



Back pain and sleep quality after effleurage massage with lavender aromatherapy in third-trimester pregnant women

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ABSTRACT

The global prevalence of back pain during pregnancy is 40.5%, making appropriate prevention and treatment a priority (Salari et al., 2023). Back pain in pregnant women has the potential to worsen their health and lead to adverse pregnancy outcomes, thereby increasing sleep disturbances. This study aimed to examine changes in back pain intensity and sleep quality before and after a two-day effleurage massage combined with lavender aromatherapy among third-trimester pregnant women. The study employed a quasi-experimental design with a pretest-posttest one-group design, involving 40 pregnant women in their third trimester who received the effleurage massage intervention for 2 days, 20 minutes per day, using massage oil made from a mixture of virgin coconut oil (VCO) and 2% lavender essential oil. This study used the PSQI questionnaire to measure sleep quality and the VAS scale to measure back pain. The results showed a decrease in the average back pain score from 6.3 to 3.35 after the intervention. Additionally, the participants' sleep quality improved, as evidenced by an increase in the percentage of pregnant women reporting good sleep quality from 5% to 62.5% following the intervention. Statistical analysis revealed a p-value of <0.001, indicating a significant effect of effleurage massage and lavender aromatherapy on reducing back pain and improving sleep quality. The findings of this study indicate that effleurage massage and lavender aromatherapy short-term improvement in reducing back pain and improving sleep quality in third-trimester pregnant women. Thus, this intervention can be used as a simple, safe, and easily implemented nonpharmacological complementary therapy in obstetric care to help alleviate discomfort in third-trimester pregnant women. However, limited evidence is available on the combined use of effleurage massage and lavender aromatherapy as a single integrated intervention to address both back pain and sleep quality in third-trimester pregnant women. The originality of this study lies in its practical combined intervention protocol, using effleurage massage with virgin coconut oil and 2% lavender essential oil, to simultaneously reduce back pain and improve sleep quality.

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1. Introduction

Lower back pain is a common complaint among women in their third trimester of pregnancy and can interfere with daily activities, often leading to sleep disturbances. The combined effects of back pain and poor sleep quality have the potential to impact pregnancy outcomes. Sleep is crucial for pregnant women, as insufficient sleep can potentially worsen maternal health and lead to adverse pregnancy outcomes (Nelson et al., 2022). During pregnancy, the ligaments in the sacroiliac joints become lax, causing lordosis that shifts the body's center of gravity forward. This is compounded by reduced physical activity, fatigue, and stretching of the lumbar muscles, all of which increase pressure on the posterior vertebral ligaments, resulting in back pain during pregnancy (Shijagurumayum Acharya et al., 2019). The global prevalence of lower back pain during pregnancy is 40.5% (Salari et al., 2023), making back pain a problem that requires management efforts.

Massages during pregnancy have been shown to reduce symptoms of depression and anxiety, attenuate leg and back pain, reduce cortisol levels, and show positive effects on immune function. Massage treatments show more positive effects than other relaxation techniques like progressive muscle relaxation. Effects on prenatal depression are comparable to psychotherapy and antidepressants (Mueller & Grunwald, 2021). A 20-minute effleurage massage before bedtime for two consecutive days improves sleep quality in hospitalized pregnant women with high-risk pregnancies; it would be more beneficial to apply this as a preventive measure against discomfort in pregnant women (Tien et al., 2025).

The effects of effleurage, friction, petrissage, and vibration massage techniques, combined with a massage oil containing 2% lavender essential oil, were found to relieve stress and improve the long-term immune function of pregnant women. The scent of lavender can stimulate the brain's emotional center through the olfactory system, and the hypothalamus releases neurotransmitters such as endorphins and enkephalins in response to this stimulation, which can regulate emotional and psychological states, reduce anxiety and stress, and make people feel relaxed and happy (Schneider et al., 2019).

Lavender essential oil is high in linalool and contains the active ingredients linalyl acetate and limonene. Its mechanism of action involves stimulating the parasympathetic nervous system, increasing dopamine levels, and enhancing alpha waves in the brain. Lavender essential oil is primarily indicated for anxiety, depression, and sleep disorders due to its relaxing effects (Cui et al., 2022). Lavender essential oil (*Lavandula angustifolia*) is beneficial for calming the nervous system, lowering blood pressure, and reducing anxiety and pain; it also acts as a sedative and aids in wound healing. The topical application of lavender essential oil and other administration methods in pregnant women did not result in any adverse effects; lavender essential oil demonstrated statistically significant efficacy and showed specific benefits resulting from its use (Farrar & Farrar, 2020).

Sleep quality is defined as a person's satisfaction with all measurable aspects of the sleep experience. Poor sleep quality contributes to illness and poor health outcomes (Nelson et al., 2022). A meta-analysis study showed that lavender aroma inhalation therapy has a significant effect on alleviating sleep problems ($p = 0.000$); an evaluation of secondary outcomes revealed a significant effect in reducing stress, anxiety, and depression (Cheong et al., 2021). It is important to highlight safe methods for enhancing sleep quality in pregnant women during prenatal care. Recent studies suggest that non-drug interventions (such as listening to music, engaging in physical activity, practicing relaxation techniques, using lettuce seeds, maintaining proper sleep hygiene, and acupressure) can effectively improve sleep quality throughout pregnancy. A significant improvement on the sleep quality (PSQI score) was observed when all interventions were grouped (Paulino et al., 2022).

Pregnant women gain an average of 11 to 12 kg, and hormonal and biomechanical changes in the body make them susceptible to various musculoskeletal problems, such as back pain, pelvic pain, sciatica, tailbone pain, carpal tunnel syndrome, and restless legs syndrome (RLS). In a cross-sectional study conducted in India involving 200 pregnant women, the prevalence of back pain was found to be 80%, with the highest incidence in the 34-week gestational age group; 47% were first-time pregnant

women, 33% were pregnant for the second time, and 20% had been pregnant more than twice (Saxena et al., 2019).

This study is innovative because it combines effleurage massage with oil massage infused with lavender aromatherapy, thereby providing new insights into complementary therapies and offering a potential intervention to improve maternal health by alleviating back pain and enhancing sleep quality. A preliminary study was conducted at the Labuapi Community Health Center in West Lombok Regency, which found that there were 576 pregnant women in their third trimester during their fourth antenatal visit between January 2025 and August 2025. In August 2025, there were 62 pregnant women in their third trimester. The Labuapi Community Health Center has implemented complementary therapies for preventive care and is supported by certified complementary therapy practitioners. The main problem identified was the discomfort frequently experienced by pregnant women in their third trimester regarding sleep quality and back pain; therefore, it was deemed necessary to investigate the administration of a combination of effleurage massage and lavender aromatherapy to reduce back pain and improve sleep quality in pregnant women in their third trimester.

2. Methods

This study conducted a literature review by compiling existing literature and examining previous research journals, followed by a preliminary study at the West Lombok Regency Health Office to collect data on the number of pregnant women. This study has received ethical approval from the Ethics Committee of Al Azhar Islamic University of Mataram and has obtained a research permit from the West Lombok Regency Office of Education and Culture based on letter number: 070/248/BAPPERIDA/2026. The research intervention was conducted through home visits. The intervention was administered by midwives who were qualified in complementary care and had completed training in massage for pregnant women.

Data on the characteristics of the pregnant women—including age, occupation, parity, and BMI—were collected. In this study, age, BMI, parity, and other demographic characteristics were collected to describe the respondents' profiles. The primary objective of this study was to conduct a comparative analysis of back pain and sleep quality before and after the intervention among the same participants. The sample size of 40 participants was determined based on the total number of eligible third-trimester pregnant women during the study period and the feasibility of conducting the home visit intervention. The sample consisted of 40 pregnant women in their third trimester who were to receive effleurage massage combined with a mixture of 0,2 ml of lavender essential oil in 10 ml of virgin coconut oil (VCO) as the massage oil (Schneider et al., 2019).

This study used a one-group pretest-posttest design as a preliminary quasi-experimental approach to assess the short-term effect of effleurage massage combined with lavender aromatherapy. This design enabled comparison of back pain and sleep quality before and after the intervention within the same participants. the absence of a control group is acknowledged as a limitation, and future studies using a randomized controlled trial design are recommended to strengthen causal inference. The lavender essential oil content is monitored by the pharmacy team, and pure lavender essential oil is used. The effleurage massage technique is performed on the back for 20 minutes over two days (Tien et al., 2025). The intervention was conducted for two consecutive days to assess the immediate short-term effects of effleurage massage combined with lavender aromatherapy on back pain and sleep quality among third-trimester pregnant women. This duration was selected to ensure feasibility during home visits, reduce participant burden, and maintain adherence, while allowing standardized administration by trained midwives.

Assessments of back pain and sleep quality in pregnant women were conducted before and after the intervention. Back pain was measured using the Visual Analog Scale (VAS), a validated tool; the VAS assessment utilized a scale with emoticon stickers to indicate the level of pain. The measurement results were scored on a scale of 1–10, with the following categories: mild pain (scale 1–3), moderate pain (scale 4–7), and severe pain (scale 8–10) (Andreyani & Kuswida Bhakti, 2023; Koo & Yang, 2025). Measurement of sleep quality in pregnant women using the Pittsburgh Sleep Quality Index (PSQI)

questionnaire, which has been validated in Indonesian. The PSQI consists of 19 items with 7 assessment components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, sleep medication use, and daytime dysfunction. The measurement results sum the total scores of the 7 components, with the following result categories: good sleep quality (score ≤ 5), poor sleep quality (score $> 6-21$).

The collected research data was reviewed for editing, coding, data entry, data cleaning, and computer-assisted analysis. The research report includes an analysis and interpretation of the data based on the research findings in comparison with existing theories, and is supplemented with conclusions and recommendations based on the research conducted.

Data were analyzed using computer-assisted statistical software. Respondent characteristics were presented using frequencies and percentages for categorical variables and mean $\pm$ standard deviation or median and interquartile range for numerical variables, depending on data distribution. Normality testing was performed before inferential analysis. Because the pretest-posttest data were not normally distributed, the Wilcoxon signed-rank test was used to analyze differences in back pain and sleep quality scores before and after the intervention. Statistical significance was set at $p < 0.05$.

3. Results and Discussion

Results

This study involved 40 pregnant women in their third trimester who received effleurage massage and lavender aromatherapy.

Table 1.
Frequency Distribution of Respondent Characteristics by Age, Education, Occupation, and Pregnancy Status (n=40)

Variabel	n	%
Maternal Age		
Low risk (20-35 years)	34	85
High risk (<20 or >35 years)	6	15
Education		
High	22	55
Low	18	45
Employment		
Unemployed	30	75
Employed	10	25
Pregnancy		
At risk	15	37.5
Not at risk	25	62.5

Based on Table 1, it is evident that the number of respondents in this study was 40 pregnant women. Respondent characteristics included maternal age, education, occupation, and gestational status. Based on maternal age, the majority of respondents fell into the low-risk category, namely those aged 20–35 years, totaling 34 respondents or 85%. Meanwhile, respondents in the high-risk age group—that is, under 20 or over 35 years old—numbered 6 respondents, or 15%. This indicates that the majority of pregnant women in this study fall within the healthy reproductive age range.

Based on educational level, the majority of respondents had a higher education, namely 22 respondents or 55%, while 18 respondents or 45% had a lower level of education. This indicates that most respondents had a relatively good educational background. Based on employment status, the majority of respondents were non-working mothers, totaling 30 respondents or 75%, while 10 respondents, or 25%, were employed. This indicates that the majority of pregnant women in this study were homemakers or did not have formal employment. Based on pregnancy status, the majority of respondents fell into the low-risk category, comprising 25 respondents (62.5%), while 15 respondents (37.5%) were classified as high-risk. This indicates that the majority of respondents had a pregnancy status that did not fall into the high-risk category.

Table 2.
Frequency distribution of pain levels among pregnant women in the third trimester

Back Pain	n	%
Pre test		
Moderate	22	55
Severe	18	45
Post test		
Mild	21	52.5
Moderate	19	47.5

Based on Table 2, it is evident that the study included 40 pregnant women in their third trimester. The pre-test results indicate that, prior to the intervention, the majority of respondents experienced moderate back pain—specifically, 22 respondents (55%)—while 18 respondents (45%) experienced severe back pain. This indicates that prior to the intervention, all respondents experienced back pain ranging from moderate to severe. After the intervention was administered, the post-test results showed a change in the severity of back pain. There were 21 respondents (52.5%) with mild back pain, while 19 respondents (47.5%) had moderate back pain. In the post-test results, no respondents were found to have severe back pain.

Table 3.
Frequency distribution of sleep quality among pregnant women in the third trimester

Sleep Quality	n	%
Pre test		
Good	2	5
Poor	38	95
Post test		
Good	25	62.5
Poor	15	37.5

Based on Table 3, it is known that the number of respondents in this study was 40 pregnant women in their third trimester. The pre-test results showed that before the intervention was administered, the majority of respondents had poor sleep quality, namely 38 respondents or 95%, while only 2 respondents or 5% had good sleep quality. This indicates that prior to the intervention, the majority of pregnant women in their third trimester experienced sleep quality disturbances. After the intervention, the post-test results showed a change in sleep quality. The number of respondents with good sleep quality increased to 25 respondents (62.5%), while the number of respondents with poor sleep quality decreased to 15 respondents (37.5%).

Table 4.
Differences in pain levels among pregnant women before and after effleurage massage and lavender aromatherapy

Variabel	Min	Max	Mean	SD
Pre test	4	8	6.3	1.137
Post test	1	6	3.35	1.167

Table 4 shows that the average pain level among pregnant women before receiving effleurage massage and lavender aromatherapy was 6.3 ± 1.137 , with a minimum of 4 and a maximum of 8. After the intervention, the average pain level decreased to 3.35 ± 1.167 , with a minimum of 1 and a maximum of 6. This average decrease of 2.95 points indicates that the administration of effleurage massage and lavender aromatherapy can reduce pain levels in pregnant women.

Table 5.
The Effect of Effleurage Massage and Lavender Aromatherapy on Back Pain Levels in Pregnant Women

Variabel	N	Mean Rank	Sum Rank	P value
Pre test	40	19.00	496.00	$p < 0.001$

Post test 40 00 00

Based on Table 5, the results of the statistical test show a $p < 0.001$, indicating that there is a significant effect of effleurage massage and lavender aromatherapy on the level of back pain in pregnant women. The mean rank score of 19.00 in the pre-test and 0.00 in the post-test indicates that back pain levels decreased following the intervention. Thus, effleurage massage and lavender aromatherapy are effective in reducing back pain in pregnant women.

Table 6.

Differences in sleep quality among pregnant women before and after effleurage massage and lavender aromatherapy

Variabel	Min	Max	Mean	SD
Pre test	6	13	9.4	1.482
Post test	1	9	4.62	2.350

Table 6 shows the sleep quality scores of pregnant women before and after receiving effleurage massage combined with lavender aromatherapy. Before the intervention, the mean PSQI score was 9.40 ± 1.482 , with scores ranging from 6 to 13. After the intervention, the mean PSQI score decreased to 4.62 ± 2.350 , with scores ranging from 1 to 9. The mean reduction in PSQI score was 4.78 points, indicating an improvement in sleep quality after the intervention, as lower PSQI scores represent better sleep quality.

Table 7.

The effect of effleurage massage and lavender aromatherapy on the sleep quality of pregnant women

Variabel	N	Mean Rank	Sum Rank	P value
Pre test	40	12.00	276.00	$p < 0.001$
Post test	40	00	00	

Based on Table 7, the results of the statistical test show a $p < 0.001$, indicating that the administration of effleurage massage and lavender aromatherapy has a significant effect on the sleep quality of pregnant women. The mean rank score of 12.00 in the pre-test and 0.00 in the post-test indicates a change following the intervention. Thus, the administration of effleurage massage and lavender aromatherapy is effective in improving the sleep quality of pregnant women.

Discussion

This study is innovative because it evaluates a combined intervention of effleurage massage and lavender aromatherapy—administered through a practical home-visit protocol by trained midwives—to simultaneously reduce back pain and improve sleep quality in pregnant women in their third trimester. The results of the study indicate that the combination of effleurage massage and lavender aromatherapy significantly reduced back pain levels in pregnant women in their third trimester. The average pain score decreased from 6.3 to 3.35 after the intervention, with a p-value of 0.000. These findings indicate that this combination of non-pharmacological therapies is effective in reducing musculoskeletal discomfort commonly experienced during the third trimester of pregnancy. The findings are also consistent with broader evidence indicating that non-pharmacological interventions can contribute to pain reduction in pregnancy-related low back pain. A recent network meta-analysis of randomized controlled trials reported that non-pharmacological interventions showed beneficial effects for pregnancy-related low back pain, and that integrated interventions may provide greater benefits than single interventions (Wang et al., 2025). Back pain during pregnancy is primarily caused by biomechanical changes in the body due to uterine enlargement, weight gain, shifts in the center of gravity, and increased levels of the hormone relaxin, which causes the loosening of pelvic and spinal ligaments. These conditions increase tension in the paravertebral and lumbar muscles, leading to pain that can interfere with daily activities and the quality of life of pregnant women (Anggasari et al.,

2024).

A significant difference was found in the prevalence of poor sleep quality across the various trimesters of pregnancy, with a trend indicating an increase in poor sleep quality as gestational age progresses. These findings suggest that the sleep quality of pregnant women deteriorates as pregnancy progresses. Interventions aimed at improving sleep hygiene, providing supportive antenatal care, and addressing specific physical discomforts associated with pregnancy have the potential to mitigate these challenges and improve maternal and fetal health outcomes (Mislu et al., 2024).

In addition to the mechanical effects of massage, the use of lavender aromatherapy is believed to provide a synergistic effect in reducing pain perception. The main compounds in lavender, such as linalool and linalyl acetate, have sedative, anxiolytic, and relaxing effects that act through the limbic system following olfactory stimulation. Activation of the limbic system can increase the release of neurotransmitters such as serotonin and endorphins, which play a role in pain modulation and relaxation. Therefore, the combination of massage and lavender aroma is capable of producing more optimal physiological and psychological effects compared to the use of either intervention alone (Vidal-García et al., 2024). a systematic review and meta-analysis on aromatherapy during pregnancy found that aromatherapy may improve sleep quality and that lavender may contribute to better sleep outcomes among pregnant women (Mascarenhas et al., 2025).

This study also showed that the sleep quality of pregnant women improved significantly after the intervention. Before the intervention, 95% of the respondents experienced poor sleep quality, whereas after the intervention, that number decreased to 37.5%, and the majority of respondents (62.5%) reported good sleep quality. These findings suggest that effleurage massage and lavender aromatherapy not only provide benefits for physical pain but also for the psychological aspects and rest quality of pregnant women. These results align with the study by Khairiah et al. (2024), which found that prenatal exercise and effleurage massage significantly reduced perceived back pain in third-trimester pregnant women, with a p-value of 0.000. The study explains that changes in body posture due to uterine enlargement, weight gain, and the effects of the hormones relaxin and progesterone lead to increased tension in the lower back muscles. Effleurage massage intervention helps relax the muscles and improves comfort for the mother during pregnancy, thereby significantly reducing pain perception (Khairiah et al., 2024).

Clinically, the combination of effleurage massage and lavender aromatherapy can serve as a safe, affordable, and easy-to-implement complementary intervention that families can perform independently after receiving education from healthcare professionals. During and after the intervention, participants were monitored for potential side effects, including skin irritation, allergic reactions, dizziness, nausea, discomfort during the massage, and uterine contractions. No side effects related to the use of lavender essential oil or the effleurage massage technique were reported by participants during this study.

The findings of this study provide preliminary evidence that effleurage massage combined with lavender aromatherapy can be considered as a supportive, non-pharmacological complementary intervention in evidence-based midwifery practice for managing back pain and sleep disturbances among third-trimester pregnant women. In antenatal care, this intervention may be integrated into midwife-led education or home-based care programs, provided that it is performed by trained personnel, uses appropriate essential oil dilution, and includes safety screening and monitoring. Nevertheless, due to the one-group pretest-posttest design and limited sample size, further controlled studies are needed before this intervention can be recommended for broader antenatal care guidelines. However, this study still has limitations because it used a one-group pretest-posttest design without a control group, so the influence of external factors could not be fully eliminated. Future research is recommended to use a randomized controlled trial design with a larger sample size to obtain a stronger level of evidence.

The findings should be generalized with caution because this study involved a small sample from a single study area and did not specifically analyze high-risk pregnant women. Further multicenter studies with larger samples and controlled designs are needed before applying the results to high-risk

pregnancies or broader populations.

4. Conclusion

The scientific contribution of this study is the evaluation of a combined effleurage massage and lavender aromatherapy intervention as a simple, midwife-led complementary approach to address two common discomforts in third-trimester pregnancy: back pain and poor sleep quality. In the manuscript, the intervention was delivered through home visits by trained midwives, and the findings showed a decrease in mean back pain score from 6.3 to 3.35 and an increase in good sleep quality from 5% to 62.5% after the intervention. Statistical test results showed a p-value of <0.001, indicating a significant effect of effleurage massage and lavender aromatherapy on reducing back pain and improving sleep quality. This study provides preliminary evidence that effleurage massage combined with lavender aromatherapy may help reduce back pain and improve sleep quality in pregnant women in their third trimester. The uniqueness of this study lies in the use of an integrated complementary intervention led by midwives and conducted at home to address back pain and sleep quality simultaneously. In practice, this intervention could be considered a supportive complementary option in antenatal care, provided it is performed by trained personnel following appropriate safety protocols. However, these findings should be interpreted with caution because this study employed a single-group pretest-posttest design, involved a relatively small sample from a single study region, had a short intervention period, and did not account for potential confounding factors. Further randomized controlled trials with larger samples, longer follow-up periods, standardized intervention protocols, and analyses of maternal characteristics are needed to confirm the effectiveness and generalizability of this intervention.

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