



Bitter Orange Aromatherapy: A Natural Solution to Reduce Pain During the First Stage of Labor

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ABSTRACT

Labor pain is a significant challenge for expectant mothers, affecting both the psychological and physiological aspects of pregnant woman. Non-pharmacological pain management approaches, such as aromatherapy, have gained attention for their effectiveness and minimal side effects. This study aimed to assess the impact of bitter orange aromatherapy on reducing labor pain during the first stage of labor at Inpatient Clinic Pratama Ibu Hawa in 2024. A quasi-experimental design with pre-test and post-test measures was employed, involving 22 multigravida women in active labor. The intervention group received bitter orange aromatherapy via a diffuser for 60 minutes, while the control group received standard care. Pain intensity was measured using the Visual Analog Scale (VAS). The results indicated a significant reduction in pain intensity after the intervention, with a notable shift from moderate to mild pain in the experimental group ($p = 0.000$, 95% CI = (5.098-8.876)). These findings suggest that bitter orange aromatherapy is an effective non-pharmacological intervention for reducing labor pain, improving maternal comfort, and enhancing the overall labor experience. The study highlights the potential for integrating aromatherapy into routine maternal care, offering an accessible and cost-effective alternative to pharmacological methods. Further research is needed to explore its broader application and long-term benefits in various clinical settings.

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INTRODUCTION

Childbirth is a significant moment eagerly awaited by all expectant mothers. However, for some women, this experience is overshadowed by fear and anxiety due to labor pain, a natural but challenging aspect of childbirth (Wiknjosastro, 2016). Labor pain arises from uterine contractions, leading to cervical dilation, thinning, and uterine ischemia caused by myometrial artery contractions. Excessive pain can heighten anxiety, triggering the release of prostaglandins, which exacerbate stress and amplify pain perception (Maryunani, 2015). The World Health Organization (WHO) estimates that annually, 210 million pregnancies occur worldwide, with 20 million women experiencing significant labor pain. This pain, compounded by anxiety and fear, can prolong labor and lead to complications such as obstructed labor (Handayani, 2014).

The global maternal mortality rate (MMR) remains a pressing concern, with WHO reporting 303,000 maternal deaths annually in 2019. In ASEAN, the MMR stands at 235 per 100,000 live births (ASEAN Secretariat, 2020). Indonesia has shown fluctuating trends, with the MMR rising from 228 in 2002-2007 to 359 per 100,000 live births in 2007-2012, then declining to 305 in 2012-2015. Despite progress, the Sustainable Development Goals (SDGs) aim to reduce the MMR to 70 per 100,000 live births by 2030, highlighting the need for improved maternal care quality (Kemenkes RI, 2019). Pain management during labor plays a crucial role in achieving these goals, as excessive pain can impair maternal psychology, labor progression, and fetal well-being (Potter & Perry, 2017). Unmanaged pain during childbirth can lead to severe stress responses that may result in physiological complications such as hypertension or prolonged labor, which in turn increase the risk of maternal mortality. Additionally, poorly managed pain can contribute to delayed or ineffective responses during obstetric emergencies, further elevating maternal mortality rates. Therefore, effective pain management is essential not only for the comfort of the mother but also for reducing adverse outcomes that can potentially lead to maternal death.

Non-pharmacological pain management approaches have gained attention due to their affordability, non-invasive nature, and patient involvement, which enhance confidence and satisfaction (Mety, 2020). Aromatherapy, using essential oils, has been identified as an effective method for pain relief. Bitter orange essential oil, known for its calming and soothing effects, has been shown to reduce labor pain and promote psychological well-being (Kumalasari, 2012; Adnyana & Hamdani, 2015). When inhaled, its molecules are absorbed through the olfactory system and interact with the limbic brain, influencing emotions, learning, and memory (Wiji, 2015).

Previous studies have demonstrated the effectiveness of bitter orange aromatherapy in reducing labor pain. For instance, Nurhayati (2020) found a significant reduction in pain intensity among laboring women who used bitter orange aromatherapy, with a paired sample t-test result of $p=0.000$. However, these studies are limited by variations in respondent characteristics, settings, and timeframes.

While existing research highlights the efficacy of bitter orange aromatherapy, its application in specific clinical settings, such as primary inpatient clinics, remains underexplored. The absence of prior implementation of this intervention at Klinik Rawat Inap Pratama Ibu Hawa,



coupled with the high number of laboring patients 122 cases from January to September 2024 presents a unique opportunity to investigate its impact. The observed difficulty in managing labor pain among these patients further underscores the need for innovative and accessible pain management solutions.

This study aims to assess the effectiveness of bitter orange aromatherapy in reducing labor pain among patients at Inpatient Clinic Pratama Ibu Hawa. The research seeks to fill the gap in localized evidence and contribute novel insights into non-pharmacological pain management practices in maternal healthcare.

The study introduces a novel perspective by focusing on a new setting, unique respondent characteristics, and an updated timeframe. By conducting the research in a clinic with no prior experience in using bitter orange aromatherapy, this study adds significant value to existing knowledge and opens avenues for broader implementation of non-pharmacological interventions in maternal care.

METHODS

This study employed a quasi-experimental research design with intervention and control groups design. The study began with a pretest to assess initial conditions in both groups, followed by the intervention, and concluded with a posttest to evaluate changes. The research design was based on Sugiyono (2021).

The population included all multigravida mothers in the first stage of active labor at Inpatient Clinic Pratama Ibu Hawa in September-Oktober 2024, comprising 11 individuals. The sampling technique used was purposive sampling, based on inclusion and exclusion criteria. Inclusion criteria were in the active phase of the first stage of labor with cervical dilation of 4–6 cm, singleton pregnancies, cephalic presentation, no complications, willingness to participate, intact membranes, and no administration of analgesics or uterotonic agents. Exclusion criteria included allergies to bitter orange aromatherapy, assisted delivery using vacuum or forceps, pelvic abnormalities, uterine contraction disorders, or any uterine anomalies. The sample size was determined using Federer's formula, resulting in 22 respondents, with 11 in the experimental group and 11 in the control group. However, the small sample size has the potential to affect the p-value, increasing the risk of bias in statistical analysis. To mitigate this limitation and gain deeper insights, incorporating interviews as part of a qualitative study could complement the quantitative findings, providing a more comprehensive understanding of the research outcomes.

The study was conducted in September 2024 at Inpatient Clinic Pratama Ibu Hawa. The independent variable was the administration of bitter orange aromatherapy, applied using a diffuser with 20 ml of water and 5 drops of essential oil for 60 minutes during the active labor phase. The dependent variable was labor pain intensity, measured using the Visual Analog Scale (VAS).

The instruments used in this study included the VAS and partograph to record labor pain levels. Primary data were obtained through direct observations using the VAS, while secondary data were sourced from clinic records and relevant references. Data analysis involved univariate analysis to describe respondent characteristics and research variables, as well as bivariate analysis



using the Wilcoxon Signed Rank Test to evaluate changes in pain levels before and after the intervention in each group (Dharma, 2017). Pain levels were assessed on a scale of 0–10, where 0 represents no pain and 10 represents the worst possible pain. For clearer categorization, pain levels were divided into ranges: mild pain (1–3), moderate pain (4–6), and severe pain (7–10). This categorization allowed for a more detailed analysis of the effectiveness of the intervention in reducing pain intensity.

Data collection followed a systematic process, including editing, coding, entry, and tabulating. Statistical analysis was conducted using SPSS software. Ethical considerations were upheld by implementing principles of informed consent, anonymity, and confidentiality. Respondents were given the freedom to participate or withdraw from the study, and their identities were protected. All collected data were securely stored and destroyed after the study, in line with ethical research guidelines (Notoadmojo, 2018).

This study was conducted in a structured manner, starting from planning and implementation to data analysis. Each step was meticulously described to ensure replicability and the reliability of the results.

RESULTS

Table 1. Pain Scale Before and After Bitter Orange Aromatherapy During Active Phase of First Stage Labor at Inpatient Clinic Pratama Ibu Hawa in 2024

Pain Scale	Pretest	N =11	Posttest	N =11
	F	%	F	%
<i>Mild Pain</i>	0	0	6	54.5
<i>Moderate Pain</i>	9	81,8	5	45.5
<i>Severe Pain</i>	2	18,2	0	0.0
Total	11	100	11	100

Table 1 illustrates the changes in pain scale during the active phase of the first stage of labor before and after the intervention of Bitter Orange Aromatherapy at Inpatient Clinic Pratama Ibu Hawa in 2024. Before the intervention (pretest), 81.8% (9 out of 11) reported moderate pain, and 18.2% (2 out of 11) suffered from severe pain. After the intervention (posttest), there were notable reductions in pain intensity. None of the participants experienced mild or severe pain, while 45.5% (5 out of 11) reported moderate pain and 54.5% of participants (6 out of 11) experienced mild pain. These findings suggest that Bitter Orange Aromatherapy effectively reduced the intensity of pain during labor, particularly by alleviating severe pain and reducing the number of women experiencing moderate pain.

Table 2. The Effect of Bitter Orange Aromatherapy on Pain Intensity Reduction During the Active Phase of the First Stage of Labor at Inpatient Clinic Pratama Ibu Hawa in 2024

Pain Scale	Df	Mean	Standar Deviasi	ρ -value
	F	%	F	%



<i>Pretest</i>	11	5.64	0,924	0.000
<i>Posttest</i>	11	3.64	0.809	

The results presented in Table 2 indicate a significant reduction in pain intensity during the active phase of the first stage of labor after the intervention of Bitter Orange Aromatherapy at Inpatient Clinic Pratama Ibu Hawa in 2024. The pretest pain intensity had a mean of 5.64 with a standard deviation of 0.924. The statistical analysis, based on the q -value of 0.000, shows that the change in pain intensity is highly significant ($q < 0.05$), suggesting that the application of Bitter Orange Aromatherapy effectively contributed to the reduction of pain intensity during labor. Additionally, the 95% confidence interval (CI) for the reduction in pain intensity ranged from 5.098 to 8.876, further supporting the robustness and reliability of the findings.

DISCUSSION

1. Pain Scale During Labor for Multigravida in the Active Phase of Stage 1 Before Bitter Orange Aromatherapy Intervention

Based on the results of the study in Table 1, the pain scale for pregnant women during the active phase of stage 1 before the bitter orange aromatherapy intervention showed that the majority of respondents reported mild pain, with 9 people (81.8%) in the moderate pain category, and 2 people (18.2%) in the severe pain category.

This result is consistent with the study conducted by Nurhayati and Santi (2020), which found that the average pain score before the bitter orange therapy was 6.50. After the therapy was given, the average pain intensity decreased to 5.70.

In this study, the pain scale for multigravida in the active phase of stage 1 before receiving the bitter orange aromatherapy intervention showed that most respondents experienced moderate pain (81.8%), which is a result of the labor pain. Labor pain is a response to nervous stimulation caused by uterine contractions and tissue damage during labor, as well as delivery through the vagina. Pain perception varies depending on the individual, and the intensity of pain or pain tolerance during labor can affect the mother's psychological state (Susati & Andriani, 2023). Labor pain can cause stress, leading to the release of excessive hormones like catecholamines and steroids. These hormones can cause muscle tension and vasoconstriction, reducing uterine contractions, blood flow, and oxygen to the uterus, thus increasing ischemia in the uterus, which intensifies the pain impulses (Yadul Ulya, 2021).

This study shows that the pain experienced by a mother during labor is not the same for everyone, as each individual has different pain thresholds and tolerances. The difference in pain intensity, according to Sari et al. (2010), can be influenced by various factors, one of which is an individual's pain tolerance threshold.

In the first stage of normal labor, pain arises from involuntary contractions of the uterine muscles. At the onset, the discomfort is typically experienced in the lower back. As labor continues, the pain grows more intense and spreads to both the abdomen and back. Contractions usually last between 45 and 90 seconds, and as labor progresses, their intensity escalates, resulting in stronger pain. (Reeder, 2019).



During labor, as the mother experiences contractions and periods of relaxation, she needs methods to help ease the pain. Aromatherapy is one non-pharmacological approach to managing labor pain. It involves the use of essential oils or pure plant extracts to provide therapeutic effects. Bitter orange aromatherapy is a natural, non-pharmacological method that can help relieve or reduce pain during the first stage of labor. According to Ulya, Herlina, & Pratiwi (2021), clinical experience has shown that aromatherapy produces a beneficial fragrance, which, when inhaled or applied to the skin, can cause psychological and physiological changes in the body. The inhalation of aromatic scents can lead to relaxation and calmness by increasing alpha waves in the brain (Yadul Ulya, 2021).

The researcher assumes that the use of bitter orange aromatherapy during labor helps the mother reduce pain. A mother who is able to relax in sync with the uterine contractions will feel more comfortable during the labor process.

2 . Pain Scale During Labor for Multigravida in the Active Phase of Stage 1 After Bitter Orange Aromatherapy Intervention

Based on the results in Table 1, the pain scale for pregnant women during the active phase of stage 1 after receiving the bitter orange aromatherapy intervention showed that the majority of respondents reported moderate pain, 45.5% (5 out of 11) reported moderate pain and 54.5% of participants (6 out of 11) experienced mild pain.

The use of bitter orange aromatherapy during active labor resulted in a decrease in the pain perceived by the mothers. This reduction in pain was attributed to the diversion of attention away from the pain. Aromatherapy, which uses essential oils, is known to have various benefits, from first aid to improving mood and promoting relaxation (Afdila& Nuraida, 2021). A study revealed that aromatherapy can psychologically reduce pain and anxiety. Immunologically, aromatherapy can increase lymphocytes in peripheral blood, and increase CD8 and CD16 cells, which play a role in immunity (Aswan & Abadi, 2021).

Bitter orange contains limonene, linalool, linalyl acetate, geranyl acetate, geraniol, nerol, and neryl acetate. A study found that a cloth soaked in 4 ml of citrus essence placed near the patient for 30 minutes was effective in reducing labor pain (Namazi, 2014). The oil has calming, antiseptic, antispasmodic, and mild sedative effects. Limonene in bitter orange oil controls cyclooxygenase I and II, prevents prostaglandin activity, and reduces pain (Nurhayati, 2020).

Essential oil from bitter orange can be beneficial in reducing labor pain. Bitter orange has a calming effect. Aromatherapy with bitter orange creates relaxation, balance, and comfort. The fragrance released from the aromatherapy contains chemical components that are absorbed by the body through the nose and lungs and enter the bloodstream. As the fragrance reaches the brain's limbic system, it influences emotional expression, memory, and physical responses, offering psychological benefits (Susilo & Hariyani, 2021).

In this study, the pain levels of multigravida mothers during the first stage of labor, prior to the bitter orange aromatherapy intervention, indicated that the majority (81.8%) experienced moderate pain. Following the intervention, the pain intensity decreased significantly, shifting from



severe to mild. This reduction is attributed to the soothing effects of bitter orange aromatherapy, a non-pharmacological method for alleviating pain during active labor. The essential compounds in bitter orange, such as limonene, linalool, and linalyl acetate, contribute to its analgesic properties and mood-enhancing effects (Irmawati et al., 2021).

3 . Difference in Pain Intensity Before and After Bitter Orange Aromatherapy Intervention in Stage 1 Active Labor

Based on the research results in Table 2, the average pain intensity for multigravida during stage 1 active labor was 5.64 before receiving bitter orange aromatherapy and 3.64 after receiving the intervention, indicating a decrease in pain intensity. Statistical analysis using the Wilcoxon test showed a p-value of 0.003 with 95% CI (2.786-3.786). Since the p-value is less than 0.05, the alternative hypothesis is accepted, indicating a significant reduction in pain intensity before and after the aromatherapy intervention in multigravida during stage 1 active labor at Inpatient Clinic Pratama Ibu Hawa in 2024.

This result is consistent with the study by Irmawati (2021), where the average pain score before treatment was 5.93, and after treatment, it decreased to 3.63. Statistical analysis using the Wilcoxon test revealed a p-value of 0.00095% CI (5.545-7.445), confirming the significant effect of aromatherapy on labor pain intensity.

Other studies also support these findings. Nurhayati and Santi (2020) found that bitter orange aromatherapy significantly reduced labor pain in stage 1, with a p-value of 0.005. Similarly, Astutik LD (2019) found that bitter orange aromatherapy significantly reduced pain intensity during stage 1 labor at a p-value of 0.00095% CI (4.665-8.767).

Labor pain is a natural physiological process resulting from uterine muscle contractions that help open the cervix and guide the baby's head toward the pelvis. When labor pain is not properly managed, it can cause exhaustion, frustration, and stress, leading to an increased release of catecholamines and steroid hormones. This can lead to muscle tension and vasoconstriction, resulting in reduced uterine blood flow, oxygen supply, and increased ischemia, thus amplifying the pain (Lestari & Andayani, 2021).

According to Judha (2017), labor pain is caused by uterine muscle contractions, stretching of uterine muscles, and psychological factors such as fear, anxiety, and tension, all of which can worsen the pain experience. The intervention using bitter orange aromatherapy may influence pain perception through its chemical components, such as linalool and limonene. These compounds are known to have anxiolytic and sedative effects, potentially reducing the release of catecholamines like adrenaline and noradrenaline, which are typically elevated during stress and labor pain. The reduced catecholamine levels help lower heart rate and blood pressure, contributing to a calmer state. Furthermore, the intervention may also modulate steroid hormone levels, such as cortisol, which is often associated with stress responses. In contrast, the control group, which did not receive this intervention, may experience higher levels of catecholamines and cortisol, leading to greater pain perception and physiological tension. This difference underscores the potential efficacy of the intervention in alleviating labor pain.



CONCLUSIONS

The research conducted at Inpatient Clinic Pratama Ibu Hawa in 2024 aligns with the objectives outlined in the Introduction section, confirming the effectiveness of Bitter Orange Aromatherapy in reducing labor pain intensity during the active phase of the first stage of labor. As expected, the results show that before the intervention, most participants experienced moderate to severe pain. However, after the intervention, there was a significant reduction in pain, with more women reporting mild pain and fewer experiencing moderate or severe pain.

The statistical analysis further strengthens these findings, with a significant reduction in pain intensity (p -value = 0.000) 95% CI = (5.098-8.876), indicating that the application of Bitter Orange Aromatherapy plays a vital role in pain management during labor. This demonstrates that the aromatherapy intervention is not only effective in reducing pain intensity but also has potential as a non-pharmacological approach to enhance the birthing experience for pregnant women.

Based on these findings, future research could explore the long-term effects of Bitter Orange Aromatherapy, its application in different stages of labor, or its combination with other complementary therapies to improve labor outcomes. Further studies could also examine its impact on maternal anxiety, relaxation, and overall birth satisfaction, contributing to a holistic approach in childbirth management. Additionally, the integration of Bitter Orange Aromatherapy into standard labor care protocols could be a promising avenue for enhancing patient comfort and reducing the need for pharmacological interventions.

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