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The Effect of Andaliman Aromatherapy (*Zanthoxylum acanthopodium* Dc) on Pre-Delivery Anxiety

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ABSTRACT

Background: Anxiety is common in the third trimester. Globally, untreated anxiety affects 15–25% of pregnant women, with adverse effects on maternal health, labor, and fetal outcomes. Inhalation aromatherapy is a non-pharmacological intervention. Andaliman (*Zanthoxylum acanthopodium* DC), containing α-pinene, limonene, geraniol, citronellol, and geranyl acetate, shows therapeutic potential. This study aimed to evaluate the effect of inhalation aromatherapy with andaliman essential oil on pre-delivery anxiety in pregnant women.

Method: This pre-experimental study used a one-group pretest–posttest design. Thirteen third-trimester primigravida women at PMB Rika Fadilah Marelan in 2024 were recruited using a total sampling approach. Anxiety was confirmed using the Hamilton Anxiety Rating Scale (HARS). Participants inhaled five drops of andaliman essential oil diluted in 20 ml of water for 15 minutes, twice in one week. Data were analyzed using the Wilcoxon signed-rank test.

Result: The mean pre-test anxiety score was 30.08 ± 4.591 (range 23–37), indicating moderate to severe anxiety. After the intervention, the mean score decreased significantly to 19.85 ± 2.734 (range 15–24), corresponding to mild to moderate anxiety (p = 0.000).

Conclusion: Inhalation aromatherapy with andaliman essential oil effectively reduced anxiety in pregnant women before delivery and may serve as a safe, practical, and culturally acceptable complementary intervention.

INTRODUCTION

During pregnancy, particularly in the third trimester, women often experience increased anxiety. Anxiety in pregnant women is an emotional response influenced by the subconscious, encompassing fear and worry (Putri et al., 2021). According to the World Health Organization (WHO), approximately 13% of pregnant women suffer from anxiety or related disorders, with depression being the most common as delivery approaches. In developing countries, this figure rises to 19.8% (World Health Organization, 2022), while in Indonesia, 26.8% of expectant mothers report anxiety related to childbirth (Kementerian Kesehatan RI, 2022). This highlights that maternal psychological health remains a pressing issue alongside physical health concerns.

Unmanaged anxiety in pregnancy can lead to increased muscle tension, hinder relaxation, cause fatigue, and negatively affect fetal well-being (Asmariyah et al., 2021). Furthermore, anxiety can obstruct cervical dilatation during labor, increasing the risk of complications such as bleeding and fetal distress (Putri et al., 2021). Research also indicates that maternal anxiety is associated with a higher incidence of low birth weight (LBW) and a greater likelihood of both planned and

unplanned cesarean sections (Arianti & Restipa, 2019). Various factors contribute to anxiety, including discomfort, prior negative experiences, fear of death for the mother or baby, fear of bleeding, trauma from perineal tears, concerns about congenital disabilities, and worries about life after delivery (Isnaini et al., 2020).

Several non-pharmacological approaches are available to help manage prenatal anxiety, such as attending prenatal classes, positive thinking, praying, sharing experiences, meditation, yoga, hydrotherapy, listening to classical music, pregnancy exercise, acupressure, and the use of aromatherapy (Rahmayanti et al., 2020). Complementary therapies including relaxation techniques, hypnotherapy, and classical music have been reported to reduce anxiety (Suharna et al., 2021). Similarly, yoga, brain boosters, massage, and aromatherapy provide psychological benefits to pregnant women (Purba & Sembiring, 2021). Aromatherapy in particular is widely used, as it stimulates the release of endorphins, enkephalins, and serotonin—hormones that help reduce pain and tension before delivery (Miarso et al., 2019). Commonly used essential oils include sandalwood, jasmine, basil, cloves, lavender, and cinnamon, which are marketed in forms such as incense, salts, soaps, massage oils, and candles (Ningsih et al., 2024). Evidence also shows aromatherapy can significantly reduce prenatal anxiety, with average scores dropping from 26.41 before to 23.41 after intervention (Wati & Fatmawati, 2020). However, most studies focus on a limited range of commonly used oils, leaving opportunities to explore alternative local resources.

Indonesia is home to 40–50 species of essential oil-producing plants, with different plant parts—roots, stems, leaves, and fruits—providing active compounds (Hilmarni et al., 2021). One such plant is Andaliman (Zanthoxylum acanthopodium DC), a spice native to North Sumatra, especially in Toba Samosir and Tapanuli, which grows at 1,500 meters above sea level. Traditionally used as a culinary spice, Andaliman contains terpenoids with geranyl acetate (35%) as the main component, and is characterized by citrus-like aromas such as limonene and citronellol, along with β-myrcene, β-ocimene, linalool, and E-1 decenal (Asbur & Khairunnisyah, 2018). Previous research developed technology to process Andaliman into perfume, enhancing its economic value (Pakpahan et al., 2019). But its therapeutic potential for maternal mental health has not been studied. This phytochemical profile suggests Andaliman may offer comparable or even superior benefits to commonly used oils, providing both novelty and cultural relevance.

An initial survey conducted among 13 primigravida women in their third trimester undergoing antenatal care at PMB Rika Fadilah revealed that four women experienced anxiety before childbirth and did not know how to manage it, while two reported no anxiety due to practicing yoga with classical music. Anxiety was assessed through a simple self-reported questionnaire. Interviews with midwives also indicated that Andaliman aromatherapy had never been used in this setting. These findings, along with the unique phytochemical profile of Andaliman, provide the rationale for investigating its effect on reducing anxiety in pregnant women before delivery at PMB Rika Fadilah Marelan. To our knowledge, no previous studies have examined Andaliman essential oil for prenatal anxiety, thus this study offers novelty by introducing a locally available, culturally relevant, and potentially cost-effective complementary therapy for pregnant women.

METHODS

This study employed a quantitative pre-experimental design with a one-group pre-test and post-test model. In this design, subjects were observed before and after the intervention without randomization. The study population consisted of third-trimester primigravida pregnant women attending antenatal care (ANC) at PMB Rika Fadilah Marelan, Medan, North Sumatra. A total sampling technique was used, with 13 respondents meeting the inclusion criteria: (1) primigravida in the third trimester, (2) willing to participate and provide informed consent, and (3) able to follow the intervention procedure. Exclusion criteria included (1) presence of severe pregnancy complications, (2) respiratory problems such as asthma, and (3) known allergies to essential oils. The relatively small sample size (n=13) is acknowledged as a limitation that may affect the generalizability of findings.

The study was conducted in a private midwifery practice (PMB Rika Fadilah Marelan), Medan, North Sumatra, in a controlled room measuring 2 × 3.5 meters to standardize the

intervention environment. The aromatherapy used was derived from Andaliman fruit (Zanthoxylum acanthopodium DC), extracted using the hydro distillation method with a Stahl apparatus. The essential oil was diluted by adding five drops into 20 ml of water and diffused with an electric diffuser for 10 minutes. Respondents inhaled the aroma for 15 minutes while seated in a comfortable position. The intervention was carried out twice over a one-week period. Instrument for Data Collection Anxiety levels were measured using the Hamilton Anxiety Rating Scale (HARS), a widely used instrument for assessing anxiety symptoms. The scale consists of 14 items, each rated on a scale of 0 (not present) to 4 (very severe), with a total score range of 0–56. The classification of anxiety severity was as follows: mild (14–20), moderate (21–27), severe (28–41), and very severe (42–56). The HARS was administered by trained midwives before and after the intervention.

Data were analyzed using the Wilcoxon signed-rank test, a non-parametric test suitable for paired data with small sample sizes. The significance level was set at $\alpha = 0.05$. Potential confounding variables, such as participation in other relaxation techniques (e.g., yoga, music therapy), were minimized by instructing participants to refrain from additional anxiety-reducing interventions during the study period.

Ethical approval was obtained from the Health Research Ethics Committee of Universitas Sari Mutiara Indonesia (No. 2150/F/KEP/USM/VII/2024). All participants received detailed information regarding the study's purpose, procedures, risks, and benefits, and written informed consent was obtained prior to participation. Participant confidentiality and anonymity were maintained throughout the study.

RESULTS

1. Characteristics of Respondents

To provide a clearer understanding of the study population, the characteristics of pregnant women before delivery at PMB Fika Fadilah in 2024 were analyzed. The characteristics described include age, education level, and occupation. These background variables are important for illustrating the respondents' demographic profile and may serve as contextual factors in interpreting the study's findings. The distribution of respondents' characteristics is presented in Table 1.

Table 1. Distribution of Characteristics of Pregnant Women Before Delivery

Variables	n	%
Age (year)		
<20	2	15.4
20-35	11	84.6
Education		
Junior high	1	7.7
senior high	8	61.5
Bachelor	4	30.8
Occupation		
Housewife	9	69.2
Private employees	2	15.4
Self-employed	1	7.7
Teachers	1	7.7

Table 1 indicates that the majority of respondents were aged 20-35 years, accounting for 84.6% (11 respondent), whereas only 15.4% (2 respondent) were aged 20 or younger. Regarding educational background, the majority of respondents were high school graduates (61.5%; 8 respondent), followed by those with a bachelor's degree (30.8%; 4 respondent) and junior high school graduates (7.7%; 1 person). In terms of occupation, the majority of respondents were housewives (69.2%, 9 respondent), followed by private employees (15.4%, 2 respondent), self-employed individuals (7.7%, 1 person), and teachers (7.7%, 1 respondent).

2. The Anxiety Levels of Pregnant Women

The anxiety levels of pregnant women before and after the administration of andaliman (*Zanthoxylum acanthopodium* DC) aromatherapy are presented in Table 2.

Table 2. The anxiety level of pregnant women before and after the administration of aromatherapy with andaliman (*Zanthoxylum acanthopodium* DC) oil

The application of andaliman aromatherapy	Mean	Median	SD	Min.	Max.
Before	30.1	30	4.6	23	37
After	20	21	2.7	15	24

As shown in Table 2, the mean anxiety level of pregnant women before the administration of andaliman aromatherapy was 30.08, with a score range of 23–37. After the administration, the mean anxiety level decreased to 19.85, with a score range of 15–24. This represents a mean reduction of 10.23 points, equivalent to approximately 34.0%.

3. The effect of andaliman (*Zanthoxylum acanthopodium* DC) essential oils before and after the intervention

The effect of andaliman aromatherapy on pregnant women's pre-delivery anxiety levels was analyzed by comparing the mean scores before and after the intervention. The results are presented in Table 3.

Table 3: The effect of andaliman essential oils on pregnant women's pre-delivery anxiety levels

Variable	Mean	SD	Minimum	Maximum	Asymp. Sig
Before intervention	30.1	4.6	23	37	0.000
After intervention	20	2.7	15	24	

As shown in Table 3, the mean anxiety level of pregnant women before the intervention was 30.08 with a standard deviation of 4.591, ranging from 23 to 37. After the administration of andaliman aromatherapy, the mean decreased to 19.85 (SD = 2.734), ranging from 15 to 24. The mean reduction was 10.23 points, equivalent to approximately 34.0%. The statistical test indicated an *Asymp. Sig* value of 0.000.

DISCUSSION

This study demonstrated that aromatherapy using Andaliman essential oil significantly reduced anxiety levels among third-trimester primigravida women. The average anxiety score decreased from 30.08 (moderate to severe anxiety) before the intervention to 19.85 (mild to moderate anxiety) after the intervention, with a statistically significant difference ($p < 0.05$). Scores ranged from 15 to 37, reflecting the variability in individual anxiety levels as measured by the HARS scale.

Maternal characteristics, particularly age and occupation, appear to influence baseline anxiety. Most participants were between 20 and 35 years old, a reproductive age associated with greater emotional maturity and adaptability during pregnancy (Islami et al., 2021). Younger mothers may experience higher levels of childbirth-related anxiety due to limited physical and psychological preparedness (Ju et al., 2024) . Additionally, the majority of participants were housewives (n = 9), a group that tends to report higher anxiety, potentially due to limited social interactions, financial concerns, and fewer opportunities for distraction (Gary & Hijriyati, 2020). Access to health information and peer support also plays an important role in shaping maternal perceptions and psychological readiness for childbirth (Khan et al., 2023).

The significant reduction in anxiety following the aromatherapy intervention indicates the potential effectiveness of Andaliman essential oil as a complementary, non-pharmacological approach. Although individual differences in aroma preference and olfactory sensitivity exist, personalized application in a supportive environment may enhance relaxation and anxiety

reduction (Kintamani et al., 2023). This anxiolytic effect is thought to be mediated through the olfactory–limbic system, which may influence emotional regulation and stress response more specifically than general aromatherapy, providing a unique neurobiological rationale for Andaliman's use. Additionally, bioactive compounds like cinnamaldehyde and eugenol may influence neurotransmitters such as gamma-aminobutyric acid and serotonin, contributing to reduced physiological arousal and subjective anxiety

Andaliman essential oil, extracted via hydrodistillation from the fruit of Zanthoxylum acanthopodium DC (Rutaceae), contains bioactive compounds such as cinnamaldehyde and eugenol. These compounds are thought to act through the olfactory–limbic pathway, stimulating the amygdala and hypothalamus to regulate emotional responses and induce relaxation (Haslin, 2019; Siregar et al., 2024; Wira et al., 2021). This mechanism aligns with the theoretical basis of aromatherapy, where volatile molecules modulate the central nervous system to reduce anxiety (Kintamani et al., 2023). To our knowledge, this is the first study to investigate Andaliman essential oil specifically for prenatal anxiety in this local setting, highlighting an important research gap and the novelty of this intervention. This underscores the potential for culturally relevant, locally sourced interventions in maternal mental health.

The novelty of this study also lies in the use of Andaliman, a locally available and culturally familiar plant, as an accessible and potentially cost-effective alternative to commonly used essential oils. Integration of Andaliman aromatherapy into antenatal care may enhance maternal comfort and psychological well-being. Preliminary feedback from participants indicated high satisfaction and perceived benefit from the aromatherapy sessions, suggesting practical feasibility in routine care. Midwives could implement aromatherapy sessions in small groups during ANC visits, potentially combined with short counseling or relaxation exercises to maximize benefits.

Several limitations should be acknowledged. The small sample size (n = 13) and single-center design limit the generalizability of the findings. External factors such as family support, prior childbirth experiences, or concurrent relaxation techniques were not controlled, which may have influenced anxiety outcomes. Future research could employ randomized controlled trials with larger, more diverse samples, including a control group with a placebo or alternative interventions. Additional outcome measures, such as maternal cortisol levels, sleep quality, or postpartum anxiety, may provide further insight into the physiological and psychological impact of Andaliman aromatherapy.

In conclusion, Andaliman essential oil shows promise as a safe, culturally relevant, and non-pharmacological intervention to reduce prenatal anxiety. Its incorporation into antenatal care could provide an accessible means to enhance maternal comfort, psychological well-being, and readiness for childbirth. These findings support the integration of culturally adapted aromatherapy into routine maternal care programs, particularly in low-resource settings where conventional anxiety management strategies may be limited.

CONCLUSIONS

Based on the research conducted in 2024 at PMB Rika Fadilah Marelan, this study demonstrated that inhalation aromatherapy with andaliman (Zanthoxylum acanthopodium DC) essential oil significantly reduced pre-delivery anxiety among pregnant women. The mean anxiety score decreased considerably after the intervention, highlighting the effectiveness of andaliman essential oil as a complementary, non-pharmacological approach to maternal care.

For midwifery practice, these findings suggest that aromatherapy can be integrated as a simple, safe, and affordable intervention to support mothers in managing anxiety before childbirth. Midwives can apply this method as part of holistic antenatal care, thereby improving maternal comfort and readiness for labor.

However, this study has several limitations, including a relatively small sample size and limited control over external factors such as family support and environmental influences. These limitations indicate that caution is needed when generalizing the findings. Future research is recommended to involve larger, more diverse populations, adopt a multicenter design, and explore the long-term impact of aromatherapy on labor outcomes and neonatal well-being.

Combining aromatherapy with other relaxation techniques may also provide valuable insights for maternal mental health interventions.

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