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ORIGINAL ARTICLE

The Effect of Combination of Citronella Oil and Back Massage on Sleep Quality and Stress Levels in Postpartum Mothers

Heyrani Heyrani[1*], Melania Asi[1], Elyasari Elyasari[1], Maya Astuti[2], Arsulfa Arsulfa[1], Hesty Resyana[1]

[1]*Department of Midwifery, Faculty of Medicine, Polytechnic of The Ministry of Health Kendari, Kendari, Southeast Sulawesi, Indonesia*
[2]*Department of Midwifery, Faculty of Medicine, Polytechnic of The Ministry of Health Bandung, Bandung, West Java, Indonesia*
Correspondence: *heyrani1112@gmail.com*
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ABSTRACT

OBJECTIVE: This study aimed to investigate the impact of combining citronella oil with back massage on sleep quality and stress levels in postpartum mothers.

METHODOLOGY: This study employed a quantitative, quasi-experimental design with two groups, utilizing pre- and post-tests. This study was conducted from August 2024 to April 2025 in the Wawolesea, Lembo, and Saka sub-districts of the North Konawe Regency. A total of 196 samples were collected using purposive sampling. The Pittsburgh Sleep Quality Index (PSQI) was used to measure sleep quality, and the Perceived Stress Scale-10 was used to measure stress levels. The data were analysed using both univariate and bivariate methods.

RESULTS: The intervention group experienced 79 cases of negative sleep quality, with a p-value of 0.000, indicating that the intervention significantly improved sleep quality. In contrast, the control group showed seven positive cases with a p-value of 0.157, which was not statistically significant. For stress levels, the intervention group reported 86 negative cases, with a p-value of 0.003, indicating significant effectiveness, whereas the control group reported a p-value of 0.076. The intervention group had a mean sleep quality score of 24.50 compared to 36.50 in the control group ($p < 0.001$), as well as a stress level score of 25.47 versus 35.53 ($p = 0.011$).

CONCLUSION: The combination of *citronella oil* and back massage not only improves sleep quality but also significantly reduces stress levels in postpartum mothers.

KEYWORDS: *Citronella Oil*, Back Massage, Sleep Quality, Stress Level, Postpartum Mother

INTRODUCTION

Physiological, emotional, and psychological changes in postpartum mothers are indicators of the postpartum phase. These changes may affect mothers' general health and well-being. Postpartum mothers frequently experience increased stress and poor sleep quality. Non-pharmacological methods, such as massage therapy and the use of citronella oil, can be employed to reduce stress and improve sleep quality. The plant that yields citronella oil, *Cymbopogon nardus*, is known to promote blood circulation and relaxation [1].

The integration of holistic health practices in postpartum care through a multidisciplinary approach is essential for optimizing maternal well-being. Holistic strategies encompass emotional support alongside traditional medical care, recognized as vital in fostering psychological well-being and enhancing breastfeeding outcomes. A study indicates that emotional release practices, such as self-talk, are significantly associated with improved maternal mental health and lactation, highlighting the importance of addressing emotional well-being in postpartum care.

The postpartum period is marked by significant physiological and psychological transitions influenced by a combination of biological, psychological, and social factors, as described in the biopsychosocial model. Physiologically, women undergo changes in their reproductive and endocrine systems, as well as alterations in blood circulation and vital signs, reflecting the body's adaptation following delivery. For example, uterine involution and hormonal adjustments are crucial for recovery, highlighting the biological aspect of postpartum adaptations[3].

The integration of massage and aromatherapy into postpartum care routines offers significant benefits for new mothers, particularly in alleviating physical and emotional stressors associated with childbirth. Studies indicate that techniques such as endorphin massage can effectively reduce anxiety levels in postpartum mothers, enhancing their psychological well-being[4]. Combining this with loving massage and aromatherapy, particularly lavender oil, has been shown to improve breast milk production and promote relaxation, thus aiding maternal recovery[5].

Massage therapy and *citronella oil* exert calming effects through complex physiological and neurobiological mechanisms. Massage therapy is recognized for its ability to stimulate pressure receptors in the skin, which can activate the vagus nerve, leading to increased vagal activity associated with reduced cortisol levels related to stress[6]. This reduction in cortisol has been linked to improved mood and relaxation, as evidenced in various populations, including infants and the elderly[7]. Additionally, massage promotes an increase in serotonin and dopamine, neurotransmitters that play crucial roles in mood regulation and contribute to feelings of well-being[8]. *Citronella oil*, an essential oil known for its calming properties, enhances this relaxing effect. Its aromatic compounds are believed to influence neurobiological responses through olfactory pathways, which can affect the limbic system, particularly in emotional regulation and stress response[9]. The combined application of massage therapy with aromatherapy using citronella may

The postpartum phase involves complex physiological, emotional, and psychological transitions that significantly impact the mother's health and well-being. Postpartum depression (PPD) rates can be as high as 21%, highlighting the urgent need for effective intervention strategies [10]. New mothers often experience increased stress and decreased sleep quality, which can exacerbate health problems, including anxiety and hypertension [11]. Nonpharmacological interventions, such

as massage therapy combined with aromatherapy, have shown potential in addressing these challenges. For example, studies have shown that aromatherapy with essential oils, including those with calming properties, can improve relaxation and emotional well-being among postpartum mothers[11]. Additionally, the efficacy of combining massage with aromatherapy to enhance relaxation and reduce muscle tension supports better sleep quality in this population [12]. These dual interventions can help create an environment that promotes maternal recovery[13].

This study aimed to examine the effects of *citronella oil* and back massage on postpartum stress levels and sleep quality. The novelty of this study lies in the fact that numerous studies have been conducted on this topic; however, this study offers a fresh perspective by investigating the combined effects of massage techniques and the use of *citronella oil*. By utilising massage techniques in conjunction with citronella oil, we aim to enhance our understanding of how to improve the welfare of postpartum mothers and provide an additional resource for complementary postpartum care methods.

METHODOLOGY

A two-group pre-test–post-test design with a quasi-experimental approach was employed in this quantitative study. Questionnaires and observational techniques were used to gather data. From August 2024 to April 2025, the study was conducted in the Wawolesea, Lembo, and Saka sub-districts of the North Konawe Regency.

This study included all postpartum women in the North Konawe Regency in 2024. The Lemeshow formula was used to calculate the sample size, and 196 mothers were included in the sample. The sampling technique employed was purposive. The inclusion criteria for the included samples were as follows: age between 17 and 45 years, experiencing sleep issues or stress as measured before the intervention, being in the postpartum period (0–6 weeks postpartum), and being willing to provide informed consent. The exclusion criteria were serious health issues, history of severe mental disorders, inability to adhere to the intervention process thoroughly, and use of sedatives were the exclusion criteria.

Mothers were approached through community health centers and local maternal health clinics within the Wawolesea, Lembo, and Saka sub-districts. The recruitment process included disseminating information about the study objectives and eligibility criteria in various community forums and through healthcare providers. Interested participants were screened for inclusion and exclusion criteria, ensuring a focused cohort of mothers who could benefit from the intervention involving *citronella oil*.

In this study, the fidelity of the intervention involving *citronella oil* was supported by comprehensive training provided to the nurses and midwives participating in the fieldwork. The training encompassed specific objectives, procedural protocols, and operational definitions related to the intervention. It included sessions on the therapeutic properties and application methods for *citronella oil*, emphasizing the importance of consistency in dosage and administration techniques to maintain the integrity of the integration process. Moreover, the training addressed best practices in participant engagement and ethical considerations, promoting informed consent and participant safety. An emphasis was placed on the accurate use of assessment tools, including the Pittsburgh Sleep Quality Index (PSQI) and the Perceived Stress Scale-10, to ensure that participants received a standardized approach to monitoring outcomes. This preparatory phase aimed to cultivate competency and confidence among nurses and midwives, thereby establishing a robust foundation for the intervention's reliability and validity.

Applying for a research permit was the first step of this study, followed by site exploration. *Citronella oil* was used as an intervention material. The primary researcher enlisted the assistance of qualified nurses and midwives to support the fieldwork. After that, socialisation sessions were conducted to help all the research assistants in the field understand the goals and direction of the study. Stress levels and sleep quality of postpartum mothers were assessed through a screening process. Informed consent was obtained, and samples were split into intervention and control groups, which were then gathered according to the inclusion criteria. Following socialization, the intervention was conducted as planned. After data processing and creation of an extensive report, the evaluation was completed with a post-test to gauge the research outcomes.

The research timeline began in August 2024, with the application for a research permit and site exploration, as well as the initiation of recruitment of mothers through community health centres and clinics. September 2024: Pre-tests conducted, assessing sleep quality (using the Pittsburgh Sleep Quality Index, PSQI) and stress levels (using the Perceived Stress Scale-10) among the participants who met the inclusion criteria. October 2024: Training for nurses and midwives on

intervention protocols, including objectives and application of *citronella oil*, concluded. November 2024: Intervention commenced, where the intervention group received *citronella oil* while the control group did not.

February 2025: Post-tests conducted to evaluate changes in stress and sleep quality in both groups. April 2025: Data analysis finalized, along with the preparation of results for dissemination.

As the study design incorporated two independent groups (intervention and control), bivariate analysis was employed to assess differences in outcomes between these groups. The Wilcoxon test, a non-parametric test, was appropriately selected because the data on stress levels and sleep quality do not exhibit a normal distribution. This choice enables reliable comparisons of ordinal or continuous data that do not meet the assumptions of parametric tests. Furthermore, the Mann-Whitney U test was used to examine post-treatment variations in stress levels and sleep quality between the two groups, thereby reinforcing the validity of the findings when normality assumptions are untenable. The choice of these tests thus ensured robust statistical inference while addressing pertinent research questions regarding the efficacy of *citronella oil* as an intervention.

Sleep quality was evaluated by using the Pittsburgh Sleep Quality Index (PSQI). This is due to the high validity and reliability of the Pittsburgh Sleep Quality Index (PSQI), which is used to assess various aspects of sleep. Stress levels were measured using the Perceived Stress Scale-10.

The Ethics Commission of the Kendari Ministry of Health Polytechnic granted ethical approval (DP.04.03/F.XXXVI.39/003/2024).

RESULTS

Table I shows the distribution of respondents between the intervention group and the control group in a study. The analysis includes demographic variables such as age, education, occupation, number of live births, sleep quality (both pre-test and post-test), and stress levels (both pre-test and post-test). In a specific period, the intervention group tended to be younger than the control group. Education showed a fairly balanced proportion, although there were slightly more respondents with junior high school education in the control group. In terms of occupation, most respondents were household workers, with relatively low poverty levels in both groups. Sleep quality improved in the intervention group post-intervention, as indicated by a decrease in the number of respondents reporting disturbed sleep. Stress levels also changed, with more respondents in the intervention group reporting mild stress levels after the intervention compared to the control group. All variables showed good homogeneity values ($p > 0.05$), indicating no significant differences between the two groups in the measured demographic characteristics.

Table I: Distribution of respondents in the intervention and control groups

Variables	Intervention group		Intervention group		Homogeneity sample
	Frequency	%	Frequency	%	
Age					
17-34	69	70.4	76	77.6	0.882
35-44	23	23.5	17	17.3	
>45	6	6.1	5	5.1	
Education					
Elementary school	13	13.3	7	7.1	
Junior high school	7	7.1	20	20.4	0.831
Senior high school	63	64.3	59	60.2	
University	15	15.3	12	12.2	
Work					
Government employee	3	3.1	3	3.1	
Household	88	89.8	81	82.7	0.952
Private employee	5	5.1	7	7.1	
Unemployment	2	2.0	7	7.1	
Number of live births					
Primipara	33	33.7	40	40.8	0.873
Multipara	65	66.3	58	59.2	
Sleep quality (pre-test)					
Not disturbed	35	35.7	26	26.5	0.845
Disturbed	63	64.3	72	73.5	

Sleep quality (post-test)					
Not disturbed	83	84.7	73	74.5	0.817
Disturbed	15	15.3	25	25.5	
Stress level (pre-test)					
Mild	20	20.4	30	30.6	0.811
Moderate	58	59.2	56	57.1	
Heavy	20	20.4	12	12.2	
Stress level (Post test)					
Mild	60	61.2	40	40.8	0.821
Moderate	30	30.6	50	51.0	
Heavy	8	8.2	8	8.2	

Levane test

As shown in **Table II**, out of 98 participants, the intervention group, which received back massage and citronella oil, experienced 79 cases of poor sleep quality and 0 positive cases. In contrast, the control group experienced only 7 positive cases. The control group recorded 91 cases in the tie category compared to 19 cases in the intervention group. A p-value of 0.000 was found for sleep quality in the analysis, indicating that the intervention significantly improved sleep quality. Furthermore, the intervention group recorded 86 negative cases of stress levels, whereas the control group recorded only 13. The intervention had an impact on stress levels, as evidenced by the p-value for stress levels in the intervention group (0.003).

Table II: Differences in sleep quality and stress levels in each group

	Sleep quality		**Stress levels**	
Cases	**Intervention**	**Control**	**Intervention**	**Control**
Negative	79	0	86	0
Positive	0	7	7	13
Ties	19	91	6	85
p-value	0.000	0.157	0.003	0.076

Wilcoxon test

According to **Table III**, the mean score for sleep quality in the intervention group was 24.50, while that in the control group was 36.50, with a p-value of 0.001. These findings suggest that the two groups differ significantly in the degree to which the intervention improves sleep quality. With a p-value of 0.011, the mean stress level in the intervention group was 25.47, and that in the control group was 35.53. These findings also revealed significant differences between the two groups.

Table III: Differences in sleep quality and stress levels after treatment between the two groups

Variables	N	Mean	p-value
Sleep quality			
After treatment			
Intervention	98	24.50	**0.001**
Control	98	36.50	
Total			
Stress levels			
After treatment			
Intervention	98	25.47	**0.011**
Control	98	35.53	
Total			

Mann-Whitney U Test

DISCUSSION

The results indicated that the stress levels and sleep quality of the intervention group significantly changed following treatment. The proportion of individuals with undisturbed sleep quality has increased from 35.7% to 84.7 %. This result is consistent with earlier research demonstrating that structured intervention programs have a significant impact on stress and sleep quality[14]. Furthermore, the results indicated that the percentage of people who experienced extreme stress levels decreased from 20.4% to 8.2% following the intervention. This demonstrates that the intervention can help individuals sleep better and experience less stress. Additionally, prior research has shown that massage can improve sleep quality[15].

The results also demonstrated that the intervention and control groups differed significantly from each other. The intervention group reported 79 cases of poor sleep quality, with no positive cases, whereas the control group reported only seven positive cases. Numerous studies have demonstrated that aromatherapy using essential oils, such as peppermint and lavender, can enhance sleep quality, which helps explain this phenomenon [16,17]. According to earlier research by **Chen et al. (2015)**[18]**,** the sleep quality of postpartum women can be enhanced by lavender aromatherapy. The results of this study demonstrated effects comparable to those of earlier studies, in which *citronella oil* and massage techniques were combined.

Aromatherapy, particularly with lavender oil, has been shown to influence cortisol levels and sleep patterns. The administration of lavender aromatherapy can stimulate the olfactory system, activating brain regions that regulate emotional responses and stress [19]. Research indicates that exposure to lavender essential oil can lead to a reduction in cortisol levels, as observed in various studies measuring cortisol levels in saliva and urine [20]. One study highlighted a decrease in salivary cortisol levels of 0.8 µg/dL after inhalation, suggesting a calming effect on the sympathetic nervous system [20]. Furthermore, aromatherapy with lavender has been linked to improved sleep quality by promoting relaxation and reducing anxiety [21].

In contrast to the control group, which had only 13 negative cases for stress levels, the intervention group had 86 negative cases. Before and after the intervention, the results revealed a p-value of 0.003 in the intervention group. This suggests that the intervention groups differed significantly before and after treatment. There was no difference between the control group before and after treatment, as indicated by the control group's p-value of 0.076, which was lower than that of the intervention group. It is well known that there is a higher chance of stress and depression during the postpartum phase [22]. According to earlier studies, using specific essential oil types can lessen anxiety and depression [23,24]. According to earlier studies, lavender oil used as aromatherapy can help haemodialysis patients feel less uncomfortable and improve their overall wellbeing[24].

By lowering stress, sleep quality was improved in the intervention group. This result implies a connection between the two elements. Tress reduction has been linked to better sleep quality, according to earlier research[25]. Postpartum women's physical and mental health benefit of this positive cycle. Health professionals can use the success of the intervention as a guide when creating comparable programs to enhance sleep quality in postpartum mothers.

Interestingly, in contrast to the intervention group, the control group showed a significantly higher number of positive cases, including stress reduction and improved sleep quality. This serves as the foundation for supporting the idea that massage and *citronella oil* can help postpartum mothers sleep better and feel less stressed. This is corroborated by research by Park et al. [26] which shows aromatherapy massage greatly enhances sleep quality and lessens fatigue.

According to the results, the average sleep quality in the intervention group was 24.50, with a p-value = 0.001. In contrast to the control group, which had an average of only 36.50, this indicates that the treatment had a significantly positive effect on sleep quality. As with the stress level variable, the control group's average was 35.53, while the intervention group's average was 25.47 with a p-value of 0.011.

These results are consistent with those of earlier studies, which have demonstrated that the use of essential oils can dramatically lower stress levels and enhance sleep quality. This was evident in a study by Karadağ et al.. The results demonstrated that aromatherapy had a positive impact on patients' anxiety levels and sleep quality, which is consistent with the information gathered in this study [27].

When used in conjunction with massage, essential oils can influence biological processes associated with emotions and stress. The nervous system can be influenced by essential oils, which help lower the stress-related hormone cortisol [28]. This is further supported by Yang et al.'s research, which shows that inhaling lavender oil can reduce stress and enhance sleep quality by regulating the body's hormonal system. 17

In particular, both factors underscore the potential of aromatherapy as a non-invasive approach to enhance mental and physical well-being. According to the study's observations, the intervention's impact aligns with findings from related research, indicating that aromatherapy can provide emotional solace, as evidenced by improved sleep and reduced stress. For instance, Lee et al.'s study demonstrated that aromatherapy can help patients undergoing medical procedures sleep better and experience less pain, suggesting that aromatherapy and relaxation have a significant combined effect [30].

The use of aromatherapy and massage as interventions for postpartum women demonstrates potential long-term benefits in enhancing maternal well-being and reducing psychological distress. Aromatherapy has shown efficacy in decreasing postpartum depression (PPD) symptoms through trials that reported lower Edinburgh Postnatal Depression Scale (EPDS) scores in women receiving aromatherapy compared to control groups [31,32]. Additionally, routines incorporating aromatherapy along with oxytocin massage have been linked to increased breast milk production and improved emotional states among postpartum mothers [33,34].

Cultural perceptions significantly influence the acceptance and effectiveness of aromatherapy and massage therapy across diverse populations. The historical development of these practices varies, as evident in the differences between countries. For instance, the development of aromatherapy in Poland has been less pronounced compared to Western nations, where such modalities are more ingrained in health practices [35]. Positive attitudes toward these therapies, shaped by cultural beliefs and personal experiences, can either enhance or hinder their perceived efficacy [36]. Furthermore, individuals' socio-cultural backgrounds, including their spirituality and religious inclinations, influence their openness to complementary and alternative medicine (CAM) practices, which can lead to varying levels of acceptance among groups [37]. Such insights underscore the importance of culturally sensitive approaches in implementing aromatherapy and massage within public health strategies.

Our study is critical because it may offer medical professionals new approaches to enhancing the general health of new mothers. Additionally, these favourable results may inspire further studies on the integration of massage and aromatherapy in maternal care procedures. We hope that your readers will find this article interesting, as we believe it offers essential perspectives on maternal health and the use of complementary therapies. We hope for a positive review and look forward to hearing from you.

CONCLUSION

Postpartum mothers who received interventions that combined back massage with citronella oil reported significantly improved sleep and lower stress levels. Overall, it can be concluded that the intervention was suitable for treating sleep issues, although the analysis revealed that the intervention group had lower quality sleep. The control group, on the other hand, did not address stress levels but demonstrated improved sleep quality. The results indicated that the intervention had a significant impact on both measured variables. The effectiveness of this approach in providing postpartum emotional and physical support, which can impact overall well-being, was demonstrated by the intervention group's notable reduction in stress levels. These results suggest that to promote the health and recovery of postpartum mothers, clinical practice should consider complementary approaches, such as those employed in this study. In this regard, back massage and the application of *citronella oil* can be regarded as potentially beneficial methods for enhancing the mental health and quality of life of new mothers. Further investigation is required to examine the variations in individual responses and confirm the long-term efficacy of these interventions.

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AUTHOR CONTRIBUTION

Heyrani H: Conception, Interpretation, Analysis, Drafting, Revising, Final approval
Asi M: Interpretation, Drafting, Revising, Final approval
Elyasari E: Interpretation, Drafting, Revising, Final approval
Astuti M: Revising, Final Approval
Arsulfa A: Revising, Final Approval
Resyana H: Revising, Final Approval

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