

The Effectiveness of Endorphin Massage Combined with Nutmeg (*Myristica fragrans*) Aromatherapy in Reducing Pain and Anxiety During the Active Phase of the First Stage of Labor at Labuha Regional Hospital

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ABSTRACT

Background: Labor pain and anxiety, primarily caused by uterine contractions, are common experiences during childbirth and can lead to complications if not properly managed. Non-pharmacological methods such as endorphin massage and nutmeg aromatherapy offer promising alternatives for pain and anxiety reduction. This study aimed to evaluate the effectiveness of endorphin massage in combination with nutmeg aromatherapy in reducing pain and anxiety during the active phase of the first stage of labor.

Methods: A quasi-experimental design with a pretest-posttest control group was employed. The intervention group received endorphin massage alongside nutmeg aromatherapy, while the control group was given nutmeg aromatherapy alone. A total of 52 laboring women in the active phase of first-stage labor at Labuha Regional Hospital during May–June 2025 were recruited using purposive sampling, with 26 participants in each group. Data were collected using questionnaires and observation sheets. Descriptive statistics, the Kolmogorov-Smirnov normality test, and both paired and unpaired statistical tests were utilized. The Mann-Whitney U test was used to assess group differences.

Results: In the control group, Wilcoxon tests showed significant reductions in both pain ($p = 0.000$) and anxiety levels ($p = 0.000$) following the aromatherapy intervention. The treatment group demonstrated a significantly greater reduction in pain ($Z = -6.102$, $p = 0.000$) and anxiety ($Z = -3.074$, $p = 0.002$) compared to the control group, indicating the added benefit of endorphin massage.

Conclusion: The combination of endorphin massage and nutmeg aromatherapy is effective in significantly reducing labor-related pain and anxiety. This method may be recommended as a supportive non-pharmacological intervention to enhance maternal comfort and care quality during labor, particularly by midwives.

I. Introduction

Childbirth is a physiological and natural process that occurs in women with healthy reproductive organs following conception (Martin et al., 2022). However, despite its physiological nature, labor can become pathological when not properly understood or managed by either the mother or the attending healthcare provider (Weckend et al., 2025a). Pain and anxiety are common during labor and, if not adequately managed, may lead to complications for both mother and infant (Ahadi Yulghunlu, 2025). Globally, maternal mortality remains a significant concern. According to Indonesia's Ministry of Health, maternal mortality increased from 4,005 deaths in 2022 to 4,129 in 2023 (Julian Jingsung & Nindy

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Elliana Benly, 2025). While the national target is to reduce the maternal mortality rate (MMR) to 183 per 100,000 live births by 2024, further efforts are needed to achieve the Sustainable Development Goals (SDGs), which aim for an MMR of 70 by 2030. Complications during pregnancy, childbirth, and the postpartum period, such as preeclampsia, hemorrhage, and prolonged labor are among the leading causes of maternal death (Song et al., 2025). Anxiety during labor is one factor that contributes to these complications by interfering with uterine contractions, prolonging labor, and increasing the risk of fetal distress and low birth weight (Edyedu et al., 2025).

In Indonesia, the prevalence of maternal anxiety during pregnancy is reported at 28.7%, particularly high in the third trimester as women approach labor. Data from RSUD Labuha, the referral hospital for 32 community health centers in South Halmahera Regency, North Maluku Province, reported that 74% of women in the active phase of the first stage of labor experienced severe anxiety in June 2024. Labor pain, associated with uterine contractions, cervical dilation, and fetal descent, also poses a significant psychological burden (Wu et al., 2022). When unmanaged, it can lead to elevated catecholamines, reduced placental perfusion, and negative maternal-fetal outcomes such as hypoxia, prolonged labor, increased blood pressure, and in severe cases, maternal or neonatal death (Weckend et al., 2025b).

Non-pharmacological methods for pain and anxiety management during labor, including warm compresses, counterpressure, hydrotherapy, and massage, are considered safer and more accessible alternatives to pharmacological interventions. Among these, endorphin massage and aromatherapy are gaining attention (Armstrong et al., 2024). However, despite their potential benefits, such methods remain underutilized in clinical settings, particularly due to the lack of standardized protocols and trained personnel. RSUD Labuha has yet to implement endorphin massage as a complementary therapy. Field observations show that healthcare providers are not yet trained or certified in this technique, indicating an opportunity to introduce and evaluate its effectiveness. Nutmeg (*Myristica fragrans*) aromatherapy, known for its calming properties, may enhance the effects of endorphin massage.

Given the persistent issues of labor pain and anxiety and the limited application of complementary therapies in Indonesian hospitals, this study aims to evaluate the effectiveness of endorphin massage combined with nutmeg aromatherapy in reducing pain and anxiety during the active phase of the first stage of labor at RSUD Labuha.

II. METHODS

This study employed a quasi-experimental design with a pre-test and post-test approach using a control group. The research was conducted at RSUD Labuha from May to June 2023. The population consisted of women in the active phase of the first stage of labor. A total of 30 participants were selected through purposive sampling and divided into two groups: 15 in the intervention group and 15 in the control group.

The instruments used in this study consisted of questionnaires and observation sheets designed to measure the intensity of pain and anxiety levels among women in the active phase of labor. The primary instrument for measuring pain was a questionnaire based on the Likert scale, adapted from previous research by Puji Lestari (2023), which included 20 questions related to various dimensions of pain experience. Anxiety was assessed through a similarly structured questionnaire covering physical, psychological, emotional, and behavioral aspects of anxiety, with a total of 60 items distributed across several anxiety domains. Data collection was performed through direct interviews and observations. Prior to intervention, baseline measurements of pain intensity and anxiety levels were obtained from all participants. The intervention group received an endorphin massage combined with nutmeg (*Myristica fragrans*) aromatherapy, administered for 15 minutes per session, three times over the course of labor, totaling 45 minutes. The control group received only nutmeg aromatherapy with the same dosage and frequency but without massage. Following the intervention, post-test data on pain and anxiety were collected using the same instruments and procedures to ensure consistency. During the data collection process, researchers maintained close supervision to ensure adherence to protocol and to provide assistance if any participant experienced discomfort or wished to withdraw. All responses were recorded anonymously to maintain participant confidentiality.

Data were analyzed using SPSS version 25. Descriptive statistics were used to summarize demographic characteristics. The Wilcoxon signed-rank test was used to assess differences before and after

intervention within each group, while the Mann–Whitney U test was used to compare outcomes between the two groups. The significance level was set at $p < 0.05$. The research process began with obtaining permission from relevant health authorities and the ethics committee. Participants who met the inclusion criteria were informed about the study and gave their consent. The intervention was administered in accordance with standardized procedures and under supervision. Pain and anxiety levels were measured before and 30 minutes after the intervention.

Ethical clearance was obtained from the Health Research Ethics Committee of This study was conducted after obtaining ethical approval from Stikes Guna Bangsa Yogyakarta, and the research permit was forwarded to the research site institution, RSUD Labuha. Participants provided informed consent and were assured of confidentiality and the right to withdraw at any time without any consequences

III. RESULT

This study (table 1) involved 52 participants equally divided into control and experimental groups. Most respondents in both groups were aged 20-35 years, with 53.8% in the control group and 73.1% in the experimental group. Regarding parity, 42.3% of the control group were primiparas, while 42.3% of the experimental group were multiparas. Nearly all participants in both groups received family support during labor (92.3%). Over half of the respondents had a history of spontaneous or normal delivery (53.8%) in each group. Before treatment, all participants experienced severe to very severe labor pain, with 57.7% of controls and 65.4% of experimental participants reporting very severe pain. After treatment, the experimental group showed a marked reduction in pain, with no severe or very severe pain reported; instead, 53.8% experienced moderate pain and 46.2% mild pain. Meanwhile, the control group mostly still experienced severe (73.1%) or very severe pain (15.4%). Anxiety levels before treatment varied, with moderate and severe anxiety predominating. Post-treatment, the experimental group showed significant anxiety reduction, with 30.8% mild anxiety and 15.4% no anxiety, whereas the control group continued to experience high anxiety levels, mostly severe (57.7%) and none mild or absent. These results indicate that endorphine massage combined with nutmeg (*Myristica fragrans*) aromatherapy effectively reduces labor pain and anxiety compared to aromatherapy alone.

Table 1. Distribution of Respondent Characteristics and Outcomes in Control and Experiment Groups

Variable	Category	Control Group (n=26)	Experiment Group (n=26)
Age	<20 years	6 (23.1%)	3 (11.5%)
	20-35 years	14 (53.8%)	19 (73.1%)
	>35 years	6 (23.1%)	4 (15.4%)
Parity	Primipara	11 (42.3%)	10 (38.5%)
	Multipara	9 (34.6%)	11 (42.3%)
	Grandemultipara	6 (23.1%)	5 (19.2%)
Family Support	Supportive	24 (92.3%)	24 (92.3%)
	Not supportive	2 (7.7%)	2 (7.7%)
History of Delivery	Never delivered	10 (38.5%)	10 (38.5%)
	Spontaneous/Normal	14 (53.8%)	14 (53.8%)
	Abnormal/C-section	2 (7.7%)	2 (7.7%)
Labor Pain Before Treatment	Very Severe	15 (57.7%)	17 (65.4%)
	Severe	11 (42.3%)	9 (34.6%)
Labor Pain After Treatment	Very Severe	4 (15.4%)	0 (0%)
	Severe	19 (73.1%)	0 (0%)
	Moderate	3 (11.5%)	14 (53.8%)
	Mild	0 (0%)	12 (46.2%)

Variable	Category	Control Group (n=26)	Experiment Group (n=26)
Anxiety Before Treatment	Very Severe	1 (3.8%)	4 (15.4%)
	Severe	9 (34.6%)	8 (30.8%)
	Moderate	9 (34.6%)	12 (46.2%)
	Mild	5 (19.3%)	1 (3.8%)
	None	2 (7.7%)	1 (3.8%)
Anxiety After Treatment	Very Severe	1 (3.8%)	4 (15.4%)
	Severe	15 (57.7%)	2 (7.6%)
	Moderate	10 (38.5%)	8 (30.8%)
	Mild	0 (0%)	8 (30.8%)
	None	0 (0%)	4 (15.4%)

The Wilcoxon Signed Ranks tests revealed significant reductions in both labor pain and anxiety levels within each group after their respective interventions. The experimental group, receiving endorphine massage combined with nutmeg (*Myristica fragrans*) aromatherapy, demonstrated a stronger decrease in pain and anxiety compared to the control group which received only aromatherapy. This is further supported by the Mann-Whitney U tests comparing post-intervention outcomes between groups, showing the experimental group had significantly lower pain and anxiety scores than the control group ($p < 0.05$). These findings indicate that the combined intervention of endorphine massage and aromatherapy is more effective at alleviating labor pain and anxiety during the active phase of the first stage of labor than aromatherapy alone (table 2).

Table 2. Combined Table of Wilcoxon and Mann-Whitney Test Results on Labor Pain and Anxiety Levels

Analysis	Group	N	Mean Rank	Sum of Ranks	Test Statistic	p-value
Wilcoxon - Pain (Before vs After) - Endorphine Massage + Aromatherapy	Experimental	26	13.50	351.00	$Z = -4.574$	0.000*
Wilcoxon - Anxiety (Before vs After) - Endorphine Massage + Aromatherapy	Experimental	26	12.44	211.50	$Z = -2.314$	0.021*
Wilcoxon - Pain (Before vs After) - Aromatherapy Only	Control	26	7.50	105.00	$Z = -3.742$	0.000*
Wilcoxon - Anxiety (Before vs After) - Aromatherapy Only	Control	26	8.00	40.00	$Z = -2.559$	0.010*
Mann-Whitney - Pain (Between groups)	Experimental vs Control	52	14.31 (Exp) / 38.69 (Ctrl)	372.00 / 1006.00	$Z = -6.102$	0.000*
Mann-Whitney - Anxiety (Between groups)	Experimental vs Control	52	20.31 (Exp) / 32.69 (Ctrl)	528.00 / 850.00	$Z = -3.074$	0.002*

* $p < 0.05$ (statistically significant)

IV. DISCUSSION

The results showed that the experimental group receiving endorphine massage combined with nutmeg seed (*Myristica fragrans*) aromatherapy experienced significantly greater reductions in both labor pain and anxiety compared to the control group receiving only aromatherapy. This aligns with previous studies indicating that massage therapy effectively stimulates the release of endorphins, natural painkillers that reduce pain perception (C. Liu et al., 2024). Aromatherapy using nutmeg seed has also been documented to provide calming effects and reduce anxiety by influencing the limbic system, the brain's emotional center (Thangaleela et al., 2022). The combined intervention appears to have a synergistic effect integrating massage with aromatherapy enhances relaxation and pain relief during labor (Hu et al., 2025). These findings are consistent with the gate control theory of pain, which posits that sensory input from massage can inhibit pain signals to the brain, and with psychophysiological theories suggesting that anxiety reduction positively influences pain perception (S. Liu & Kelliher, 2022). Overall, the study supports the use of multimodal non-pharmacological interventions to improve labor outcomes by addressing both physical pain and emotional distress.

The results of this study also show a statistically significant reduction in pain scores among women in labor after receiving endorphin massage combined with nutmeg seed (*Myristica fragrans*) aromatherapy, as indicated by the Wilcoxon test result ($Z = -4.574$, $p = 0.000$). This suggests that the intervention effectively reduced labor pain in the active phase of the first stage. Endorphin massage stimulates the release of endogenous opioids, helping to block pain perception pathways (Özdemir et al., 2025). Demonstrated that massage interventions can stimulate A-beta fibers that inhibit nociceptive input via the gate control mechanism proposed (da Nobrega et al., 2023). In addition, nutmeg aromatherapy contains compounds such as myristicin and eugenol, which have been shown to have analgesic and sedative effects, thereby strengthening the physiological rationale behind the significant pain reduction observed (Shah et al., 2024; Wakkumbura et al., 2024).

In terms of anxiety levels, the Wilcoxon test also revealed a significant decrease following the combination intervention ($Z = -2.314$, $p = 0.021$). Endorphin massage induces relaxation by increasing oxytocin and serotonin levels, which contribute to emotional comfort and anxiety reduction during labor (Azissah RS et al., 2024). Furthermore, essential oils from nutmeg are known to have anxiolytic effects due to their action on GABA receptors, promoting calmness and reducing sympathetic nervous system activity (Hartley & McLachlan, 2022). These biological mechanisms support the observed psychological benefits of the combined therapy in reducing maternal anxiety.

The control group, which received only nutmeg aromatherapy, also showed significant reductions in both pain ($Z = -3.742$, $p = 0.000$) and anxiety ($Z = -2.559$, $p = 0.010$), although the magnitude of change was lower than that observed in the experimental group. This indicates that while aromatherapy alone has therapeutic benefits, the combination with endorphin massage provides a synergistic effect. The Mann-Whitney test confirmed significant differences in pain ($Z = -6.102$, $p = 0.000$) and anxiety ($Z = -3.074$, $p = 0.002$) between the two groups, favoring the experimental group. This supports the theory that multimodal interventions, which integrate both physical and olfactory stimulation, can produce enhanced effects through complementary mechanisms, as noted in the holistic pain management approach advocated (Shi & Wu, 2023). Together, these findings reinforce the value of non-pharmacological interventions in labor, particularly those rooted in sensory stimulation and neurohormonal modulation (Nori et al., 2023). The combination of endorphin massage and nutmeg aromatherapy not only reduces physical pain but also alleviates psychological distress, offering a comprehensive strategy for improving maternal comfort and well-being during childbirth (Dewanti et al., 2024).

This study has several limitations that should be acknowledged for scientific transparency. First, it employed a quasi-experimental design without randomization, introducing the possibility of selection bias that cannot be entirely eliminated. Although both intervention and control groups had equal numbers of participants, baseline characteristics were not guaranteed to be homogeneous. Second, the sample size in each group was limited to only 26 participants, which restricts the generalizability of the findings to a broader population and may affect statistical power. Third, maternal anxiety levels during labor could have been influenced by other uncontrolled factors such as family support, previous childbirth experiences, or psychological conditions during pregnancy. Lastly, in the intervention group, endorphin

massage and aromatherapy were administered simultaneously, making it difficult to isolate the individual effects of each component and determine which had the most significant impact.

V. CONCLUSION

The findings of this study indicate that the combination of endorphin massage and nutmeg seed (*Myristica fragrans*) aromatherapy is effective in reducing pain intensity and maternal anxiety during the active phase of the first stage of labor, offering a promising non-pharmacological approach to enhance maternal comfort and emotional well-being during childbirth. Therefore, it is recommended that healthcare providers consider integrating this intervention into maternity care practices.

VI. ACKNOWLEDGMENTS :

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VII. CONFLICTS OF INTEREST

No conflict of interest was found during the research

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