The Effect of Pregnancy Exercises on Sleep Quality among Pregnant Women

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Abstract:
Pregnant women commonly experience sleep disturbances, which may affect maternal well-being. Prenatal exercise is a non-pharmacological intervention that can improve sleep quality by promoting relaxation and reducing physical discomfort. This study aimed to examine the effect of prenatal exercise on sleep quality among pregnant women. A quasi-experimental study with a one-group pre-test and post-test design was conducted from May to August 2024. A total of 33 pregnant women were selected using purposive sampling. Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI) before and after participation in a structured prenatal exercise program conducted regularly. Data were analyzed using a paired sample t-test. The mean PSQI score decreased significantly from 12.39 before the intervention to 5.44 after the intervention, with a p-value of 0.000, indicating a substantial improvement in sleep quality. Prenatal exercise has a significant positive effect on sleep quality in pregnant women. It can be recommended as a safe and effective intervention to be integrated into routine antenatal care services.

INTRODUCTION

Pregnancy is a dynamic physiological state characterized by profound physical, psychological, and hormonal transformations that can significantly impact a woman's overall well-being, particularly her sleep quality (Özkan & Güney, 2025; Rahmawati & Murtaqib, 2024). Sleep quality, defined as an individual's subjective evaluation of sleep duration, latency, continuity, and its impact on daytime functioning, is often compromised during pregnancy (Nelson et al., 2021; Kocasli et al., 2023). As gestation progresses, especially into the second and third trimesters, pregnant women frequently report increased sleep disturbances, including difficulty falling asleep, frequent awakenings, and non-restorative sleep (Wong et al., 2022; Rahayu et al., 2025). These disruptions are commonly attributed to a combination of anatomical changes, such as increased abdominal girth and back pain, as well as biochemical and emotional factors like hormonal surges, nocturia, fetal movements, and heightened anxiety about childbirth and parenting (Üzelpasaci et al., 2024).

In response to these challenges, non-pharmacological interventions have gained attention as safe and practical strategies to support maternal health without posing risks to the developing fetus (Paulino et al., 2022). Among these, prenatal exercise has emerged as a promising approach. Structured, moderate-intensity physical activity tailored for pregnant women, such as walking, swimming, prenatal yoga, and stretching, has been endorsed by major health organizations for its multifaceted benefits (Cilar & Budler, 2022). Beyond enhancing cardiovascular fitness and muscular

strength, regular prenatal exercise is believed to promote psychological relaxation, reduce stress and anxiety, alleviate musculoskeletal discomfort, and regulate circadian rhythms, all of which may contribute to improved sleep architecture and subjective sleep quality (Choong et al., 2022; McCarthy et al., 2023).

Despite growing international evidence supporting the positive association between prenatal exercise and sleep, the contextual applicability of these findings in local primary healthcare settings remains underexplored (Cannon et al., 2023). Many studies have been conducted in high-income or urban clinical environments, which may not reflect the realities of rural or community-based care systems where resources, cultural attitudes, and access to structured exercise programs can differ substantially. This gap in localized evidence limits health practitioners' ability to confidently implement or advocate for prenatal exercise as a standard component of antenatal care to improve sleep outcomes (Pratiwi et al., 2025).

In Indonesia, the integration of prenatal exercise into routine maternal health services has been promoted through community health centers as part of national maternal health programs (Herwansyah et al., 2024). At the Jelbuk Community Health Center in Jember Regency, East Java, prenatal exercise classes are regularly offered to expectant mothers as a component of antenatal care. However, anecdotal reports and preliminary field observations suggest that a notable proportion of participants continue to experience poor sleep quality despite consistent engagement in these programs. This discrepancy raises critical questions about the real-world effectiveness of locally delivered prenatal exercise interventions and underscores the need for empirical investigation within this specific setting (Felder et al., 2022).

Therefore, this study aims to examine the effect of participation in community-based prenatal exercise programs on sleep quality among pregnant women attending the Jelbuk Community Health Center. By generating context-specific evidence, the findings are expected to inform local maternal health policies, refine antenatal care protocols, and support the development of more effective, culturally appropriate strategies to enhance sleep and overall well-being during pregnancy in similar primary healthcare environments (Meneo et al., 2024).

METHOD

This study employed a quasi-experimental design with a one-group pretest and posttest, with no control group. The study was conducted at the Jelbuk Community Health Center in Jember Regency from May to August 2024. A total of 33 pregnant women were recruited using purposive sampling, selected to ensure participants met specific characteristics relevant to the intervention and research objectives. The inclusion criteria were pregnant women in the second or third trimester, able to communicate effectively, willing to participate by signing informed consent, and not experiencing pregnancy-related comorbidities or medical complications. Exclusion criteria included respondents who were unable to complete the intervention or had conditions contraindicated by physical exercise during pregnancy.

The intervention consisted of a structured prenatal exercise program conducted twice per week, with each session lasting approximately 60 minutes over 4 weeks. Each session included warm-up movements, breathing and relaxation exercises, gentle stretching, posture training, and cool-down activities. Trained midwives supervised the exercises to ensure safety and proper technique.

Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI), which had been translated and culturally adapted into Indonesian and demonstrated acceptable validity and reliability in previous studies. The PSQI questionnaire was administered before and after the intervention.

Data analysis was performed using a paired sample t-test to compare mean PSQI scores before and after the intervention. Normality testing using the Shapiro–Wilk test indicated that the data were normally distributed ($p > 0.05$), justifying the use of parametric analysis.

Ethical approval was obtained from the Health Research Ethics Committee of the Faculty of Health Sciences, Institute of Technology, Science and Health, Dr. Soepraoen Hospital. The study adhered to the ethical principles of autonomy, anonymity, beneficence, non-maleficence, and justice by obtaining informed consent, ensuring voluntary participation, protecting participant confidentiality, and employing safe and non-invasive procedures. All participants were selected fairly, and their rights and well-being were prioritized throughout the research process.

RESULT

Univariate Analysis

Univariate analysis was conducted to describe the distribution of respondents' sleep quality before and after the pregnancy exercise intervention using the Pittsburgh Sleep Quality Index (PSQI). Sleep quality was categorized into four levels (good, mild, moderate, and severe) based on PSQI scores. The frequency and percentage of respondents in each category are presented in Table 1 to illustrate changes in sleep quality status following the intervention.

Table 1. Classification of Respondents' Sleep Quality Based on PSQI Scores Before and After Pregnancy Exercise (n = 33)

Sleep Quality	PSQI Score			
	Pre-test		Post-test	
	n	%	n	%
Good	0	0.00	0	0.00
Mild	4	12.12	13	39.39
Moderate	19	57.57	18	54.54
Severe	10	30.30	2	6.06
Total	33	100	33	100

Based on Table 1, prior to the pregnancy exercise intervention, the majority of respondents (57.57%) experienced moderate sleep disturbances, while nearly one-third (30.30%) reported severe sleep problems. Only 12.12% of respondents were classified as having mild sleep disturbances, and none reported good sleep quality.

After participating in pregnancy exercise, participants observed a noticeable improvement in sleep quality. More than half of respondents (54.54%) were classified as having moderate sleep disturbances, while the proportion experiencing severe sleep problems decreased substantially from 30.30% to 6.06%. The number of respondents with mild sleep disturbances increased from 12.12% to 39.39%. However, no respondents achieved good sleep quality either before or after the intervention.

Bivariate Analysis

Table 2. Normality Test of PSQI Scores (Shapiro–Wilk Test)

Measurement	p-value
Pre-test	0.781
Post-test	0.733

The Shapiro–Wilk test showed that both pre-test and post-test PSQI scores were normally distributed (p > 0.05). Therefore, a parametric paired t-test was appropriate to analyze differences in sleep quality before and after the intervention.

Table 3. Effect of Pregnancy Exercise on Sleep Quality Among Pregnant Women (n = 33)

Variable	Pre-test Mean ± SD	Post-test Mean ± SD	Sig. (2-tailed)
Sleep Quality (PSQI)	12.39 ± 2.61	5.44 ± 2.52	0.000

The paired t-test analysis demonstrated a statistically significant reduction in PSQI scores following the pregnancy exercise intervention (p < 0.001). The mean PSQI score decreased from 12.39 ± 2.61 before the intervention to 5.44 ± 2.52 after the intervention, indicating a substantial improvement in sleep quality among pregnant women.

DISCUSSION

This study demonstrated a statistically significant improvement in sleep quality among pregnant women following participation in a prenatal exercise program, as indicated by a reduction in mean PSQI scores from 12.39 before the intervention to 5.44 after the intervention (p < 0.05). These findings support the effectiveness of prenatal exercise as a non-pharmacological intervention to improve sleep quality during pregnancy, particularly in the second and third trimesters.

The results of this study are consistent with previous research, which reported a significant improvement in sleep duration and quality following prenatal exercise (Choong et al., 2022). At the same time, Liu et al. (2025) found that structured prenatal exercise programs incorporating warm-up, breathing, stretching, and relaxation components significantly reduced sleep disturbances in pregnant women. The consistency of these findings suggests that regular, structured prenatal exercise has a meaningful impact on improving maternal sleep quality.

Several physiological and psychological mechanisms may explain this effect. Prenatal exercise promotes muscle relaxation, reduces musculoskeletal discomfort, and improves blood circulation, thereby alleviating common physical complaints such as back pain and leg cramps that interfere with sleep (Ali et al., 2024; Rosidah et al., 2025). Additionally, physical activity stimulates the release of endorphins, reduces anxiety and stress, and supports balance in the autonomic nervous system, thereby facilitating relaxation and more stable sleep patterns (Daniela et al., 2022). Controlled breathing and relaxation exercises also help regulate respiratory rhythm and enhance sleep onset (Kepenek-Varol et al., 2022).

Despite these positive findings, this study has several limitations. The use of a one-group pre-test and post-test design without a control group limits the ability to make causal inferences. The relatively small sample size and single study setting limit generalizability, and the short follow-up duration does not permit an assessment of long-term effects. Therefore, the results should be interpreted with caution.

Nevertheless, the findings highlight the practical value of prenatal exercise as a low-cost, safe, and feasible intervention within primary healthcare settings (Latif et al., 2025). Future studies employing randomized controlled designs, larger samples, and extended follow-up periods are recommended to strengthen the evidence and support broader implementation of prenatal exercise programs to improve sleep quality in pregnant women.

CONCLUSION

This study concludes that prenatal exercise significantly improves sleep quality among pregnant women, thereby achieving the research objective. Integrating structured prenatal exercise programs into routine antenatal care at community health centers is recommended to support maternal well-being and overall health. Midwives play a key role in implementing and promoting this intervention. Future studies should employ controlled designs with larger samples to determine the optimal frequency and duration of prenatal exercise, thereby strengthening the evidence base.

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