins that act as natural analgesics, thereby reducing pain perception (Irmawati et al., 2021). Linalool also possesses anxiolytic and sedative properties that help reduce psychological stress and increase pain tolerance. Similar mechanisms have been described in the literature, emphasizing that aromatherapy reduces sympathetic nervous system activity, improves emotional stability, and promotes muscular relaxation—factors that collectively minimize ischemic pain during labor (Afdila & Nuraida, 2021).

International evidence further supports these findings. A clinical trial in Turkey demonstrated that citrus-based aromatherapy significantly reduced labor pain scores and shortened the duration of active labor compared to standard care (Baser et al., 2020). Likewise, a randomized controlled trial in Iran found that inhalation of Citrus aurantium essential oil significantly decreased pain intensity and anxiety during the first stage of labor (Namazi et al., 2016). These studies confirm that citrus-derived essential oils exert analgesic and calming effects through neuroendocrine modulation and enhanced parasympathetic activation.

Overall, the consistency between the current study and both national and international evidence reinforces the reliability of bitter orange aromatherapy as an effective, safe, and easily administered complementary therapy for managing labor pain. The significant reduction in pain experienced by the intervention group highlights the importance of integrating non-pharmacological methods such as aromatherapy into routine midwifery practice to enhance maternal comfort during childbirth (Irmawati et al., 2021).

CONCLUSION

The results of this study demonstrate that bitter orange aromatherapy is effective in reducing labor pain intensity among multigravida women during the active phase of first-stage labor at MB

Eneng Nurhayati, Serang City, in 2025. The findings show a shift from higher pain categories toward lower and more manageable levels following the intervention. Before receiving aromatherapy, most respondents experienced moderate to severe pain, while after the intervention, pain levels significantly decreased, and no respondents reported severe pain.

Based on statistical analysis using the Wilcoxon test, a significant difference was found between pretest and posttest pain intensity scores (p-value = 0.003 < 0.05), indicating that bitter orange aromatherapy contributes meaningfully to pain reduction. This aligns with previous studies showing the analgesic, calming, and antispasmodic effects of bitter orange due to its active compounds such as limonene, linalool, and linalyl acetate.

Overall, bitter orange aromatherapy can be considered a non-pharmacological, safe, and effective method to support comfort and relaxation in laboring mothers, making it a valuable complementary intervention in maternity care settings.

RECOMMENDATION

Based on the findings of this study, bitter orange aromatherapy is recommended as an effective non-pharmacological intervention to reduce labor pain intensity among multigravida women during the active phase of first-stage labor. Its calming, analgesic, and antispasmodic effects make it a safe complementary method that can enhance maternal comfort and support a positive childbirth experience at MB Eneng Nurhayati, Serang City.

Midwives and healthcare providers are encouraged to apply bitter orange aromatherapy as part of standard intrapartum care, particularly for mothers who prefer natural pain-management methods. Training and guidance on proper administration techniques, dosage, and duration of aromatherapy use should be provided to ensure optimal outcomes.

Future researchers are advised to conduct studies with larger sample sizes and include control groups to strengthen scientific evidence regarding the effectiveness of bitter orange aromatherapy. Additional research exploring physiological responses, maternal satisfaction, and comparisons with other aromatherapy types may further enrich knowledge and clinical application.

This study has several limitations that should be considered when interpreting the findings. First, the sample size was relatively small (n = 11), which may limit the generalizability of the results to a broader population. Second, the absence of a control group makes it difficult to fully attribute pain reduction solely to the aromatherapy intervention, as psychological or environmental factors may also influence labor pain. Third, pain intensity was measured using a self-reported scale, which is subjective and may vary based on individual perception. Additionally, the study was conducted in a single maternity clinic, limiting the ability to compare outcomes across different clinical settings.

Despite these limitations, the findings provide useful preliminary evidence supporting the potential benefits of bitter orange aromatherapy for labor pain management and highlight the need for further rigorous research.

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