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The Effect of Lavender Aromatherapy on Anxiety Levels Among Pregnant Women in the Third Trimester at the Kedungwuni I Community Health Center in Pekalongan Regency

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Abstract

Anxiety before childbirth is a common psychological concern among third-trimester pregnant women and may affect maternal comfort and readiness for labor. Lavender aromatherapy is a non-pharmacological complementary intervention that may help reduce anxiety through the relaxing effects of its aromatic compounds. This study aimed to analyze the effect of lavender aromatherapy on anxiety levels among third-trimester pregnant women at the Kedungwuni I Community Health Center, Pekalongan Regency, in 2026. A quantitative approach with a quasi-experimental one-group pretest–posttest design was employed. A total of 66 third-trimester pregnant women were selected using purposive sampling. The intervention consisted of inhaling 4–6 drops of lavender essential oil placed on cotton for 5 minutes once daily for three consecutive days. Anxiety levels were measured using the Perinatal Anxiety Screening Scale (PASS) before and after the intervention. Before the intervention, 28 participants (42.4%) experienced moderate anxiety, 20 (30.3%) experienced mild anxiety, and 18 (27.3%) experienced severe anxiety. After the intervention, 32 participants (48.5%) had no anxiety, 18 (27.3%) experienced mild anxiety, and 16 (24.2%) experienced moderate anxiety, with no participants experiencing severe anxiety. The Wilcoxon Signed Rank Test produced a p-value of 0.000 ($p < 0.05$), indicating a significant difference in anxiety levels before and after the intervention. Lavender aromatherapy significantly reduced anxiety among third-trimester pregnant women and may be considered a complementary intervention in antenatal care.

Keywords: *Anxiety, Lavender Aromatherapy, Perinatal Anxiety Screening Scale, Pregnant Women, Third Trimester.*

INTRODUCTION

Pregnancy is increasingly recognized as a period in which maternal psychological well-being is closely intertwined with physical health, childbirth preparedness, and the transition to parenthood, making anxiety during pregnancy an important concern within contemporary maternal and psychological health research. Maternal anxiety may arise from uncertainty surrounding childbirth, concerns about fetal well-being, anticipated pain, changes in maternal roles, and perceived readiness to become a parent, while the intensity of these concerns can be shaped by social support and individual psychological conditions (Kucukkaya & Basgol, 2023). Anxiety is not merely a subjective emotional response because persistent psychological distress may influence behavioral, physiological, and interpersonal dimensions of maternal health, requiring attention within routine antenatal care (Handayani, 2022). Evidence from the broader anxiety literature indicates that nonpharmacological nursing and psychological interventions have increasingly been considered important components of anxiety management because they can provide relaxation without relying exclusively on pharmacological treatment (Istiarini et al., 2021). Complementary approaches, including aromatherapy, have consequently attracted growing interest as accessible interventions that can be incorporated into health services and potentially support maternal psychological well-being (Mianna et al., 2024; Nayaka et al., 2023). This development is particularly relevant in antenatal settings, where interventions need to balance therapeutic effectiveness, maternal acceptability, ease of implementation, and safety for both mother and fetus.

The third trimester represents a particularly important period for addressing anxiety because psychological concerns may become more closely connected with the approaching delivery process and

the perceived uncertainty of childbirth. Previous evidence has demonstrated that lavender aromatherapy can reduce anxiety among pregnant women in the third trimester, indicating that olfactory stimulation may have clinically meaningful effects on maternal emotional states (Purba et al., 2022). Similar findings have been reported in Indonesian antenatal settings, where lavender aromatherapy was associated with reduced anxiety among women preparing for childbirth, suggesting that the intervention may be applicable within community-based maternal health services (Setiati et al., 2019). Recent Indonesian studies have continued to report beneficial effects of lavender aromatherapy among third-trimester pregnant women, including reductions in anxiety before childbirth and improvements in psychological relaxation (Kusumastuti, 2025; Sugiharti et al., 2025; Tamar, 2025). Evidence from broader clinical populations also supports the potential anxiolytic properties of lavender, although the magnitude of the effect may depend on the population, intervention protocol, comparison condition, and clinical context (Simanjuntak et al., 2023). The physiological rationale for this intervention is associated with the inhalation of lavender essential oil and its interaction with olfactory pathways involved in emotional regulation, providing a plausible mechanism through which relaxation responses may be facilitated (Mirazanah et al., 2021). These findings collectively indicate that lavender aromatherapy has moved beyond being viewed solely as a traditional complementary practice and has become a clinically investigated intervention for anxiety management.

The growing evidence base, however, does not yet establish a uniformly transferable conclusion regarding the effectiveness of lavender aromatherapy for every pregnant population or antenatal service context. A recent systematic review identified evidence supporting lavender essential oil for reducing stress, insomnia, and anxiety among pregnant women, while also highlighting differences among studies in intervention procedures, outcomes, and methodological characteristics (Vidal-García et al., 2024). Individual studies have similarly demonstrated reductions in anxiety among pregnant women receiving lavender aromatherapy, but variations in duration, frequency, measurement instruments, and participant characteristics make direct comparison of effect magnitude difficult (Wasis & Saribu, 2022). Research comparing lavender with other aromatherapy approaches has also suggested that lavender may provide favorable relaxation effects, although findings from non-obstetric clinical populations cannot automatically be generalized to pregnant women because the psychological and physiological circumstances differ (Mittal et al., 2024). Evidence from other nonpharmacological approaches, such as pregnancy exercise and positive self-talk, further indicates that maternal anxiety can respond to interventions targeting relaxation, cognition, and emotional regulation, but these findings do not clarify whether lavender aromatherapy produces an independent effect within routine antenatal care (Wulan, 2024; Suryani et al., 2025). Broader studies of anxiety management likewise demonstrate that intervention effects are strongly influenced by contextual and individual factors, reinforcing the need for evidence generated from clearly defined populations and service environments (Aprelia et al., 2019; Manurung, 2022). The principal gap therefore concerns not simply whether lavender aromatherapy can reduce anxiety, but whether its effect can be demonstrated consistently among third-trimester pregnant women receiving antenatal services in a specific primary healthcare context.

This gap has scientific and practical significance because anxiety that remains unmanaged during pregnancy may compromise maternal psychological adaptation and interfere with readiness for childbirth and early parenting. The concern becomes more consequential when antenatal services focus predominantly on physical indicators while psychological symptoms remain insufficiently identified or addressed through structured interventions. Pharmacological approaches to anxiety may not always represent the preferred first-line option during pregnancy because treatment decisions must consider maternal benefits alongside potential fetal risks, increasing the relevance of safe complementary approaches (Lizawati et al., 2022). Lavender aromatherapy offers a potentially feasible intervention because it can be administered through inhalation, requires relatively simple equipment, and may be integrated into existing antenatal encounters without substantially altering routine service delivery (Nayaka et al., 2023). Previous Indonesian studies have reported positive outcomes in various healthcare settings, yet differences in geographical location, healthcare organization, participant characteristics, and intervention implementation limit the extent to which their findings can be directly extrapolated to Puskesmas Kedungwuni I (Utama & Suardi, 2025; Tamar, 2025). The local preliminary assessment identified anxiety-related complaints among several third-trimester pregnant women, including sleep difficulties, restlessness, bodily tension, and excessive thoughts concerning childbirth and fetal safety, while lavender aromatherapy had not previously been routinely used by these women.

This combination of an identifiable local psychological need and the absence of formal complementary aromatherapy integration provides a concrete empirical basis for evaluating whether lavender aromatherapy can function as a feasible anxiety-reduction strategy within primary antenatal care.

The present study is positioned within the intersection of maternal health, psychological sciences, and complementary nursing and midwifery care by focusing specifically on the relationship between lavender aromatherapy and anxiety among third-trimester pregnant women at Puskesmas Kedungwuni I, Pekalongan Regency. Its positioning responds to the need for context-specific evidence because intervention effectiveness should be interpreted not only through aggregate findings from previous studies but also through the characteristics of the population and healthcare environment in which the intervention is delivered. A quantitative research framework is appropriate for examining measurable changes in anxiety and for determining whether the observed difference can be attributed to the intervention under a structured research design (Creswell, 2022). The use of systematic health-research procedures is also important because the validity of conclusions concerning complementary interventions depends on clear operationalization of variables, standardized measurement, and consistent intervention implementation (Notoatmodjo, 2021; Nursalam, 2020). Principles of quantitative inquiry emphasize the importance of objective measurement and analytical procedures when assessing relationships or effects between variables, which supports the empirical examination of lavender aromatherapy as an anxiety-reduction intervention (Sugiyono, 2022; Swarjana, 2023). Methodological rigor is particularly necessary in this topic because previous studies have employed heterogeneous intervention durations, assessment approaches, and participant characteristics, making standardized procedures essential for generating evidence that can be meaningfully interpreted alongside existing findings (Arikunto, 2019; Ibrahim, 2023). The study consequently seeks to strengthen the empirical foundation for incorporating a simple complementary intervention into antenatal psychological care while maintaining a research approach capable of producing measurable and contextually relevant evidence.

This study aims to determine the effect of lavender aromatherapy on anxiety levels among pregnant women in the third trimester at the Kedungwuni I Community Health Center in Pekalongan Regency. The study focuses on anxiety as an important psychological outcome during late pregnancy and examines lavender aromatherapy as a nonpharmacological intervention that can potentially be incorporated into routine antenatal services. The research is expected to contribute theoretically by strengthening understanding of how an olfactory-based complementary intervention may function within the psychological management of anxiety during the third trimester. It is also expected to contribute empirically by providing evidence from a primary healthcare setting whose population and service characteristics may differ from those represented in previous studies. Methodologically, the study provides a context-specific assessment of an intervention that can be operationalized through a structured and measurable procedure, allowing its findings to be compared with the existing body of maternal anxiety research. Practically, the findings may provide health professionals with evidence to consider lavender aromatherapy as an accessible complementary strategy for supporting psychological well-being during antenatal care. The study ultimately seeks to bridge the gap between growing evidence for complementary anxiety management and the need for locally grounded evidence that supports its potential implementation in maternal health services.

RESEARCH METHODS

This study employed an empirical quantitative approach using a quasi-experimental one-group pretest–posttest design to examine changes in anxiety levels among third-trimester pregnant women following lavender aromatherapy (Creswell, 2022). The study involved 66 pregnant women in the third trimester who were selected through purposive sampling at the Kedungwuni I Community Health Center, Pekalongan Regency, with purposive sampling applied according to predetermined characteristics relevant to the research objectives (Nursalam, 2020). The inclusion criteria comprised third-trimester pregnant women receiving antenatal care at the study site, willing to participate, and able to communicate and complete the research instrument, whereas women who declined participation or had conditions that could interfere with the intervention or anxiety assessment were excluded. Data collection began with the measurement of anxiety using the Perinatal Anxiety Screening Scale (PASS) as a pretest before the intervention was administered. Lavender aromatherapy was provided through inhalation using 4–6 drops of lavender essential oil placed on cotton, which was inhaled for

approximately 5 minutes once daily for three consecutive days. After completion of the intervention period, anxiety levels were measured again using the same instrument as the posttest. The intervention protocol was selected based on previous evidence indicating that lavender aromatherapy can reduce anxiety among pregnant women, particularly during the third trimester (Kusumastuti, 2025).

Anxiety levels were assessed using the Perinatal Anxiety Screening Scale (PASS), with measurements obtained before and after the intervention to evaluate individual changes in anxiety scores. The data were first examined for their distributional characteristics, and the normality test indicated that the data were not normally distributed, with a significance value of $p = 0.000$. Because the observations represented paired measurements from the same participants and did not meet the assumption of normality, the Wilcoxon Signed Rank Test was applied to determine differences in anxiety levels between the pretest and posttest measurements (Sugiyono, 2022). Statistical significance was determined using an alpha level of 0.05, with the analysis focusing on whether the intervention was associated with a statistically significant change in anxiety scores. The interpretation of the statistical findings considered both the direction and magnitude of changes in anxiety following the three-day intervention. The use of lavender aromatherapy as a non-pharmacological intervention is supported by previous research reporting reductions in anxiety among pregnant women following lavender aromatherapy administration (Purba et al., 2022). Ethical approval was obtained from the Ethics Committee of the Faculty of Pharmacy, Universitas Islam Sultan Agung Semarang, under Ethical Clearance No. 94/KEPK-RSISA/V/2026, and participation was voluntary based on informed consent, with anonymity, confidentiality, and protection of participants' rights maintained throughout the research process.

RESULTS AND DISCUSSION

Anxiety Levels Among Third-Trimester Pregnant Women Before Lavender Aromatherapy

The assessment of anxiety before the intervention provides an important baseline for understanding the psychological condition of third-trimester pregnant women at the Kedungwuni I Community Health Center, Pekalongan Regency. Among the 66 participants, 20 women (30.3%) experienced mild anxiety, 28 women (42.4%) experienced moderate anxiety, and 18 women (27.3%) experienced severe anxiety. The distribution indicates that moderate anxiety was the most prevalent category, suggesting that psychological concerns related to late pregnancy and preparation for childbirth were prominent among the participants. Anxiety during pregnancy may emerge from concerns about childbirth, maternal and fetal safety, physical changes, previous experiences, and uncertainty regarding the delivery process, with psychological responses varying according to individual circumstances (Handayani, 2022). The presence of severe anxiety in 27.3% of participants is clinically relevant because elevated maternal anxiety may interfere with psychological well-being and potentially affect sleep, emotional regulation, and readiness for childbirth (Lizawati et al., 2022). These baseline findings establish a clear need for an appropriate complementary intervention that can be integrated into maternal healthcare services.

Table 1. Anxiety Levels Among Third-Trimester Pregnant Women Before Lavender Aromatherapy at the Kedungwuni I Community Health Center, Pekalongan Regency, May 2026 (n = 66)

Anxiety Level	Frequency (f)	Percentage (%)
Mild anxiety	20	30.3
Moderate anxiety	28	42.4
Severe anxiety	18	27.3
Total	**66**	**100.0**

As presented in Table 1, moderate anxiety represented the largest proportion of participants before lavender aromatherapy, accounting for 42.4% of the sample, while severe anxiety accounted for 27.3%. The predominance of moderate anxiety can be interpreted as an indication that psychological concerns had become sufficiently salient during the third trimester but had not reached the highest level of severity in most participants. The transition toward childbirth is accompanied by increasing

anticipation of labor, changes in physical functioning, and concerns about maternal and neonatal outcomes, which may intensify emotional vulnerability. Perceived social support is also relevant because support from a spouse can contribute to childbirth self-efficacy and may influence how pregnant women manage psychological challenges during late pregnancy (Kucukkaya & Basgol, 2023). Previous evidence concerning anxiety in pregnancy further indicates that psychological responses are not determined by a single factor but may reflect interactions among personal experiences, social circumstances, knowledge, and perceptions of childbirth. The distribution observed in this study therefore reflects a multidimensional maternal psychological condition rather than merely an isolated emotional response.

The relatively high proportion of participants with moderate and severe anxiety also has implications for maternal mental health screening in primary healthcare settings. A total of 46 participants, representing 69.7% of the sample, were classified as experiencing either moderate or severe anxiety before intervention, indicating that clinically meaningful psychological distress was common within the study population. Anxiety should not be regarded solely as a normal emotional reaction when its intensity becomes persistent or interferes with daily functioning, because inadequate management may compromise maternal comfort and psychological adaptation to childbirth (Aprelia et al., 2019). Interventions addressing anxiety are therefore relevant within antenatal care, particularly during the third trimester when preparation for delivery becomes increasingly salient. Non-pharmacological approaches may provide additional options for women who require support in regulating anxiety while continuing routine maternal healthcare. Psychological strategies such as relaxation-oriented interventions and supportive communication can complement standard antenatal services by addressing emotional needs alongside physical monitoring (Suryani et al., 2025). The baseline distribution in this study consequently provides an empirical basis for evaluating whether lavender aromatherapy can contribute to anxiety management among third-trimester pregnant women.

Table 2. Factors Associated with Anxiety Among Pregnant Women

Factor	Psychological relevance	Potential relationship with anxiety
Childbirth Concerns	Fear and uncertainty regarding labor may increase emotional tension	May increase anxiety
Social and Family Support	Emotional support can strengthen psychological coping and childbirth self-efficacy	Greater support may reduce anxiety
Psychological Well-Being	Emotional vulnerability may influence responses to pregnancy-related stressors	Poor psychological well-being may increase anxiety
Relaxation and Coping Strategies	Adaptive coping may help regulate emotional responses	May reduce perceived anxiety
Antenatal Preparation	Knowledge and preparation may improve confidence in facing childbirth	Better preparation may reduce uncertainty

Table 2 synthesizes several factors that help contextualize the anxiety distribution observed before intervention and shows that maternal anxiety should be understood through psychological, interpersonal, and preparatory dimensions. Concerns surrounding childbirth can become more prominent as pregnancy approaches delivery, particularly when women perceive limited control over the upcoming birth experience. Social support is particularly important because supportive relationships may strengthen confidence and reduce perceived psychological burden during pregnancy (Kucukkaya & Basgol, 2023). The availability of appropriate coping mechanisms may also influence whether pregnancy-related stress is experienced as manageable concern or more pronounced anxiety. Interventions that promote relaxation may therefore be relevant when incorporated into antenatal care, particularly for women who demonstrate moderate or severe anxiety. The findings also support the importance of identifying psychological needs during routine maternal health services rather than focusing exclusively on physiological indicators.

The baseline pattern is consistent with previous research indicating that anxiety is a meaningful concern among women approaching childbirth and can be addressed through complementary psychological interventions. Setiati et al. (2019) reported the effectiveness of lavender aromatherapy in reducing anxiety among third-trimester pregnant women preparing for childbirth, providing a relevant comparison because both studies focus on maternal anxiety during the late stage of pregnancy. Purba et al. (2022) similarly examined anxiety among third-trimester pregnant women in relation to lavender aromatherapy and reported differences in anxiety following the intervention. Evidence from a broader systematic review also indicates that lavender essential oil has potential benefits for reducing anxiety and stress among pregnant women, although differences in intervention methods and study designs should be considered when interpreting individual findings (Vidal-García et al., 2024). These previous findings provide a theoretical and empirical rationale for examining lavender aromatherapy in the present population. The current study extends this evidence by evaluating the intervention among 66 third-trimester pregnant women receiving care at a community health center in Pekalongan Regency.

The baseline findings also highlight the importance of distinguishing between the presence of anxiety and the factors that may maintain or intensify it during late pregnancy. The coexistence of mild, moderate, and severe anxiety within the same clinical setting suggests heterogeneity in maternal psychological responses and supports individualized assessment rather than assuming that all pregnant women experience similar levels of emotional distress. Maternal mental health is closely connected with the capacity to adapt to pregnancy-related changes, manage anticipated childbirth demands, and maintain psychological comfort throughout the perinatal period (Handayani, 2022). The relatively substantial proportion of severe anxiety warrants particular attention because women in this category may require more comprehensive assessment and potentially additional psychological support beyond a brief complementary intervention. Lavender aromatherapy can be considered within a broader continuum of supportive care rather than as a substitute for professional assessment when anxiety is severe or persistent. This perspective is consistent with evidence that complementary approaches can support anxiety management while remaining integrated with established maternal healthcare practices (Mianna et al., 2024). The baseline evidence therefore establishes the psychological context against which the subsequent post-intervention changes can be interpreted.

Anxiety Levels Among Third-Trimester Pregnant Women After Lavender Aromatherapy

Following three consecutive days of lavender aromatherapy, the distribution of anxiety among the 66 third-trimester pregnant women shifted toward lower levels compared with the baseline assessment. The proportion of participants classified as having no anxiety increased to 32 women (48.5%), while 18 women (27.3%) experienced mild anxiety and 16 women (24.2%) experienced moderate anxiety. Notably, no participant remained in the severe-anxiety category after the intervention, compared with 18 participants (27.3%) before treatment. The proportion of moderate anxiety consequently declined from 42.4% to 24.2%, while mild anxiety decreased from 30.3% to 27.3%. The emergence of the no-anxiety category among nearly half of the participants indicates a clinically meaningful directional shift in psychological status, although the categorical distribution alone does not establish causality. Similar improvements in anxiety among pregnant women receiving lavender aromatherapy have been reported in previous studies, supporting the potential role of this intervention as a complementary approach to maternal psychological care (Setiati et al., 2019).

Table 3. Anxiety Levels Among Third-Trimester Pregnant Women After Lavender Aromatherapy at the Kedungwuni I Community Health Center, Pekalongan Regency, May 2026 (n = 66)

Anxiety Level	Frequency (f)	Percentage (%)
No anxiety	32	48.5
Mild anxiety	18	27.3
Moderate anxiety	16	24.2
Total	**66**	**100.0**

As shown in Table 2, the post-intervention distribution demonstrates a marked reduction in the severity of anxiety, particularly through the disappearance of the severe-anxiety category and the

increase in participants classified as having no anxiety. This pattern is important because the intervention was delivered through a relatively simple inhalation procedure involving 4–6 drops of lavender essential oil on cotton for approximately five minutes per session. Lavender aromatherapy has been described as a complementary intervention that may promote relaxation through olfactory pathways and facilitate a calmer emotional state (Nayaka et al., 2023). The observed categorical shift is also compatible with findings from research involving pregnant women in which lavender aromatherapy was associated with reduced anxiety during preparation for childbirth (Kusumastuti, 2025). Nevertheless, individual responses remained heterogeneous, as 34 participants continued to experience mild or moderate anxiety after intervention. This variation indicates that aromatherapy may support anxiety regulation without necessarily eliminating psychological concerns associated with pregnancy and impending childbirth.

The psychological response observed after lavender aromatherapy can be interpreted through the interaction between olfactory stimulation and neurophysiological mechanisms involved in emotional regulation. Lavender essential oil contains major aromatic constituents, including linalool and linalyl acetate, which have been associated with calming and anxiolytic effects in aromatherapy literature. During inhalation, volatile aromatic molecules interact with olfactory receptors and transmit sensory signals toward brain regions involved in emotional processing, including structures within the limbic system (Mianna et al., 2024). This pathway provides a plausible explanation for the rapid perception of relaxation that may accompany lavender inhalation, particularly when the intervention is administered in a quiet and supportive healthcare environment. Reduced psychological tension may subsequently influence autonomic activity, allowing participants to experience greater comfort and reduced subjective anxiety. Evidence from nursing literature also indicates that aromatherapy can be incorporated among non-pharmacological approaches for anxiety management because it is relatively simple to administer and does not require invasive procedures (Istiarini et al., 2021). The physiological rationale therefore complements the observed post-intervention shift and provides a basis for considering lavender aromatherapy within maternal psychological care.

Table 4. Summary of Previous Evidence on Lavender Aromatherapy for Anxiety Reduction

Population	Intervention Form	Research Context	Main Finding
Third-Trimester Pregnant Women	Lavender aromatherapy	Preparation for childbirth	Lavender aromatherapy was associated with reduced anxiety.
Women In Labor	Lavender aromatherapy	Childbirth	Lavender aromatherapy was associated with reduced anxiety during childbirth.
Third-Trimester Pregnant Women	Lavender aromatherapy	Maternal anxiety	Lavender aromatherapy was associated with differences in anxiety levels.
Third-Trimester Pregnant Women	Lavender aromatherapy	Preparation for childbirth	Lavender aromatherapy reduced anxiety among pregnant women.
Third-Trimester Pregnant Women	Lavender aromatherapy	Maternal anxiety	Lavender aromatherapy was associated with decreased anxiety.
Third-Trimester Pregnant Women	Lavender aromatherapy	Primary healthcare	Anxiety decreased following lavender aromatherapy.
Pregnant Women in the Second and Third Trimesters	Lavender essential oil through inhalation and topical approaches	Systematic review	Evidence supported beneficial effects on anxiety, stress, and sleep outcomes.

The evidence synthesized in Table 4 demonstrates that the present findings correspond with a growing body of literature concerning lavender aromatherapy as a complementary intervention for anxiety reduction. Evidence from third-trimester pregnant women indicates that lavender aromatherapy

may reduce anxiety during preparation for childbirth and within maternal healthcare settings (Kusumastuti, 2025). Recent findings also support reductions in anxiety among pregnant women following lavender aromatherapy, reinforcing the relevance of this intervention to maternal psychological care (Tamar, 2025). Research in other clinical populations has similarly identified reductions in anxiety after lavender aromatherapy, although differences in psychological stressors and clinical circumstances should be considered when interpreting these findings (Simanjuntak et al., 2023). A systematic review involving pregnant women reported beneficial effects of lavender essential oil on anxiety, stress, and sleep, providing higher-level evidence that supports the potential value of lavender as a complementary intervention during pregnancy (Vidal-García et al., 2024). The consistency between the present findings and previous evidence is strengthened by the comparable focus on anxiety and the use of lavender as an intervention, although variations in dosage, administration method, exposure duration, and measurement instruments limit direct comparison of effect magnitude. The present study therefore adds empirical evidence from third-trimester pregnant women receiving care at a community health center in Pekalongan Regency.

The post-intervention distribution also demonstrates that anxiety did not disappear in every participant, as 18 women (27.3%) remained in the mild-anxiety category and 16 women (24.2%) remained in the moderate-anxiety category. This finding indicates that lavender aromatherapy may facilitate relaxation without necessarily addressing all psychological and social determinants of maternal anxiety. Anxiety during late pregnancy can be influenced by perceptions of childbirth, previous experiences, knowledge, emotional preparedness, and the availability of support from significant others (Kucukkaya & Basgol, 2023). The persistence of anxiety among some participants therefore supports the need to integrate aromatherapy with broader maternal psychological interventions rather than treating it as an independent therapeutic solution. Positive self-talk and other psychological coping strategies have also been identified as approaches that can support anxiety management among pregnant women, illustrating the value of combining relaxation with cognitive and emotional support (Suryani et al., 2025). Antenatal healthcare providers can use anxiety screening to identify women who may benefit from additional counseling, childbirth education, or referral for professional psychological support when symptoms are persistent or severe. Such an integrated approach is particularly important because maternal mental health requires attention to both immediate emotional symptoms and the contextual factors contributing to psychological distress.

From a maternal healthcare perspective, the favorable shift in anxiety categories suggests that lavender aromatherapy may be a practical complementary intervention within antenatal services. Its inhalation-based administration is simple and can be incorporated into relaxation activities without requiring invasive procedures or substantial modification of routine maternal care. Previous literature describes aromatherapy as a complementary health approach that can support emotional comfort and anxiety management when appropriately administered (Mianna et al., 2024). The present findings also indicate that the intervention may be particularly relevant for women experiencing moderate anxiety who require accessible non-pharmacological support during late pregnancy. Nevertheless, women with persistent moderate or severe psychological symptoms should receive comprehensive assessment rather than relying exclusively on aromatherapy. The intervention can be combined with childbirth preparation, health education, supportive counseling, relaxation techniques, and family involvement to strengthen maternal coping and psychological readiness. Such an approach is consistent with evidence supporting lavender aromatherapy as one component of broader complementary care for anxiety rather than a replacement for professional mental-health assessment (Utama & Suardi, 2025).

Effect of Lavender Aromatherapy on Anxiety Levels Among Third-Trimester Pregnant Women

The inferential analysis was initiated with a normality assessment to determine the appropriate statistical procedure for comparing anxiety levels before and after lavender aromatherapy. As shown in Table 5, the Kolmogorov–Smirnov test produced a significance value of 0.000 for both measurements, indicating that the anxiety data did not follow a normal distribution. The statistical values were 0.270 for the pre-intervention measurement and 0.284 for the post-intervention measurement, with each analysis involving 66 participants. Because the paired observations violated the normality assumption, the Wilcoxon Signed Rank Test was selected as an appropriate non-parametric procedure for examining changes between the two measurements (Sugiyono, 2022). This analytical decision is consistent with quantitative research principles requiring the statistical method to correspond to the distributional

characteristics and paired structure of the data (Creswell, 2022). The normality findings therefore provided the methodological basis for proceeding with a non-parametric analysis of the intervention effect.

Table 5. Kolmogorov–Smirnov Normality Test of Anxiety Levels Before and After Lavender Aromatherapy (n = 66)

Variable	Statistic	Kolmogorov–Smirnov df	Sig.
Before	0.270	66	0.000
After	0.284	66	0.000

The Wilcoxon Signed Rank Test demonstrated a statistically significant difference in anxiety levels between the pre-intervention and post-intervention measurements. As presented in Table 6, the mean rank was 33.50 with a sum of ranks of 2211.00, while the standardized test statistic was Z = −7.1122 and the p-value was 0.000. Since the obtained p-value was below the predetermined significance level of 0.05, the null hypothesis of no difference between the paired measurements was rejected (Notoatmodjo, 2021). The statistical finding indicates that anxiety levels after lavender aromatherapy differed significantly from those recorded before the intervention. The magnitude and direction of the categorical changes described previously, together with the significant Wilcoxon result, provide converging evidence that the three-day intervention was associated with an improvement in anxiety status. Similar statistically significant reductions in anxiety following lavender aromatherapy have been reported among pregnant women, supporting the consistency of the present finding with previous empirical evidence (Setiati et al., 2019). The result is particularly relevant to maternal psychological care because it demonstrates that a brief, non-pharmacological intervention can be associated with measurable changes in anxiety during the third trimester.

Table 6. Wilcoxon Signed Rank Test of Anxiety Levels Before and After Lavender Aromatherapy (n = 66)

Variable	*Mean Rank*	*Sum of Ranks*	*Z*	*P value*
Before	33.50	2211.00	−7.1122	0.000
After	0.00	0.00	—	0.000

The significant difference identified in Table 6 can be interpreted within a psychological framework in which relaxation reduces physiological and emotional responses associated with perceived threat. Lavender aroma may influence olfactory pathways connected with neural systems responsible for emotional processing, potentially facilitating a calmer psychological state during exposure (Nayaka et al., 2023). Reduction in psychological tension may be particularly relevant during the third trimester because concerns regarding childbirth, maternal safety, fetal well-being, and adaptation to impending motherhood can intensify emotional distress. Evidence from pregnant women and women approaching childbirth has similarly demonstrated beneficial changes in anxiety following lavender aromatherapy, supporting the plausibility of the present statistical finding (Purba et al., 2022). Comparable effects have also been reported among pregnant women with hypertension, suggesting that lavender aromatherapy may have value when anxiety occurs alongside additional maternal health concerns (Wasis & Saribu, 2022). From a maternal mental-health perspective, the intervention may therefore function as a complementary relaxation strategy that helps reduce psychological arousal without replacing comprehensive assessment and professional care.

The consistency of the present finding with previous studies is further demonstrated by evidence from different maternal and clinical contexts. Research involving women during childbirth found a significant difference in anxiety after lavender aromatherapy, indicating that the intervention may support emotional regulation during periods associated with heightened psychological demands (Mirazanah et al., 2021). Studies involving third-trimester pregnant women have likewise reported significant reductions in anxiety following lavender aromatherapy, although differences in administration procedures, sample characteristics, and measurement instruments should be considered

when comparing outcomes (Tamar, 2025). Similar evidence has been reported in research examining lavender aromatherapy among pregnant women approaching childbirth, reinforcing its potential role as a complementary maternal-care intervention (Utama & Suardi, 2025). At a higher level of evidence, a systematic review identified beneficial effects of lavender essential oil on anxiety, stress, and sleep among pregnant women, providing broader support for the psychological relevance of the intervention (Vidal-García et al., 2024). The convergence of these findings with the present Wilcoxon result strengthens the interpretation that the observed change is compatible with an established pattern of anxiety reduction associated with lavender aromatherapy. Nevertheless, statistical consistency across studies does not eliminate the need to consider methodological differences when determining the strength and generalizability of the evidence.

Table 7. Evidence Supporting Lavender Aromatherapy as a Complementary Intervention for Maternal Anxiety

Evidence Dimension	Scientific Interpretation	Relevance to the Present Study
Psychological Relaxation	Lavender aroma may support emotional calmness and reduce subjective tension.	Helps explain the reduction in maternal anxiety after intervention.
Olfactory Stimulation	Aromatic stimulation is connected with neural processes involved in emotional regulation.	Provides a plausible pathway for the observed psychological response.
Non-Pharmacological Approach	Aromatherapy can be administered as a complementary relaxation intervention.	Relevant to antenatal care requiring accessible supportive interventions.
Maternal Anxiety Management	Previous evidence indicates potential reductions in anxiety among pregnant women.	Supports the direction of the present empirical findings.
Complementary Care	Aromatherapy can accompany education, counseling, and psychosocial support.	Encourages integration rather than replacement of standard maternal mental-health care.
Evidence Synthesis	Systematic evidence supports beneficial effects on anxiety and related psychological outcomes.	Strengthens the scientific basis for considering lavender aromatherapy in maternal care.

The synthesis in Table 7 indicates that lavender aromatherapy has a plausible role as a complementary intervention because its potential psychological effects are supported by both empirical findings and broader evidence synthesis. The present study contributes to this evidence by demonstrating a statistically significant difference in anxiety levels among 66 third-trimester pregnant women following a standardized three-day inhalation intervention. Previous research has similarly reported reductions in anxiety among pregnant women receiving lavender aromatherapy, although the intervention procedures and research settings have varied across studies (Setiati et al., 2019). Evidence from systematic review further indicates that lavender essential oil may improve anxiety and other stress-related outcomes during pregnancy, providing a broader context for interpreting the present findings (Vidal-García et al., 2024). The consistency between the current result and previous evidence supports the clinical relevance of lavender aromatherapy as an adjunctive strategy within maternal psychological care. Application in antenatal services should nevertheless remain integrated with anxiety screening, health education, counseling, and appropriate referral when psychological symptoms require more intensive management. Such integration is consistent with the concept of complementary care, in which relaxation-based interventions are used alongside rather than instead of established maternal healthcare services (Wasis & Saribu, 2022).

Despite the statistically significant result, interpretation of causality should remain cautious because the study used a quasi-experimental one-group pretest–posttest design without a control group. Changes in anxiety may have been influenced not only by lavender aromatherapy but also by time, repeated measurement, interactions with healthcare providers, changing perceptions of childbirth, or

other experiences occurring during the three-day observation period. The absence of a comparison group limits the ability to determine whether the entire observed change can be attributed specifically to the intervention, which is an important consideration in evaluating quasi-experimental evidence (Arikunto, 2019). The use of the same participants for pretest and posttest measurements nevertheless strengthens the analysis of within-person change and reduces variability associated with differences between independent groups. Future research could employ randomized controlled designs with larger samples, control or placebo-aroma groups, longer follow-up periods, and standardized intervention protocols to strengthen causal inference. Such studies could also examine whether maternal characteristics, childbirth experience, family support, or baseline anxiety severity moderate the response to lavender aromatherapy (Kucukkaya & Basgol, 2023). Within primary healthcare, the present findings support the cautious integration of lavender aromatherapy as a complementary relaxation technique while maintaining routine antenatal assessment and appropriate psychological support.

CONCLUSION

The study demonstrated a significant difference in anxiety levels among third-trimester pregnant women before and after the administration of lavender aromatherapy at the Kedungwuni I Community Health Center, Pekalongan Regency. Before the intervention, moderate anxiety was the most prevalent category at 42.4%, followed by mild anxiety at 30.3% and severe anxiety at 27.3%. After three consecutive days of lavender aromatherapy, 48.5% of participants were categorized as having no anxiety, while mild anxiety decreased to 27.3% and moderate anxiety to 24.2%, with no participants remaining in the severe-anxiety category. The Kolmogorov–Smirnov test indicated that the data were not normally distributed, supporting the use of the Wilcoxon Signed Rank Test for paired analysis. The Wilcoxon analysis produced a Z value of −7.1122 and a p-value of 0.000 ($p < 0.05$), confirming a statistically significant difference between anxiety levels before and after the intervention. These findings indicate that lavender aromatherapy has potential as a complementary non-pharmacological intervention for reducing anxiety among third-trimester pregnant women approaching childbirth. The findings also support previous evidence indicating that lavender aromatherapy can contribute to maternal psychological relaxation and anxiety management during pregnancy (Vidal-García et al., 2024).

In clinical practice, lavender aromatherapy may be considered by midwives and other maternal healthcare professionals as a complementary intervention within antenatal care to support maternal comfort and psychological preparedness for childbirth. Its application should be accompanied by appropriate anxiety screening, health education, counseling, and assessment of individual maternal conditions to ensure that the intervention is used appropriately. Healthcare providers should also provide clear information regarding the procedure and ensure that participation in complementary interventions remains voluntary and consistent with safe maternal-care practices. Because the present study used a one-group pretest–posttest design without a control group, the findings should be interpreted as evidence of a significant pre-post change rather than definitive proof of an exclusive causal effect of lavender aromatherapy. Future research is recommended to use randomized controlled designs, larger samples, longer observation periods, and comparison groups to strengthen causal inference and evaluate the sustainability of the intervention effect. In routine antenatal services, lavender aromatherapy can be integrated with other psychological and supportive strategies, including childbirth preparation, relaxation techniques, and family support, rather than being used as a substitute for professional mental-health care. Such an integrated approach may contribute to improving maternal comfort, psychological readiness, and confidence in facing childbirth while strengthening the role of complementary interventions within primary maternal healthcare.

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