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Improving Sleep Quality in Third Trimester Pregnant Woman: The Effect of Chamomile Aromatherapy

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ABSTRACT

Background: *Sleep quality during pregnancy decreases significantly as pregnancy progresses. Poor sleep quality can be addressed with various methods, including aromatherapy as a relaxation technique. Chamomile aromatherapy contains compounds that increase gamma-aminobutyric acid (GABA) receptor activity, thereby promoting muscle relaxation and inducing sleepiness. This study aims to assess improvement in sleep quality in third-trimester pregnant women after receiving chamomile aromatherapy.*

Methods: *This study used a pre-experimental one-group pretest–posttest design. The sample consisted of 30 participants, all of whom were pregnant women in their third trimester. Data were collected using the Pittsburgh Sleep Quality Index (PSQI) questionnaire and an observation sheet. The chamomile aromatherapy intervention was administered before bedtime for 14 consecutive days by adding three drops of chamomile essential oil to a humidifier containing 100 ml of water, which was diffused for 10 minutes.*

Results: A total of 53.3% of respondents had poor sleep quality before the chamomile aromatherapy intervention, which increased to 53.3% with excellent sleep quality after the intervention. The results of the Wilcoxon Signed-Rank Test showed a statistically significant improvement in sleep quality (p = <0.001). The Wilcoxon Signed Rank Test showed a significant improvement in sleep quality (p = <0.001).

Conclusion: *Chamomile aromatherapy significantly improves sleep quality in third trimester pregnant women. Health workers, especially midwives and nurses, should provide education and guidance on the safe use of chamomile aromatherapy.*

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INTRODUCTION

Poor sleep quality is often experienced by pregnant women (Yang et al., 2020), while sleep plays an important role in maintaining health and improving quality of life (Wijayanti et al., 2020). The American Academy of Sleep Medicine and the Sleep Research Society recommend that adults, including pregnant women, obtain 7 to 8 hours of sleep each night (Wang et al., 2022), as sleep plays a crucial role in supporting optimal health and maintaining a healthy lifestyle (Delgado & Louis, 2022).

Sleep quality among pregnant women tends to decline significantly as pregnancy progresses. The overall prevalence of poor sleep quality during pregnancy is 38.2%, with the highest rate observed in the third trimester (39.7%), compared to 25.3% in the first trimester and 27.2% in the second trimester (Sedov et al., 2021). According to the Sleep Foundation, approximately 50% of pregnant women experience poor sleep quality. In Indonesia, the prevalence of poor sleep quality among pregnant women remains relatively high, at around 64% (Ismiyati & Faruq, 2020).

Preliminary research based on interviews with 14 third-trimester pregnant women at the Sukorame Health Center revealed that 12 respondents (80%) experienced poor sleep quality. The reported causes included frequent urination at night (5 respondents, 33.3%), back pain (4 respondents, 26.6%), shortness of breath (1 respondent, 6.6%), dizziness (1 respondent, 6.6%), and anxiety before delivery (1 respondent, 6.6%)(Ismiyati & Faruq, 2020).

Poor sleep quality can cause serious complications and increase morbidity in pregnant women and fetuses (Lu et al., 2021). In addition, poor sleep quality during pregnancy is associated with various adverse outcomes, such as gestational diabetes and cesarean delivery (Du et al., 2021). Other studies have also shown that poor sleep quality increases the risk of perinatal complications, including preterm birth and low birth weight (Zhu et al., 2024).

Poor sleep quality can be managed through various methods, one of which is aromatherapy as a relaxation technique (Dwi Anggraini et al., 2023). Aromatherapy helps relax the body, thereby improving sleep quality and duration (Ari Adiputri et al., 2023). It is a therapeutic technique that utilizes natural floral scents, with each type offering distinct benefits (Ayuningtias & Burhanto, 2021).

Chamomile is one of the most commonly used herbal remedies for managing common ailments during pregnancy, particularly as a relaxation agent in the first and third trimesters (Sarecka-Hujar & Szulc-Musioł, 2022). Another study reported that chamomile extracts typically contain about 1% apigenin by mass (0.8–1.2%), where apigenin is a bioactive compound that accounts for approximately 68% of the total flavonoids in chamomile plants. Apigenin has a benzodiazepine-like function, as it enhances GABA (Gamma-Aminobutyric Acid) receptor activity, which promotes drowsiness and muscle relaxation (Sugiarto, 2020). The anxiolytic properties of apigenin found in chamomile flowers play an important role in improving sleep quality during pregnancy (Putri & Astuti, 2023).

Previous studies have shown that lavender aromatherapy and chamomile tea consumption have a significant effect on improving sleep quality in pregnant women. The intervention involved administering 100 ml of chamomile tea in the afternoon and evening, accompanied by lavender aromatherapy, and the results were statistically significant (Maulidawati et al., 2022). Most previous studies have used chamomile in the form of tea, whereas the effectiveness of chamomile aromatherapy in improving sleep quality among pregnant women in their third trimester has been rarely investigated. Therefore, this study aims to examine the effectiveness of chamomile aromatherapy as a method to improve sleep quality in pregnant women.

MATERIALS AND METHODS

This study employed a quantitative approach with a pre-experimental one-group pretest–posttest design. The study population consisted of 56 third-trimester pregnant women at the Sukorame Health Center, Kediri City. A sample of 30 participants was

selected using simple random sampling. The inclusion criteria included third-trimester pregnant women registered at the Sukorame Health Center, Kediri City, who had poor sleep quality during pregnancy, no history of severe asthma or other respiratory disorders, and were willing to participate in the study. The exclusion criteria included third-trimester pregnant women who were taking medications that could affect sleep quality, had skin allergies, pruritus, or irritation to aromatherapy, did not regularly follow the intervention, or were unable to complete the study.

The dependent variable in this study was sleeping quality in pregnant women in their third trimester, which was measured after the intervention. The independent variable was the administration of chamomile aromatherapy as an intervention to improve sleep quality. In other words, this study aimed to determine the effect of chamomile aromatherapy on changes in sleep quality in pregnant women in their third trimester.

Participants first underwent a pre-test before receiving the intervention. The intervention consisted of chamomile aromatherapy administered before bedtime for 14 consecutive days by adding three drops of chamomile oil to a humidifier containing 100 ml of water, which was operated for 10 minutes, based on the results of previous trials. A post-test was conducted on the 14th day to assess the effect of chamomile aromatherapy on improving sleep quality.

Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI), a questionnaire that has been tested for validity and reliability both globally and in Indonesia. The test results demonstrated a high level of validity and reliability, with a Cronbach's Alpha value of 0.83, indicating that this instrument is appropriate for assessing sleep quality, including among pregnant women. In addition, an observation sheet was used to evaluate the respondents' level of compliance with the intervention.

Data analysis was carried out in two stages. The first stage involved univariate analysis to describe the frequency distribution of each research variable. The second stage involved bivariate analysis using the Wilcoxon Signed Rank Test to determine the differences in sleep quality before and after the intervention.

This study received ethical approval from the Health Research Ethics Committee of Poltekkes Malang on May 28th, 2024, with approval number DP.04.03/F.XXI.31/0516/2024. Permission to conduct the study was also obtained from the Health Office and Sukorame Health Center in Kediri City. All respondents provided written informed consent, and the confidentiality of their personal data was ensured.

RESULTS

Table 1. Characteristics of Respondents (n = 30)

Variable	Criteria	Frequency (n)	Percentage (%)
Age	<20 years old	1	3
	20-35 years old	23	77
	>35 years old	6	20
	Total	**30**	**100**
Pregnancy age	≥28-30 weeks	12	40
	≥31-34 weeks	11	37
	≥35-38 weeks	7	23
	Total	**30**	**100**
Pregnancy of the child	1	15	50
	2	8	27
	≥3	7	23

Variable	Criteria	Frequency (n)	Percentage (%)
	Total	**30**	**100**
Parity	Primigravida	15	50
	Multigravida	15	50
	Total	**30**	**100**
Education level	Middle school	4	13
	High school	16	53
	Higher Education	10	33
	Total	**30**	**100**
Work status	Housewife	18	60
	Private	2	7
	Self-employed	6	20
	Civil Servant	4	13
	Total	**30**	**100**

Based on Table 1. that most respondents were between 20 and 35 years old (77% or 23 respondents). Half of the respondents experienced their first pregnancy (50% or 15 respondents). The majority had a high school education (53% or 16 respondents), and most were housewives (60% or 18 respondents).

Table 2. Sleep Quality Before and After Chamomile Aromatherapy Intervention (n =30)

Categories	Before Intervention n (%)	After Intervention n (%)
Very Good (Score 0-7)	2 (6.7)	16 (53.3)
Good (Score 8-14)	12 (40.0)	14 (46.7)
Poor (Score 15-21)	16 (53.3)	-

Note: n = number of observations; % = percentage

Table 2. shows the sleep quality of respondents before and after being given chamomile aromatherapy. Before the intervention, most respondents experienced poor sleep quality, with 53.3% falling into the poor category and only 6.7% falling into the very good category. After the intervention, there was a significant improvement, with 53.3% of respondents achieving excellent sleep quality and 46.7% falling into the good category, indicating the positive effect of chamomile aromatherapy on the sleep quality of pregnant women in their third trimester.

Table 3. The Difference in Sleep Quality Before and After the Intervention was Analyzed Using the Wilcoxon Signed Rank Test (n =30)

Variable	Before			After			Z-score	*P Value*
	n	%	Mean ±SD	n	%	Mean ±SD		
Very good	2	6.7	0.629 ± 2.47	16	53.3	0.507 ± 1.47	**-4.667**	**0.000**
Good	12	40.0		14	46.7			
Poor	16	53.3		0	0			

Note: n = number of observations; % = percentage; SD = standart deviation

Table 3. shows the difference in sleep quality of respondents before and after being given chamomile aromatherapy, analysed using the Wilcoxon Signed Rank test. The results show significant improvement, with the number of respondents with very good sleep quality increasing from 2 people (6.7%) to 16 people (53.3%), while the poor category decreased from 16 people (53.3%) to 0 people (0%). Statistical analysis shows a Z value of -4.667 with P = 0.000, indicating that the difference in sleep quality before and after the intervention is statistically significant.

DISCUSSION

Sleep Quality Before Intervention

The results presented in Table 2 show that before the intervention, most respondents had poor sleep quality. A total of 40.0% had good sleep quality, while only 6.7% had very good sleep quality. Based on these data, the number of respondents with good and very good sleep quality was lower than those with poor sleep quality.

The main factor affecting sleep quality is the physical changes that occur during pregnancy. In the third trimester, physical and psychological changes often cause discomfort, such as increased frequency of urination, fetal movements, lower back pain, leg cramps, heartburn, fatigue, and abdominal discomfort, all of which can interfere with sleep (Wong et al., 2022). In addition to physical changes, poor sleep quality can also be influenced by mood swings. Previous studies have found that pregnant women experience significant mood fluctuations during pregnancy, accompanied by varying levels of anxiety, stress, and depression. The higher the level of depression in pregnant women, the poorer their sleep quality (Bahani et al., 2024).

Previous cross-sectional research involving 986 pregnant women showed that basic characteristics, obstetric factors, lifestyle, and psychological conditions directly influence the sleep quality of pregnant women based on PSQI scores. Among these factors, psychological disorders had the highest path coefficient, indicating the strongest influence on sleep quality (Bahani et al., 2024). In addition, another cross-sectional study involving 415 respondents in Ethiopia examined sleep quality and its related factors. The results of this study showed that various sociodemographic, obstetric, and lifestyle factors contributed to poor sleep quality among pregnant women (Anbesaw et al., 2021).

Sleep Quality After Intervention

The results in Table 2 after the intervention show that most respondents had excellent sleep quality. In addition, nearly half of the respondents had good sleep quality. Improved sleep quality after the intervention may occur because, during aromatherapy, participants are in a comfortable and relaxed position. Additionally, the soft and soothing scent of chamomile helps divert attention from discomfort, allowing the body to relax and facilitating the process of falling asleep.

This effect is further supported by the mechanism of chamomile aromatherapy, which influences sleep quality through the activation of GABA receptors in the brain. Aromatic molecules from chamomile that enter the body through the respiratory tract and skin affect the limbic system in the brain. These molecules regulate and modify messages transmitted through the hypothalamus, thereby decreasing sympathetic nerve activity and enhancing parasympathetic nerve activity. This mechanism promotes physical relaxation, calms the mind, and helps individuals achieve more restful sleep (Her & Cho, 2021).

The main component of chamomile responsible for this effect is apigenin, a flavonoid compound with biological activity on the central nervous system. Mechanistically, apigenin acts by modulating the inhibitory neurotransmitter system, namely GABA (gamma-aminobutyric acid). This compound binds to GABA-A receptors at the same allosteric site as benzodiazepines, although with weaker affinity. Such binding increases the receptor's affinity for endogenous GABA, thereby enhancing the inhibitory effect on neurons. The resulting increase in chloride ion influx into the neurons leads to membrane hyperpolarization, which reduces neuronal excitability and produces sedative and anxiolytic effects, ultimately facilitating the onset of sleep (Kramer & Johnson, 2024).

In addition to its effects on the GABA system, apigenin also exhibits antioxidant and anti-inflammatory activities that help maintain neural function balance and support sleep homeostasis (Yeom & Cho, 2024). Furthermore, several studies have demonstrated that the consumption of chamomile extract or chamomile tea can improve subjective sleep quality, reduce sleep latency, and enhance feelings of freshness upon waking (Kazemi et al., 2024).

In addition, participants' compliance with the 14-day intervention, which was monitored through observation sheets and evidence of intervention adherence in the WhatsApp group, also contributed to the improvement in sleep quality. Similarly, a study conducted among young adults with poor sleep quality reported that 80 participants who performed a 10-minute daily chamomile oil inhalation routine for 15 days experienced a significant improvement in sleep quality (Deepa et al., 2024).

Comparison with Previous Studies

Based on the results of the Wilcoxon Signed Rank Test presented in Table 3, the calculated Z value was -4.667. The analysis showed that a statistically significant difference in the sleep quality of third-trimester pregnant women before and after the intervention. This finding is further supported by a decrease in the mean sleep quality score from 2.47 (indicating poor sleep quality) to 1.47 (indicating good sleep quality).

Participants in this study were pregnant women in their third trimester, whereas previous studies involved participants from different groups, such as older adults, menopausal women experiencing hot flashes, adolescents, burn patients, postpartum women, and healthcare or shift workers. Research outcomes may be influenced by various factors, including the intervention modality, dosage, chamomile formulation, duration and frequency of administration, as well as unrelated factors such as the natural course of the condition and regression toward the mean, which may affect an individual's ability to respond to the intervention (Zick et al., 2021).

In this study, chamomile was administered in the form of aromatherapy. In contrast, another study used chamomile tea and lavender aromatherapy, each consumed at a dose of 100 ml during the day and at night (Maulidawati et al., 2022). Meanwhile, other studies used several types of chamomile preparations, including chamomile jelly containing 10 grams of dried chamomile, chamomile syrup at a dose of 400 mg per day, and high-grade chamomile extract (270 mg) administered orally twice daily. The first capsule was taken between lunch and dinner, while the second capsule was taken approximately one hour before bedtime (Kazemi et al., 2024).

The duration of chamomile aromatherapy administration in this study was 14 consecutive days, with an exposure time of 10 minutes per day by adding three drops of chamomile oil to a humidifier containing 100 ml of water. In contrast, a previous study

conducted the intervention by applying three drops of essential oil onto a napkin, which was then attached to the collar for 20 minutes at 9:00 p.m., with the intervention lasting for seven consecutive nights (Mahdavikian et al., 2021). Another study also reported that participants inhaled essential oils before bedtime for 29 days (Hachul et al., 2023).

In another study, the instruments used to assess sleep quality included the Insomnia Severity Index (ISI), the Epworth Sleepiness Scale (ESS), and the Sleep Hygiene Index (SHI). Meanwhile, the present study used the Pittsburgh Sleep Quality Index (PSQI). The PSQI is commonly used to assess sleep quality, particularly among pregnant women, because it is comprehensive, valid, and reliable. It evaluates various aspects of sleep, is easy to administer, and has been proven effective in providing a comprehensive description of sleep quality in pregnant women.

This study shows that chamomile aromatherapy can be an effective non-pharmacological intervention to improve sleep quality in pregnant women in their third trimester. The limitations of this study include a small sample size, limited intervention duration, and the use of the subjective PSQI. Further research is recommended to use a larger sample size, a longer intervention duration, objective measurement methods, and a more rigorous randomised and controlled design to improve the validity and generalisability of the results.

CONCLUSION

After reviewing the results and discussing the effects of chamomile aromatherapy on improving sleep quality, it can be concluded that most pregnant women in their third trimester had poor sleep quality before the intervention but experienced an improvement to excellent sleep quality after receiving chamomile aromatherapy. Overall, these findings support the effectiveness of chamomile aromatherapy as a non-pharmacological method for enhancing sleep quality. However, this study also highlights the importance of considering sample size, the inclusion of a control group, and other factors that may influence the results, such as environmental conditions, participants' psychological states, and the intensity of the intervention. Further research is recommended to determine the optimal dose of chamomile and to compare its effects with other non-pharmacological interventions to obtain more comprehensive results.

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