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Original Article

The Effect of Walking as A Physical Activity on Sleep Quality in The Third Trimester of Pregnancy

Peti Apriliani, Noviyati Rahardjo Putri, Rufidah Maulina, Revi Gama Hatta Novika, Siti Nurhidayati

Midwifery Study Program, Faculty of Medicine
Sebelas Maret University Surakarta, Central Java Indonesia

Abstract

Background : Sleep disorders are common in pregnant women during the third trimester, with frequent urination being a prevalent issue due to weakened bladder muscles, leading to deteriorated sleep quality. Physical activity, such as walking, is recommended as an easy, effective, and economical way to improve sleep quality in pregnant women.
Aims : To analyze the effect of walking on sleep quality in third-trimester pregnant women at Kebakkramat I Karanganyar Health Center, Central Java.
Methods : This study used a Quasi-Experimental design with a Pretest-Posttest Control Group approach. The sample consisted of 80 third-trimester pregnant women, selected using Multistage Sampling. The Pittsburgh Sleep Quality Index (PSQI) questionnaire was used to measure sleep quality. The intervention involved walking for 20 minutes over two weeks.
Results : The analysis used the Delta score mean test between the pre-tests and post-tests for each respondent to show a significant effect of walking on sleep quality. A negative delta value shows a decrease in the PSQI score, indicating improved sleep quality for the respondent, and vice versa. The intervention group had a lower delta score mean of -3.13 compared to the control group, indicating that walking effectively improves sleep quality.
Conclusion : Walking has significant potential to improve sleep quality in third-trimester pregnant women. Pregnant women are encouraged to walk regularly and increase their knowledge about pregnancy.

Keywords : Pregnant women; sleep quality; physical activity; walking.

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Author's affiliation:
Midwifery Study Program, Faculty of Medicine
Sebelas Maret University Surakarta,
Central Java Indonesia

Author's correspondence:
Peti Apriliani
Ir. Sutami 36 Kentingan, Jebres,
Surakarta, Central Java, 57126,
Indonesia

E-mail:
petiapriliani2@gmail.com
novirahardjo@staff.uns.ac.id

INTRODUCTION

Physical changes during the third trimester of pregnancy can lead to discomfort, including sleep disturbances, which significantly affect sleep quality in pregnant women. A study found that 88% of African-American pregnant women experienced poor sleep quality during this stage.[1] Similarly, research indicates that in Poland, the prevalence of sleep disturbances among pregnant women is estimated at 25–40%, with overall rates of sleep disturbances ranging from 84.2% to 90.5%.[2] The prevalence of sleep disturbances among pregnant women in Asia is reported to be 41.8%.[3] Data from the Basic Health Research showed that sleep disturbances in pregnant women in Indonesia reached 64%, with 65% of pregnant women in Indonesia experiencing sleep apnea.[4]

Sleep disturbances in pregnant women can be caused by various factors, such as shortness of breath, increased fetal weight, cramps during sleep, fetal movements, frequent waking to urinate, feeling too hot or cold, and back pain. The increase in progesterone hormone, which has a muscle-relaxing effect on the bladder, can also cause pregnant women to urinate frequently, ultimately negatively impacting their sleep quality.[5] Inadequate sleep in pregnant women can negatively impact both the mother and the fetus, including an increased risk of depression, preterm birth, low birth weight, increased pain during labor, and a higher potential for cesarean delivery.[1] Insufficient sleep duration in pregnant women can also result in declining health conditions, such as decreased concentration, fatigue, muscle pain, mood changes, and a tendency to become emotional.[1]

Adequate sleep is crucial for pregnant women to stay fit and healthy, enabling them to carry out daily activities, and ensuring the healthy growth of the fetus. Therefore, pregnant women need to ensure that they get enough sleep. It is recommended to sleep for 7–8 hours per day to keep the body relaxed, fit, and healthy.[6] Sleep disturbances are most common during the third trimester of pregnancy.[7] According to research, the prevalence of poor sleep quality in third-trimester pregnant women is 55.6%.[5] Various literature suggests that non-pharmacological measures recommended to improve sleep quality in pregnant women include physical activities or exercises such as swimming, yoga, pilates, pregnancy massages, relaxation, and walking. Physical activity refers to any bodily movement generated by skeletal muscles that requires energy and effort. Engaging in proper and consistent physical activity is recommended 35 times per week, with a minimum duration of 150 minutes per week.[8]

One of the easiest, most effective, and economical physical activities is walking. For pregnant women, especially in the late trimester, it is recommended to walk three times a week for 15–20 minutes.[9] Pregnant women in their late trimester who routinely walk in the morning can improve their health and that of their fetus. The high oxygen levels in the morning help the brain increase focus, thinking ability, and concentration. The amount of oxygen in the blood affects the release of serotonin in the body, which can improve mood and make them feel happier. The best time to walk is between 05:30–08:00 AM with a distance of about 500 meters.[5]

Walking provides several benefits for pregnant women related to sleep quality, including increasing stamina, reducing fatigue, and providing relaxation to the pelvic and uterine muscles. This activity helps the body become more relaxed, reduces physical tension and stress, and consequently improves sleep depth and overall sleep quality.[4] Regular physical activity during pregnancy, particularly walking, is fundamental component of maternal health that significantly improves clinical outcomes. Evidence suggests that consistent walking effectively regulates blood glucose levels, thereby reducing the risk of gestational diabetes mellitus and ensuring gestational weight gain remains within recommended medical limits.[26,27]

Furthermore, routine exercise enhances cardiovascular fitness and strengthens optimal fetal positioning and potentially shortens the duration of labor.[25] In addition to preparing the body for childbirth, low-impact activities improve systemic blood circulation, which is essential for alleviating common pregnancy related discomforts such as lower back pain and peripheral edema.[28]

Providing health counseling on the recommendation of physical activities such as walking for pregnant women is part of the midwife's authority in antenatal care for normal pregnancies, as stated in the Minister of Health Regulation (Permenkes) No. 1464/Menkes/Per/X/2010 regarding the authority possessed by midwives.

This study highlights the need to further investigate the effects of walking on sleep quality among third-trimester pregnant women, as most previous research has focused on earlier trimesters or other forms of exercise. By using the standardized Pittsburgh Sleep Quality Index (PSQI) to objectively measure outcomes, this study aims to provide stronger scientific evidence that walking is a simple, safe, and effective intervention to enhance sleep quality during late pregnancy.

Based on a preliminary study conducted, 6 out of 8 third-trimester pregnant women who completed the questionnaire had poor sleep quality and reported rarely engaging in daily physical activity. Therefore, further research is needed to determine whether physical activity such as walking can influence the sleep quality of pregnant women experiencing sleep disturbances and whether it can serve as a medical intervention to reduce the negative effects of discomfort during pregnancy.

METHODS

This study is an experimental research with a quasi-experimental design using a pretest-posttest control group design. The population in the study was 104 third-trimester pregnant women who met the inclusion criteria of being in the third trimester, healthy, and not experiencing complications during pregnancy. The exclusion criteria included pregnant women who were engaging in other exercises such as yoga, pilates, swimming, women with pregnancy risks such as premature rupture of membranes, preeclampsia, placenta previa, insomnia, and depression. The sample was selected using a multistage sampling technique, and the sample size was calculated using a categorical unpaired analytical research sample formula,[12] resulting in a sample size of 80 pregnant women based on inclusion and exclusion criteria.

The independent variable in this study is the physical activity of walking, while the dependent variable is the sleep quality of pregnant women. Data collection was carried out using primary data with the PSQI (Pittsburgh Sleep Quality Index) pre-test and post-test questionnaire instruments. After that, the data collection of PSQI questionnaire delta scores between the pre- and post-tests of each patient was calculated. Pregnant women in the intervention group were given a walking procedure eight times over two weeks in the morning between 05:30–08:00 AM for 20 minutes, covering a distance of 1–2 kilometers. The control group did not receive the walking physical activity intervention during the study. During the two weeks, the walking activity was monitored via a WhatsApp group by sending videos and a stopwatch during the walk. On the 14th day, the post-test sleep quality questionnaire was filled out, and the respondents submitted their monitoring sheets to the researchers. Data analysis was carried out by looking at the average Delta score (difference) between the pre-tests and post-tests of each respondent to determine the influence between the independent and dependent variables.

This study involved human participants and therefore required ethical due diligence. Ethical approval was obtained from the Research Ethics Committee of Dr. Moewardi Regional Hospital under number 1.344/V/HREC/2024. Prior to data collection, the researcher explained the ethical principles of the study, and participant participation was voluntary through a consent form after an explanation of the study was provided. Data confidentiality was guaranteed, and only specific group data were reported in the study results.

RESULTS

The main findings indicate that most respondents in both groups were within the productive age range (20–35 years) and had a high level of education (Table 1). The majority were multigravida, with most being unemployed. Physical activity levels were lower in the control group compared to the intervention group, with more respondents in the control group exercising less than three times per week and not accustomed to walking before pregnancy. Most respondents had a normal body mass index (BMI) and a moderate level of sedentary activity. The dominant pregnancy complaints differed between groups, with sleep difficulties more common in the control group and frequent urination reported more often in the intervention group.

TABLE 1
Respondent Characteristics Data

Respondent Characteristics	Control Group		Intervention Group		*P*-value Chi-Square
	N	%	N	%	
Age					0.735
<20 years or >35 years	4	10	6	15	
20–35 years	36	90	34	85	
Education					0.453
Low	13	32.5	9	22.5	
High	27	67.5	31	77.5	
Employment					0.654
Employed	20	50	17	42.5	
Unemployed	20	50	23	57.5	

TABLE 1. *Continued.*

Respondent Characteristics	Control Group		Intervention Group		*P*-value Chi-Square
	N	%	N	%	
Sedentary Lifestyle Level					0.050
Low (<2 hours)	0	0	4	10	
Moderate (2–5 hours)	33	82.5	25	62.5	
High (>5 hours)	7	17.5	11	27.5	
BMI					0.028
Underweight (<18.5)	2	5	8	20	
Normal (18.5–24.9)	29	72.5	21	52.5	
Overweight (25–29.9)	9	22.5	7	17.5	
Obese (>32)	0	0	4	10	
Parity					0.364
Primigravida	14	35	19	47.5	
Multigravida	26	65	21	52.5	
Pregnancy Discomforts During Third Trimester					0.957
Difficulty Sleeping	9	22.5	7	17.5	
Back Pain	7	17.5	6	15	
Frequent Urination	7	17.5	12	30	
Constipation	4	10	1	2.5	
Easily Fatigued	3	7.5	1	2.5	
Leg Cramps	8	20	11	27.5	
Uncomfortable Sleeping Position	2	5	2	5	

Statistical Significance: An alpha (α) level of 0.05 was used to determine statistical significance.

TABLE 2
Respondent Data Normality Test

Variable	Group	Test	Kolmogorov *P*-value
Sleep Quality	Intervention	Pre test	0.200
		Post test	0.000
	Control	Pre test	0.077
		Post test	0.175

Statistical Significance: An alpha (α) level of 0.05 was used to determine statistical significance.

The homogeneity test results, as shown in Table 1, revealed *p*-values >0.05 for variables such as age, occupation, parity, education, sedentary lifestyle level, and third-trimester pregnancy discomfort, indicating no significant differences between the intervention and control groups. This confirms that the characteristics of respondents in both groups were homogeneous.

The normality test results in Table 2 revealed that the post-test data in the intervention group were not normally distributed (p-value < 0.05). However, the pre-test data in the intervention group, as well as both the pre-test and post-test data in the control group, followed a normal distribution. Therefore, the statistical analyses performed included the Wilcoxon test, paired t-test, and

TABLE 3
Wilcoxon Test for Pretest and Posttest in the Intervention Group

Variable	N	*P*-value Wilcoxon
Negative Rank	32	0.000
Positive Rank	6	
Ties	2	
Total	40	

Statistical Significance: An alpha (α) level of 0.05 was used to determine statistical significance.

TABLE 4
Paired T-test for Pretest and Post-test in the Control Group

Sleep Quality Result	N	Mean ± SD	*P*-value T-test
Control Pretest	40	9.43 ± 2.97	0.000
Control Post-test	40	11.55 ± 2.43	

Statistical Significance: An alpha (α) level of 0.05 was used to determine statistical significance.

TABLE 5
Descriptive Analysis on the Effect of Walking on Sleep Quality in Pregnant Women

Group	N	Median Rank	Delta Mean Score± SD
Intervention Post-test	40	-3	-3.13 ± 3.220
Control Post-test	40	2	2.13 ± 1.667

Statistical Significance: The delta mean score is used to determine statistical significance.

the second delta score mean test for both groups.

The sleep quality score analysis using the Wilcoxon test, as presented in Table 3, yielded a *p*-value of 0.000 (<0.05), indicating a statistically significant improvement in sleep quality before and after the walking intervention in the intervention group. Out of 40 respondents in the intervention group, 32 experienced improved sleep quality, attributed to adherence to the walking intervention instructions.

The paired t-test results presented in Table 4 showed a *p*-value of 0.000 (<0.05), indicating a statistically significant difference in sleep quality between the pre-test and post-test in the control group. However, within the control group, there was an average decrease in sleep quality, with an average score reduction of 2.12, as the respondents did not receive the walking intervention.

The comprehensive analysis of sleep quality scores demonstrates that walking is effective in enhancing sleep quality among third-trimester pregnant women. A comprehensive analysis of sleep quality scores indicates that walking is effective in improving sleep quality in pregnant women in their third trimester. The results of the delta score test for the two groups showed a significant difference between the intervention group at -3.13 and the control group at 2.13, indicating that the average delta score in the intervention group was lower than in the control group. The intervention in the experimental group had a positive effect because the PSQI score decreased by an average of 3.125 points (sleep quality improved). The control group actually experienced an increase in the PSQI score of 2.125 points (sleep quality decreased). In addition, the standard deviation of the intervention group was 3.220, indicating a significant difference in effect between respondents. Meanwhile, in the control group, the standard deviation was 1.667, which was smaller, so the changes between respondents were relatively similar.

DISCUSSION

According to the analysis in Table 1, most respondents were between 20–35 years, suggesting they were within a low-risk age range for pregnancy. Regarding education, the majority had a high level of educational attainment,

with 77.5% in the intervention group and 67.5% in the control group. Pregnant women with higher education are more likely to have sufficient knowledge about pregnancy, which can psychologically prepare them for childbirth, ultimately improving sleep quality.[13]

With respect to employment status, most respondents were unemployed, comprising 50% of the control group and 57.5% of the intervention group. Unemployed mothers have more time to exercise compared to working mothers, who often lack time for physical activities such as yoga, morning walks, or swimming.[14] Employment can affect sleep quality due to work-related stress and pressure, which adds to the mental, physical, and time burden for working mothers.[15]

Most respondents also had a moderate sedentary lifestyle. Pregnant women can spend around 4.2±6.5 hours per day being sedentary, with more than a quarter exceeding eight hours per day. This lifestyle is often caused by hormonal changes that make pregnant women feel more tired, mobility difficulties due to weight gain and insufficient awareness regarding the importance of physical activity during pregnancy.[16]

Most respondents had a normal body mass index (BMI). Sleep disorders that affect sleep quality are closely related to an individual's BMI.[17] A significant correlation exists between obesity and sleep quality, with a higher BMI elevating the risk of sleep disorders, including sleep apnea, back pain, leg swelling, and GERD. Obesity can also increase insulin resistance, disrupting metabolism and leading to sleep disturbances (Sari, 2021). Therefore, the higher a person's BMI, the worse their sleep quality.[19]

In terms of parity, the majority of respondents were multigravida, accounting for 65% in the control group and 52.5% in the intervention group. Multigravida parity can affect sleep quality, as mothers who already have children must care for them in addition to themselves, which can lead to fatigue and reduced rest time.[20]

Regarding pregnancy discomfort, many respondents frequently experienced difficulty sleeping, leg cramps, and frequent urination. In the third trimester, 97.3% of pregnant women often wake up 3–11 times each night due to urination and leg cramps, which reduces sleep duration.[21] One of the psychological changes that third-trimester pregnant women experience is sleep difficulty, often due to anxiety and discomfort., and restlessness.[22]

This study shows that walking is effective in maintaining overall health, including improving sleep quality in the intervention group. Walking is an effective physical activity for pregnant women to maintain fitness during pregnancy.[23]

Walking is a suitable and beneficial form of exercise for health, including maintaining fitness, improving sleep quality, controlling blood pressure, reducing weight, managing depression, and preventing cardiovascular disease.[24]

Healthy pregnant women are recommended to engage in moderate-intensity physical activity, such as morning walks, for at least 150 minutes per week, equivalent to walking three times a week for 15–20 minutes.[9] This activity benefits sleep quality and fitness during the later stages of pregnancy. Therefore, the enhancement of sleep quality in the intervention group was due to the consistency of pregnant women in walking in the morning.

In the post-test measurement, pregnant women experienced sleep disturbances caused by discomfort in the later stages of pregnancy, such as leg cramps, difficulty sleeping, and frequent urination. This is consistent with the research showing that 55.6% of third-trimester pregnant women tend to experience a decline in sleep quality.[5] Additionally, common discomforts during pregnancy, such as frequent urination and difficulty sleeping, also contribute to this issue. The growing fetus can press on the mother's bladder, reducing its capacity and causing frequent urination and sleep disturbances.[18]

Physical changes in the third trimester can lead to psychological changes, including difficulty sleeping, which impacts the sleep quality of pregnant women during this trimester.[22] Therefore, the decline in sleep quality in the control group was due to increased sleep disturbances experienced by pregnant women and the lack of physical activity that could help improve their sleep quality.

As pregnancy progresses, various factors can disrupt a mother's sleep. Nearly all pregnant women experience poor sleep quality during the third trimester with a sleep duration of around 5-6 hours.[21] A decline in sleep quality and quantity can weaken the mother's immune system, leading to low birth weight and potential complications.[22]

Good sleep quality is essential during pregnancy to avoid the risk of complications. One solution to poor sleep is regular exercise, such as morning walks. Walking is an easy and inexpensive form of exercise that can increase oxygen levels in the blood, reduce leg swelling, and improve oxygen flow throughout the body.[10]

Additionally, walking can strengthen muscles and improve joint flexibility, preventing leg cramps and back pain.[11]

Walking can also stimulate melatonin production, helping pregnant women sleep more soundly at night. This activity supports a good sleep routine by expending energy and making the body feel healthily tired, thereby improving sleep quality and regularity.[20] Furthermore, walking can lower cortisol levels in the blood and increase endorphins and serotonin, helping women feel more relaxed, calm, and happy, and reducing depression and anxiety.[9]

Walking also helps maintain a healthy weight during pregnancy, reducing the risk of sleep disorders

related to excess weight, and preventing or managing gestational diabetes and hypertension.[10] This study is consistent with the research carried out, which showed that 88.9% of nine respondents who walked experienced improved sleep quality.[5] The study used the McNemar test with a *p*-value of 0.025, demonstrating the effectiveness of walking in enhancing sleep quality in third-trimester pregnant women. That also noted that regular exercise significantly improves sleep quality.[9]

In this study, the average delta score between pre-tests and post-tests for each respondent showed that the average delta score for sleep quality in the intervention group was -3.13, lower than the average delta score of 2.13 in the control group. This indicates that the intervention group experienced improved sleep quality after walking. Therefore, it can be concluded that walking has a positive impact on sleep quality for pregnant women in the third trimester, making it an effective primary option for improving sleep quality.

CONCLUSION

Walking positively influences sleep quality in pregnant women during the third trimester. It is advised that pregnant women adopt walking as a complementary, non-pharmacological approach to address sleep disturbances. Healthcare services should collaborate with healthcare professionals to implement walking as part of antenatal care and enhance continuous education for pregnant women. Future research could investigate other forms of physical activity or exercise to broaden the variety of accessible and affordable options that pregnant women can use to enhance their sleep quality.

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CONFLICT OF INTEREST

The authors declare that there are no financial or non-financial conflicts of interest that could potentially influence the objectivity of this research. This work was conducted independently, and the authors have no competing interests or personal relationships that could have appeared to influence this manuscript.

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