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Research Article

The Role of Lavender Aromatherapy in Improving Sleep Quality Among Third Trimester Pregnant Women : Result From Pre Experimantal Study

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Abstract: Sleep disturbances in third trimester pregnant women are common and can be caused by factors such as increased fetal weight, shortness of breath, back pain, and fetal movements. These factors often disrupt the mother's sleep, leading to inadequate rest. Lack of sleep during pregnancy can have significant consequences, affecting physiological aspects like activity levels, fatigue, body weakness, delayed recovery, instability in vital signs, and a weakened immune system. Furthermore, sleep disturbances may increase the risk of low birth weight babies and other complications. The aim of this study was to investigate the effect of lavender aromatherapy on sleep quality in third trimester pregnant women. The study utilized a pre-experimental method with a one-group pretest-posttest design to measure changes in sleep quality before and after the intervention. A quota sampling technique was used to select 20 participants, all of whom were in their third trimester of pregnancy. The Hamilton Anxiety Rating Scale (HARS) questionnaire was employed to assess sleep quality as the research instrument. Data analysis was conducted using the Wilcoxon rank test. The results showed a significant effect of lavender aromatherapy on sleep quality, with the Wilcoxon test yielding a p-value of 0.000 ($p < 0.05$). This indicates a significant improvement in sleep quality after the intervention. The findings suggest that lavender aromatherapy helps in enhancing sleep by calming and soothing the limbic system in the brain, which creates a sense of comfort, allowing pregnant women to sleep longer and more soundly. In conclusion, lavender aromatherapy is an effective intervention to improve sleep quality in third trimester pregnant women, as evidenced by the significant improvement in the study participants' sleep quality after using the therapy.

Keywords: Aromatherapy; Pregnant Women; Quantity

1. Introduction

Pregnancy is a condition that many couples and even families look forward to. However, it cannot be denied that pregnancy is an adaptation process that takes quite a long time, especially in the third trimester (Ayudia et al., 2022). Various kinds of discomfort experienced by pregnant women during the third trimester, including fear of pain and physical danger during childbirth, uncomfortable sleeping positions, anxiety about the future condition of the baby, and many other factors that can cause sleep disturbances Quality of pregnant women in third trimester pregnancy is poor (Lathifatun Nafsiyah & Kamidah Kamidah, 2024).

The World Health Organization (WHO) states that in 2021 there will be approximately 145,000,000 pregnant women worldwide, with an overall incidence of sleep disorders reaching 24.7% to 84.2%. In 2022, the prevalence of sleep disorders among pregnant women in Indonesia reached 63.4%(Al, 2022).

During pregnancy, a woman's body undergoes physiological changes, psychological changes, and adaptations to lifestyle and pregnancy processes. The pregnancy process starts

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from conception, labor, recognition adaptation, pregnancy care, endocrine changes, and preparation for the birth and delivery of the baby. The mother's body system undergoes physical and mental changes during pregnancy. Signs of changes in the body of pregnant women include amenorrhea, nausea, vomiting, enlarged abdomen, enlarged breasts, increased sensory sensitivity, anxiety and sleep disturbances (Kartikasari et al., 2024).

Sleep disturbances in third trimester pregnant women are caused by increased fetal weight, shortness of breath, back pain, and fetal movements that make the mother wake up. Lack of sleep can have an impact on physiological conditions, such as decreased activity, easy fatigue, weakened body, slower recovery process, instability of vital signs, and decreased endurance. If a pregnant woman's sleep quality is disturbed, her immune system and health will also be affected, which risks causing low birth weight babies and various other complications (Fauzia S et al., 2023).

There are several ways that can be done to overcome sleep disorders To overcome sleep disorders, it is not always necessary to use sleeping pills or anxiety-lowering drugs, but there are several non-pharmacological therapies that can affect the quality of your sleep. One of them is by using aromatherapy, Aromatherapy is a form of healing therapy that uses pure essential oils distilled from various parts of plants, flowers, and trees. These essential oils have different healing properties, and have many benefits for health (Mu'alimah et al., 2022).

One of the recommended types of aromatherapy is lavender, as it has been researched to have beneficial ingredients for the nervous system. Lavender contains linalool, a compound with calming or sedative effects, which can stimulate cilia receptors on the olfactory nerve in the olfactory epithelium. This stimulation allows the scent of lavender to be delivered to the bulbus olfactorius via the olfactory nerve pathway, resulting in a relaxing effect. (Muningsih & Fitriani, 2024)(Maharani et al., 2023).

Due to its many benefits and the fact that using it is very easy, lavender aromatherapy is known as a much-loved type of aromatherapy. It is possible to calm down by inhaling or smoking (Nailul Aliyyati et al., 2024).

Several studies have examined the effectiveness of lavender aromatherapy in improving sleep quality during pregnancy. Zhang and Wang (2020) conducted a systematic review, concluding that aromatherapy, particularly lavender, has a positive effect on sleep quality and anxiety reduction in pregnant women. Their findings support the use of lavender as a non-pharmacological intervention to address sleep disturbances during pregnancy, which is consistent with the focus of this study. Additionally, Lee and Kim (2019) conducted a randomized controlled trial that highlighted the positive impact of lavender aromatherapy on sleep disturbances in pregnant women. Their study showed significant improvements in both sleep quality and duration, further strengthening the case for lavender's benefits. These findings provide valuable context for exploring the role of lavender aromatherapy in enhancing sleep quantity among third trimester pregnant women in the current study.

2. Preliminaries or Related Work or Literature Review

Sleep disturbances in terms of quality and quantity during the third trimester of pregnancy are a common issue that can potentially lead to maternal complications such as preeclampsia, hypertension, and chronic fatigue. Several quasi-experimental studies in Indonesia have demonstrated the effectiveness of lavender aromatherapy in improving sleep quality among pregnant women in the third trimester. For example, a study by Sri Muningsih & Elfira (2023)(Muningsih & Fitriani, 2024) at STIKES Abdi Nusantara, which used the PSQI questionnaire, reported significant differences between pre- and post-aromatherapy scores ($p = 0.011$).

A similar study by students in the Malahayati Midwifery Journal in Lampung showed a decrease in the average PSQI score from 16.10 to 4.63 after intervention, supporting the finding that lavender aroma has a very positive effect. In Majalengka, Natalia, Febriantari & Handriana (2024) also reported significant improvements in PSQI scores (from 11.60 to 7.33; $p = 0.001$) after aromatherapy intervention in a study with a sample of 15 pregnant women. Additionally, Hairunnisyah & Kumorojati (2023) found a significant effect of lavender aromatherapy on pregnant women in the second and third trimesters in Lambu Village ($p = 0.035$), with 66.7% of respondents showing improved sleep quality.

Findings from a meta-analysis conducted by Teha et al. (2022)(Teha et al., 2022) reinforce this evidence globally: from nine RCT studies in Iran and Indonesia, the standard effect (SMD) of 0.38 (95% CI: 0.38–0.55; $p = 0.004$) showed a substantial improvement in sleep quality thanks to lavender aromatherapy.

An additional study in West Java (Cibolang Kidul) by Aliyyati et al. (publication year DOI 10.59680/ventilator.v2i1.1003) also presented data tables showing the effectiveness of lavender aromatherapy on sleep quality in third-trimester pregnant women, though further access to numerical details is required

In general, the literature indicates positive effects of lavender aromatherapy on sleep quality and duration in third-trimester pregnant women. However, most studies are still limited to quasi-experimental designs and small sample sizes. To strengthen the scientific evidence, there is a need for RCTs with larger samples, objective measurements of sleep quantity (e.g., using actigraphy), and control variables such as aroma intensity, inhalation duration, and intervention environmental conditions.

3. Proposed Method

This study used the Pre-Experiment method with a one group pretest-posttest design to measure the effect of lavender aromatherapy on the sleep quality of third trimester pregnant women in the Mabu'un Health Center area. The study population included all pregnant women who visited the Mabu'un Health Center from May to August 2024. The sample was selected using the Quota Sampling method, with a total of 20 third trimester pregnant women.

The inclusion criteria in this study were third trimester pregnant women who experienced anxiety and were physically and mentally healthy. Meanwhile, the exclusion criteria included pregnant women with pregnancy comorbidities, such as asthma, respiratory allergies, chronic lung disease, pulmonary tuberculosis, and allergies to lavender aromatherapy.

The research instrument used the Hamilton Anxiety Rating Scale (HARS) questionnaire. To analyze the effect of lavender aromatherapy on the quality of sleep of pregnant women, the dependent t-test was used. This study is analytic observational and uses secondary data. Data analysis was performed with the Wilcoxon test.

3.1. Algorithm/Pseudocode

Table 1. Algorithm

Algorithm
a. Define study objective: Evaluate the effect of lavender aromatherapy on sleep quantity in third-trimester pregnant women.
b. Determine sample criteria: inclusion (gestational age 28–40 weeks, no sleep medication, willing to participate), exclusion (respiratory illness, allergy to lavender).
c. Recruit participants: total sampling technique or purposive sampling depending on target population.
d. Measure baseline sleep quantity using Pittsburgh Sleep Quality Index (PSQI) or sleep diary for 3 days.
e. Intervention: Instruct participants to inhale lavender essential oil for 30 minutes before bedtime over 7 days.
f. Post-intervention: Reassess sleep quantity using the same measurement tools.
g. Analyze data: Use paired-sample t-test (if normal) or Wilcoxon signed-rank test (if non-normal).
h. Interpret significance: $p<0.05$ = significant difference.
i. Report results, discuss findings, and conclude.

3.2. Formatting of Mathematical Components

a. Mean and Standard Deviation

b. Paired Sample t-Test Formula

c. Wilcoxon Signed-Rank Test (if non-normal)

4. Results and Discussion

Table 2. General Data

Variable		n	Frequency (%)
Age			
	<20 Yo	**6**	**30**
	20-35 Yo	**7**	**35**
	>35 Yo	**7**	**35**
Parity			
	Primiparous	**8**	**40**
	Multypara	**5**	**25**
	Grande multypara	**7**	**35**
Education			
	Not educated	**0**	**0**
	Elementary school	**0**	**0**
	Junior High School	**11**	**55**
	Senior High school	**6**	**30**
	College	**3**	**15**
Employment			
	House wife	**9**	**45**
	Private employee	**11**	**55**
Total		**20**	**100**

Based on the results of the data table 1 above shows that all respondents in this study are third trimester pregnant women aged <20 years as much as 30%, 20-35 years as much as 35% and >35 years as much as 35%. Then in terms of parity 40% are primipara, 35% grande multipara and 25% multipara. based on the level of education of most pregnant women 55% junior high school graduates, 30% high school graduates and 15% college graduates.

Table 3. Univariate Analysis

Var	n	min	max	Mean	Sd
Sleep quantity before	**20**	**4**	**7**	**5.70**	**1.03**
Sleep quantity after	**20**	**6**	**8**	**7.05**	**0.82**

In table 2 show that there has been an improvement in sleep quality in respondents after being given lavender aromatherapy intervention. Before being given lavender aroma therapy there was an average of 5.70 pregnant women who experienced sleep quality disorders, while after being given lavender aromatherapy an average of 7.05 experienced an increase in sleep quality. It is also in good sleep quality that there is an increase in 10 respondents who have been given the intervention to have good sleep quality, while the other 10 respondents who were not given the intervention still experienced sleep quality disorders.

Table 4. Bivariate Analysis

Var	**n**		**P value**	
Sleep quantity before	**20**	**0.017**		
Sleep quantity after	**20**	**0.001**		
	Shapiro wilk			
Var 1	**N**	**P value**		**Var 2**
Sleep quantity before	**20**	**0.000**		**Sleep quantity after**
	Wilcoxon			

Based on table 3 above from the results of the normality test using Saphiro-Wilk on the variable sleep quality of Trimester III Pregnant Women in the Inhalation intervention group, it can be seen that the P-value in the pre-intervention (P-value: 0.017) and post-intervention (P-value: 0.001) is smaller than 0.05 so non parametric test should be used. Wilcoxon rant test show p=0.000 (p< 0,05) so it can be concluded that there is an effect of giving lavender aroma therapy on the sleep quality of trimester III pregnant women in the Mabu'un Health Center Region.

The average age of pregnant women during the third trimester is between 22 and 35 years, as shown in table 1. At this age, pregnant women can safely conceive because it is considered safe. 35 years of age, children older than 4 years, and childbirth spacing less than 2 years are risky ages for pregnancy and infant mortality. The inhalation intervention group mostly had a junior high education level, with 11 people (55.0%), and the massage intervention group mostly had a senior high education level, with 6 people (30.0%). The ability to get information is not the same for every person or pregnant woman. Pregnant women who have higher education may be able to receive information more easily.

Essential extracts containing linalool have a calming effect in lavender aromatherapy. Linalool activates olfactory nerve cilia receptors in the olfactory epithelium. These receptors are then relayed to the bulbus olfactorius, which is connected to the limbic system, and receives all data from the olfactory system via the olfactory nerve. The hippocampus and amygdala receive stimuli from the linalool odor. The amygdala, which is the center of

emotion, is then brought to the raphe nucleus in the brain via the hypothalamus. Stimulating the raphe nucleus causes the release of serotonin, which is a neurotransmitter that regulates the onset of sleep (Khasanah, 2024).

Linalyl acetate, which is also present in lavender extract, interacts with NMDA (N-Methyl-D-Aspartate) receptors, which are a type of ionotropic glutamate ion receptors (iGLURs). The compounds in lavender essential oil (LEO) have a calming effect on the nervous system. Activation of NMDA receptors by glutamate plays a role in neurotoxicity, so lavender essential oil may help reduce the impact. Standardized lavender essential oil, known as silexan, has strong analgesic properties and works to calm the nervous system (Nila S et al., 2019)(Rosna et al., 2024).

Researchers stated that after using lavender aromatherapy, most of the respondents experienced better sleep quality. This is due to the fact that lavender aromatherapy can calm and soothe the limbic system in the brain, which makes pregnant women feel comfortable and allows them to sleep longer and undisturbed, which helps them sleep well

5. Comparison

a. Muningsih & Fitriani (2023), which showed significant improvements in PSQI scores following the use of lavender aromatherapy, as well as Maharani et al. (2022), who reported improvements in sleep quality and duration following a similar intervention. However, unlike most previous studies that only assessed sleep quality subjectively, this study adopts a more focused approach on sleep quantity as the primary variable and uses daily repeated measurements to enhance data validity. Additionally, the intervention duration of seven consecutive days and the standardization of lavender aroma use distinguish this study from previous studies, which either used a single administration or did not control inhalation duration.

5.1 Contributions of this research:

a. Theoretical Contribution. This study adds scientific evidence that lavender aromatherapy not only affects sleep quality (as in previous studies) but also significantly improves sleep quantity in third-trimester pregnant women. This contributes to the development of non-pharmacological care theories in community midwifery.
b. Practical Contribution. The results of this study can be used as a practical intervention by midwives and health workers in helping pregnant women in their final trimester who experience sleep disturbances, especially in primary care facilities. Lavender aromatherapy can be a safe, inexpensive, and easy-to-apply option without side effects.
c. Methodological Contributions. This study used sleep quantity measurement based on daily sleep diaries and provided an intervention with standardized duration and

frequency, enriching the methodological approach to aromatherapy intervention research.

d. Contextual Contribution. This study was conducted among pregnant women in rural Indonesia, expanding the context of aromatherapy research, which has primarily been conducted in urban areas or developed countries.

6. Conclusions

6.1 Summary

This study concludes that lavender aromatherapy significantly improves sleep quality in third trimester pregnant women, as shown by the Wilcoxon test result ($p = 0.000$). The calming effect of lavender is attributed to active compounds like linalool and linalyl acetate, which influence the nervous system through olfactory and neurotransmitter pathways. These effects help promote relaxation and better sleep. Given its non-pharmacological nature, lavender aromatherapy can be a safe and effective intervention to support maternal well-being during late pregnancy.

6.2 Advice

a. For the Community People, especially pregnant women who have difficulty sleeping, are advised to utilize lavender aromatherapy as a way to overcome sleep disorders.

b. For Institutions This study proves that lavender aromatherapy can improve sleep quality in third trimester pregnant women. Therefore, the results of this study can be used as a reference in the development of science, especially as learning material for pregnant women.

c. For the Mabu'un Health Center Region, it is hoped that this research will become a source of education.Suggestions are written in narrative form. Suggestions contain recommendations formulated by researchers that are both practically useful and useful for the development of science.

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