

## Prenatal massage in pregnant women in the third trimester to improve maternal sleep quality: quasi-experimental study

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### ABSTRACT

The third trimester of pregnancy is marked by significant physiological and psychological changes that often lead to sleep disturbances and adversely affect maternal and fetal well-being. This study explored the potential of prenatal massage as a non-pharmacological intervention to improve sleep quality among expectant mothers during this critical period. This Framework employed a quasi-experimental design utilizing a pretest-posttest control group to investigate the effects of prenatal massage on third-trimester pregnant women in Bima City, conducted from July 2024 to January 2025. A total of 448 participants were selected through cluster sampling and divided equally into an intervention group receiving prenatal massage and a control group following routine health service programs. Data collection involved skilled midwives administering a validated questionnaire, consisting of 10 questions with high content validity ( $i\text{-CVI} > 0.83$ ) and reliability (Cronbach's  $\alpha = 0.82$ ). The Wilcoxon signed-rank test was used for within-group comparisons and the Mann-Whitney test was used for between-group differences. Results indicated a significant improvement in sleep quality within the intervention group, where 96.4% reported good sleep quality post-intervention compared to only 7.1% pre-intervention. In contrast, the control group showed minimal changes, with only 5.4% reporting good sleep quality after the same period. Statistical analyses showed P values (0.000 and 0.002 respectively), confirming the significant effectiveness of the intervention. These findings suggest that integrating prenatal massage with prenatal care can enhance the well-being of pregnant women. Overall, this study underscores the importance of addressing sleep quality in prenatal care.

### Keywords:

prenatal massage, pregnant women, third trimester, maternal, sleep quality

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## INTRODUCTION

The third trimester of pregnancy is a critical period characterized by significant physiological and psychological changes that can adversely affect sleep quality in expectant mothers.<sup>1</sup> Sleep disturbances during the third trimester are common and can lead to a range of negative health outcomes, including increased stress and anxiety.<sup>2</sup> As such, there is growing interest in exploring non-pharmacological interventions that can improve sleep quality among pregnant women, particularly those in their third trimester. One such intervention is prenatal massage, which has been shown to offer various benefits, including relaxation, reduced muscle tension, and improved circulation, all of which may contribute to better sleep quality.<sup>3,4</sup>

The physical and emotional stressors experienced by pregnant women can lead to sleep disturbances, making it essential to address these issues through holistic approaches like massage therapy.<sup>5</sup> Massage can promote relaxation by stimulating the parasympathetic nervous system, thereby reducing cortisol levels and enhancing the overall sense of well-being.<sup>6</sup> Furthermore, prenatal massage has been associated with increased levels of oxytocin, a hormone that plays a vital role in fostering maternal bonding and relaxation, which can further improve sleep quality.<sup>3</sup>

Pregnant women often experience significant physical and emotional stressors that can lead to sleep disturbances, necessitating holistic interventions such as massage therapy. Research indicates that massage therapy can activate the parasympathetic nervous system, which reduces cortisol levels and enhances relaxation, thereby potentially improving sleep quality.<sup>7</sup> Furthermore, studies have shown that prenatal massage is associated

with increased oxytocin levels, a hormone crucial for maternal bonding and relaxation, which can further alleviate sleep disturbances.<sup>8</sup>

The effectiveness of prenatal massage in improving sleep quality has been supported by several studies. Additionally, the combination of massage with other interventions, such as prenatal yoga, has shown promising results in enhancing sleep quality and reducing anxiety levels among pregnant women.<sup>9</sup> This suggests that integrating massage therapy into prenatal care could serve as a valuable adjunct to the traditional methods of managing sleep disturbances during pregnancy.

Moreover, the physiological benefits of massage extend beyond relaxation. Massage therapy has been shown to improve blood circulation, reduce muscle tension, and enhance lymphatic drainage, which can alleviate discomfort and promote better sleep.<sup>4</sup> The gentle manipulation of soft tissues during massage can also stimulate the release of endorphins, which are natural pain relievers and mood enhancers, contributing to an overall sense of relaxation and well-being.<sup>4</sup> This is particularly relevant for pregnant women who often experience increased levels of discomfort and anxiety as they approach labor.

The third trimester of pregnancy is a pivotal period marked by significant physiological and psychological changes that can adversely affect sleep quality in expectant mothers. Research indicates that sleep disturbances during this time are prevalent, with rates ranging from 66% to 97%.<sup>10</sup> These disturbances can lead to increased stress and anxiety, which further exacerbate sleep issues.<sup>11</sup> Non-pharmacological interventions, such as prenatal massage, have emerged as promising strategies to improve sleep quality. Prenatal massage can facilitate

relaxation, reduce muscle tension, and enhance circulation, potentially leading to better sleep outcomes.<sup>12</sup> Moreover, massage therapy has been shown to stimulate the parasympathetic nervous system, thereby lowering cortisol levels and promoting a sense of well-being.<sup>13</sup> It is also associated with increased oxytocin levels, which can enhance maternal bonding and relaxation, further contributing to improved sleep quality.<sup>14</sup> However, there remains a notable gap in focused research examining the specific impact of prenatal massage on sleep quality in the third trimester, as most studies have concentrated on broader aspects of maternal well-being without isolating sleep quality as a primary outcome.<sup>15</sup> This highlights the need for targeted investigations into the efficacy of massage therapy as a holistic intervention for sleep disturbances in pregnant women.

While existing studies have explored the general benefits of massage therapy during pregnancy, there is a lack of focused research examining the impact of prenatal massage on sleep quality, specifically during the third trimester. Most studies have either concentrated on the physiological benefits of massage, such as pain relief and improved circulation, or have addressed broader aspects of maternal well-being without isolating sleep quality as a primary outcome.<sup>4,16</sup> Furthermore, many studies have employed varied methodologies and populations, making it challenging to draw definitive conclusions about the effectiveness of massage interventions for enhancing sleep quality in this specific demographic group.

This study explored the potential of prenatal massage as a non-pharmacological intervention to improve sleep quality among expectant mothers during this critical period. The analysis of prenatal massage in pregnant women during the third trimester to improve maternal sleep quality presents a novel approach to addressing common sleep disturbances

associated with pregnancy. This intervention is particularly relevant, as sleep issues can exacerbate maternal stress and negatively impact fetal development. The novelty lies in the targeted application of massage therapy, which has been underexplored in the context of sleep enhancement in this population.

## **METHODS**

### ***Design***

This is an experimental study using a quasi-experimental design that uses a pretest–posttest control group design. The experimental group was given treatment, while the control group was not, and both groups were given a pre-test and a post-test. This study was conducted in Bima City from July 2024 to January 2025.

### ***Sampling***

The sample in this study consisted of pregnant women in the third trimester in Bima City, in accordance with the research criteria. The number of samples used in this study was calculated using the sample size formula of Slovin.<sup>17</sup> The total sample in this study was 448, with a division of  $n_1 = 224$  respondents and  $n_2 = 224$  respondents. The cluster sampling technique was used in this study.

Researchers prefer cluster sampling over simple random sampling due to several practical and statistical advantages. Cluster sampling is particularly beneficial when the population is widely dispersed, as it reduces travel costs and time by allowing researchers to collect data from specific groups or clusters rather than individuals scattered across a large area.<sup>18</sup> This method can also enhance the feasibility of data collection in settings where individual sampling is logistically challenging, such as in rural or remote areas. Moreover, cluster sampling can improve the efficiency of the study by allowing researchers to control for intra-cluster correlation, which can lead to more accurate estimates of population parameters. The design effect,

which accounts for the increased variance due to clustering, is typically higher in cluster sampling, making it a preferred choice when dealing with correlated data.<sup>19</sup> Additionally, cluster sampling can facilitate the inclusion of larger sample sizes within clusters, thus enhancing the statistical power of the study.

### ***Research Sample Criteria***

The inclusion criteria were as follows: 1) pregnant women in their third trimester (28-40 weeks of gestation), 2) mothers who were willing to participate in prenatal massage sessions, 3) mothers who did not have medical conditions that prevented massage, such as severe hypertension or other pregnancy complications. Exclusion criteria were as follows: 1) mothers who were undergoing medical therapy that could affect the results of the massage and 2) mothers who could not communicate well or did not understand the instructions given. These criteria are important to ensure that the sample is representative and that the results of the study are reliable.

### ***Collecting data***

The participants were divided into two groups: an intervention group and a control group. The intervention group received a routine program and prenatal massage for 4 weeks for 20 min/day. The intervention program consisted of a structured routine combined with prenatal massage. The Routine program included educational sessions focused on prenatal care for pregnant women. Participants were encouraged to engage in light physical activity daily. The Prenatal Massage program involved daily 20-minute sessions, provided by a certified midwives in prenatal techniques. Techniques used included gentle stroking, massage, and acupressure, avoiding contraindicated areas. To ensure that the sample was fully involved in the

program intervention for 4 weeks, the researcher first asked the sample's willingness to remain in the research area for the specified time. This was explained when providing informed consent. The control group followed a routine health service facility program. The routine program of the health service facility includes light exercise once a week and breathing technique training three times a week. After the intervention, a questionnaire was administered. The samples were obtained from skilled certified midwives. As many as 45 skilled and certified midwives, who were assigned and responsible for 9-10 samples in the research area, were used in the implementation of this study.

### ***Questionnaire Validity***

The questionnaire topic was maternal sleep quality. The validity of the questionnaire was determined through several important steps, involving psychometric analysis. First, to ensure that the questionnaire has content validity, it was assessed by experts in the field of obstetrics and maternal health<sup>20</sup>.

Based on the calculation results of the item-level content validity index (i-CVI), questions 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 met the minimum threshold of 0.83. Thus, it can be concluded that the question items are feasible or relevant. The ten questions in the questionnaire have i-CVI values that fall within the range of 0.80 <Mean I-CVI< 1.00, which means that the question item is stated to have very high or very good validity.

The questionnaire also showed good reliability, as measured using the Cronbach's alpha coefficient with a value of 0.82, where a value above 0.7 is considered adequate.<sup>21</sup> In this context, studies examining the effectiveness of prenatal massage techniques suggest that the questionnaires used to measure maternal

sleep quality must be valid and reliable to obtain accurate results. A total score of 5 or greater is indicative of poor sleep quality. If you scored 5 or more it is suggested that you discuss your sleep habits with a healthcare provider.

### Research Protocol

The initial step for the researchers is to register their study online at <https://simlitabkes.kemkes.go.id/Login.aspx> with the Indonesian Ministry of Health, which was then given the ministry's approval under number 5012.DDC.001.421138.

### Data analysis

The data were collected directly. The researcher conducted a univariate analysis to describe the research data, which included demographic data (age, parity, occupation, and education). The results of the numerical data analysis are presented in tables. Bivariate data obtained were entered into a questionnaire. The collected data were then processed, the statistical analysis

of the results of the answers to the observations was scored, and then a comparison of the values between the pre and post of each group was carried out using the Wilcoxon Signed Rank Test. The Mann-Whitney U test was used to compare the differences between the two groups. The Kruskal–Wallis test was used to test the sample homogeneity.

## RESULTS

Table 1 shows the frequency distribution of respondent characteristics, divided into two groups: intervention and control. The intervention group had the highest proportion of respondents aged 26–35 years, while the control group had the highest proportion. The intervention group had more primiparas, unemployed individuals, and those with a senior high school education. Both groups had similar characteristics, indicating their validity in the study.

**Table 1.** Frequency Distribution of Respondent Characteristics

Characteristics	Intervention Group		Control Group		Homogeneity
	n	%	n	%	
<b>Age</b>					
19-25	44	19.6	16	7	0.831
26-35	124	55.4	108	48.2	
>35	56	25	100	44.6	
<b>Parity</b>					
Primipara	108	48.2	32	14.3	0.729
Multipara	116	51.8	192	85.7	
<b>Occupation</b>					
Employed	68	30.4	60	26.8	0.887
Unemployed	156	69.6	164	73.2	
<b>Level of education</b>					
Elementary School	0	0	8	3.6	0.816
Junior High School	4	1.8	24	10.7	
Senior High School	172	76.8	156	69.6	
Bachelor	48	21.4	36	16.1	
Levene test					

Table 2 presents data on the sleep quality of pregnant women in the third trimester, who were divided into two groups: the intervention group and the control group. In the pre-test measurement, it was observed that out of 224 respondents in the intervention group, 16 (7.1%) had good sleep quality, while 208 (92.9%) had poor sleep quality. Of the 224 respondents in the control group, 24 (10.7%) had good sleep quality and 200 (89.3%) experienced poor sleep quality. After the intervention, the results showed significant

improvements in the intervention group, where 216 (96.4%) respondents reported good sleep quality, while only 8 (3.6%) experienced poor sleep quality. In contrast, the control group showed less encouraging results, with only 12 (5.4%) experiencing good sleep quality and 212 (94.6%) experiencing poor sleep quality. These findings indicate that the intervention applied to the intervention group was successful in improving the sleep quality of the pregnant women compared to the control group.

**Table 2.** Sleep quality of pregnant women in the third trimester

Sleep Quality	Intervention Group		Control Group	
	N	%	N	%
<b>Pre-test</b>				
Good	16	7.1	24	10.7
Poor	208	92.9	200	89.3
<b>Post-test</b>				
Good	216	96.4	12	5.4
Poor	8	3.6	212	94.6

Table 3 presents a comparison of the sleep quality of pregnant women in the third trimester before and after prenatal massage management, which was divided into two groups: intervention and control. The intervention group showed a better mean value of sleep quality after management (Post: 1.04) than before management (Pre: 1.93), with a significant P Value (\*P value = 0.000), indicating that there was a statistically significant difference. The Wilcoxon test, which was appropriate for paired data, was used for this analysis. In contrast, the control group showed little change in sleep quality (Pre: 1.89, Post: 1.95), with an insignificant P Value (\*P Value = 0.180), indicating that there was no significant difference before and after the measurement. The Mann-Whitney test showed a significant difference between the two groups (\*\*P = 0.002). Overall, these results indicate that prenatal massage management can improve sleep quality in pregnant women in their third trimester.

**Table 3.** Differences in mothers' sleep quality during the Third Trimester of Pregnancy before and after Prenatal Massage Management within groups and between the two groups

Group		n	Mean	Std. Deviation	Z	P Value	P Value
<b>Intervention</b>	Pre	224	1.93	260	7,071	0.000*	0.002**
	Post		1.04	187			
<b>Control</b>	Pre	224	1.89	312	1,342	0.180*	
	Post		1.95	227			

\* Wilcoxon test

\*\* Mann Whitney test

## DISCUSSION

Table 1 presents the frequency distribution of respondent characteristics in a quasi-experimental study on prenatal massage in pregnant women in the third trimester to improve maternal sleep quality. In terms of age, the intervention group was dominated by respondents aged 26-35 years (55.4%), while the control group also showed the highest proportion in this age range (48.2%). In terms of parity, the intervention group had a higher proportion of primiparas (48.2%) than the control group (14.3%). In addition, the intervention group also showed more unemployed individuals (69.6%) than the control group (73.2%). Education level showed that most respondents in both groups had a high school education, with 76.8% in the intervention group and 69.6% in the control group. The homogeneity value (p) indicated that there was no significant difference in characteristics between the two groups, ensuring the validity of the results of this study to measure the effects of the intervention.

Based on the data presented in Table 2, there was a significant difference in the sleep quality between the intervention and control groups. In the pre-test measurement, only 7.1% of the 224 respondents in the intervention group reported good sleep quality, whereas 10.7% of the control group reported good sleep quality. However, after the intervention, the results showed a dramatic improvement in the intervention group, where 96.4% of respondents reported good sleep quality, while only 5.4% of the control group experienced the same. These findings indicate that the intervention applied to the intervention group succeeded in significantly improving the sleep quality of the pregnant women compared to the control group.

A study by Zhang et al. revealed that risk factors for poor sleep quality increased in the third trimester, where pregnant women experienced more sleep disturbances such as insomnia and difficulty sleeping related to physical and hormonal changes.<sup>22</sup> Additionally, Peiris and Sundarapperuma noted that pregnant women in the third trimester had longer sleep times and poorer sleep quality compared to previous trimesters, which contributed to increased levels of anxiety and stress.<sup>23</sup>

The interventions conducted in the intervention group may include education on sleep hygiene, relaxation techniques, and regular physical activity. This research is consistent with research conducted by Turkmen et al., which showed that educational programs on sleep hygiene can have a positive impact on the quality of sleep of pregnant women.<sup>24</sup> Another study by Wang et al. also showed that increasing physical activity, such as yoga, can help reduce insomnia symptoms and improve sleep quality in pregnant women.<sup>25</sup> This is in line with findings from Song et al. which showed that increased physical activity was significantly associated with improved sleep quality among pregnant women.<sup>26</sup>

Good sleep quality during pregnancy is important because it can affect the mental and physical health of the mother and the development of the fetus. Research by Hajipour et al. showed that poor sleep during pregnancy can contribute to undesirable pregnancy outcomes, including postpartum depression and other health problems.<sup>27</sup> In addition, Yang et al. emphasized that poor sleep quality during pregnancy can affect the mother's emotional health, which in turn can affect the child's development.<sup>28</sup> Therefore, it is important to consider the factors that affect sleep quality in pregnant women. A study by Ertmann Et al. showed that physical discomfort, such as back pain and leg

cramps, as well as psychological factors such as anxiety and depression, can contribute to sleep disturbances during pregnancy.<sup>29</sup> Therefore, holistic interventions that include physical and psychological aspects are required to improve sleep quality in pregnant women. Good sleep quality is important not only for maternal health, but also for fetal development. Research by Tang et al. showed that poor sleep quality during pregnancy may be associated with an increased risk of pregnancy complications and developmental problems in children.<sup>30</sup> Therefore, efforts to improve sleep quality in pregnant women should be a priority in prenatal care.

The physiological changes that occur during pregnancy can significantly impact sleep quality. Factors such as increased levels of progesterone, nausea, and frequent urination can disrupt sleep patterns, particularly in the first and second trimesters<sup>27</sup>. Additionally, as pregnancy progresses, physical discomfort and anxiety can further exacerbate sleep disturbances, leading to a cycle of poor sleep and increased stress.<sup>31</sup> It has been reported that nearly 75% of pregnant women experience sleep disturbances by the third trimester, highlighting the prevalence of this issue.<sup>32</sup>

Based on the data presented in Table 3, the intervention group experienced a significant improvement in sleep quality, with the mean value of sleep quality after treatment being much better than that before treatment. The Wilcoxon test used in this analysis showed a highly significant P Value (\*P = 0.000), indicating that there was a statistically significant difference between the two measurements. Previous studies have also shown that relaxation techniques, such as progressive muscle relaxation, can help reduce muscle tension and improve sleep quality in pregnant women.<sup>33</sup> In contrast, the control group showed little change in sleep quality, with

the mean values before and after treatment showing no significant difference. The P-value obtained (\*P Value = 0.180) indicates that there was no significant difference between the two measurements in this group. This is in line with research showing that without appropriate intervention, the sleep quality of pregnant women tends not to change significantly.<sup>34</sup> The Mann Whitney test also showed a significant difference between the two groups, with a P value (\*\*P Value = 0.002), which confirmed that prenatal massage management had a real positive effect on the quality of sleep of pregnant women.

Good quality sleep is very important for pregnant women, especially in the third trimester when many physical and emotional changes occur. Poor quality sleep can contribute to health problems such as depression and anxiety, which can affect the health of both mother and fetus.<sup>35</sup> Therefore, interventions such as prenatal massage which have been shown to be effective in improving sleep quality may be a useful strategy to improve the well-being of pregnant women.

Therefore, it is important to consider other factors that may affect sleep quality in pregnant women. For example, the mother's age, stress levels, and previous health conditions may contribute to the quality of sleep experienced<sup>36-38</sup>. Other relaxation techniques, such as aromatherapy and hydrotherapy, may provide additional benefits in improving sleep quality.<sup>39</sup> Therefore, a holistic approach that combines various relaxation techniques may be more effective in improving sleep quality in pregnant women. In addition, it is important to note that the results obtained from the intervention group not only showed improvements in sleep quality, but may also contribute to reducing the pain and discomfort often experienced by pregnant women in the third trimester. A previous



study has shown that massage can help reduce muscle tension and improve blood circulation, which in turn can improve sleep quality.<sup>40</sup> Thus, prenatal massage management is not only beneficial for sleep quality but also for the overall physical and mental health of pregnant women.

Overall, the results of this study indicate that prenatal massage management can significantly improve sleep quality in pregnant women in the third trimester. Considering the importance of sleep quality in maternal and fetal health, this intervention can be an integral part of comprehensive prenatal care. Further research is needed to explore the mechanisms underlying these positive effects and to determine whether a combination of other relaxation techniques may provide additional benefits in improving sleep quality in pregnant women.

## CONCLUSION

Prenatal massage management significantly improved sleep quality in pregnant women in their third trimester. The data obtained showed a clear difference between the intervention and control groups; the intervention group experienced a dramatic increase in the proportion of respondents reporting good sleep quality after the intervention. Statistical analysis, including the Wilcoxon and Mann-Whitney tests, supported these findings with significant P values, confirming the effectiveness of the intervention. In addition, the importance of sleep quality for maternal and fetal health has been emphasized, as poor sleep quality can contribute to health problems such as depression and anxiety. Therefore, the integration of relaxation techniques, such as prenatal massage, into prenatal care may be a useful strategy to improve the well-being of pregnant women. Further research is needed to explore the mechanisms underlying these positive effects and the

potential combinations of other relaxation techniques.

## AUTHOR CONTRIBUTIONS

SS, KK, WMA, IF, and AB designed the study, analyzed the data, served as lead authors, and revised the manuscript. SS, KK, WMA, IF, and AB assisted with data analysis and wrote the first draft of the manuscript. SS, KK, WMA, IF, and AB also designed and supervised the study, contributed to the local implementation of the study, assisted with data analysis and interpretation, and made substantive revisions to the manuscript. All authors read and approved the final version of the manuscript.

## ETHICAL CONSIDERATION

In conducting the study approved by the Ethics Commission of Poltekkes Kemenkes Mataram with number: DP.04.03/F.XLVIII.14/446/2024, approved on July 10, 2024

## CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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