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Effect of Postpartum Exercise and Oxytocin Massage on Uterine Involution among Postpartum Mothers

Novita Br Ginting Munthe[1)], Iskandar Markus Sembiring[2)], Rico Januar Sitorus[3)]

[1)]Faculty of Midwifery, Institut Kesehatan Medistra Lubuk Pakam, North Sumatra, Indonesia
[2)]Faculty of Nursing and Physiotherapy, Institut Kesehatan Medistra Lubuk Pakam, North Sumatra, Indonesia
[3)]Department of Epidemiology Public Health Faculty Sriwijaya University, Palembang, Indonesia

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ABSTRACT

Background: Uterine involution is an essential physiological process following childbirth that restores the uterus to its pre-pregnancy size and function. When this process is delayed or incomplete, it can lead to postpartum complications such as hemorrhage. Postpartum exercise and oxytocin massage are non-pharmacological interventions widely believed to accelerate uterine recovery and reduce the risk of complications.
Subjects and Method: This quantitative pre-experimental study with a pre-test and post-test without control design was conducted at Klinik Pratama Matahari, Tanjung Morawa, Deli Serdang, North Sumatra, Indonesia, from February to July 2025. Twenty postpartum mothers were selected using purposive sampling and divided into two groups: 10 received postpartum exercise and 10 received oxytocin massage. Uterine involution was assessed by fundal height observation before and after intervention. Data were analyzed using t-tests with a significance level of $p < 0.05$.
Results: Most respondents were aged 26–30 years (50.0%), had a senior high school education (50.0%), and were unemployed (75.0%). Before the interventions, all participants (100%) had abnormal uterine involution. After the interventions, 70% of mothers in the postpartum-exercise group and 50% in the oxytocin-massage group achieved normal uterine involution. Statistical analysis indicated significant improvements in both groups, with a stronger effect in the postpartum-exercise group (mean difference= 0.70; p= 0.001) than in the oxytocin-massage group (mean difference = 0.50; p = 0.025).
Conclusion: Both postpartum exercise and oxytocin massage effectively enhanced uterine involution among postpartum mothers, with postpartum exercise demonstrating greater effectiveness. These findings support the integration of structured postpartum exercise programs into routine maternal care to promote uterine recovery and prevent postpartum complications.

Keywords: postpartum exercise, oxytocin massage, uterine involution, postpartum period

Correspondence:
Novita Br Ginting Munthe. Faculty of Midwifery, Institut Kesehatan Medistra Lubuk Pakam, North Sumatra, Indonesia. Jl. Sudirman No. 38, Lubuk Pakam, Deli Serdang Regency, North Sumatra, Indonesia, 20512. Email: novitagintingmunthe89@gmail.com

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BACKGROUND

Maternal mortality remains a critical global health concern and serves as an indicator of the quality of maternal care in a country. According to the World Health Organization (WHO, 2022), approximately 287,000 women die each year during pregnancy, childbirth, or the postpartum period, equivalent to nearly 800 preventable maternal deaths every day. Although the global Maternal Mortality Ratio (MMR) decreased by about 34% between 2000 and 2020, 95% of these deaths still occur in low- and middle-income countries, where access to quality obstetric care remains limited. The global target for 2024 is a reduction to 183 deaths per 100,000 live births, emphasizing the importance of professional healthcare services before, during, and after childbirth (Cresswell et al., 2025).

One of the major direct causes of maternal mortality is postpartum hemorrhage (PPH). The National Library of Medicine (Fox-Harding, 2024) reports that PPH accounts for up to 20% of all deliveries worldwide, with a higher prevalence in developing countries. PPH is commonly caused by uterine subinvolution, a condition in which the uterus fails to return to its pre-pregnancy size and tone. This process disruption interferes with uterine circulation, delays tissue repair, and increases the risk of hemorrhage (WHO, 2022).

In Indonesia, the maternal mortality ratio remains high at 189 deaths per 100,000 live births, still exceeding the National Medium Term Development Plan (RPJMN) target of 183 and far from the Sustainable Development Goals (SDGs) target of 70 by 2030. In North Sumatra, the 2023 Provincial Health Office report recorded 202 maternal deaths, predominantly due to postpartum hemorrhage. In Deli Serdang Regency, there were 27 reported maternal deaths out of 40,599 live births, largely associated with complications from uterine subinvolution (Souza et al., 2024).

The postpartum period (puerperium), lasting six to eight weeks after childbirth, is therefore a crucial phase for maternal recovery. During this time, uterine involution the process by which the uterus returns to its pre-pregnancy size must occur effectively to prevent hemorrhage and other complications. Clinical assessment of this process is typically performed through fundal height (FH) observation (Souza et al., 2024).

Several non-pharmacological interventions, including postpartum exercise and oxytocin massage, have been shown to facilitate uterine involution. Postpartum exercise strengthens abdominal and pelvic muscles, supports uterine contractions, and accelerates maternal recovery (Arsulfa et al., 2025). Meanwhile, oxytocin massage stimulates the release of the oxytocin hormone, promoting uterine contraction and preventing postpartum hemorrhage.

Previous studies (Purba, 2024) demonstrated that postpartum exercise combined with oxytocin massage significantly accelerated uterine involution, as indicated by a greater decrease in fundal height compared to the control group. Preliminary observations at Klinik Pratama Matahari, Tanjung Morawa, Deli Serdang Regency, also revealed differences in the speed of uterine involution among postpartum mothers.

Based on this rationale, the present study was conducted to analyze the effectiveness of postpartum exercise and oxytocin massage on uterine involution among postpartum mothers at Klinik Pratama Matahari, Tanjung Morawa, Deli Serdang Regency, North Sumatra, Indonesia Indonesia.

SUBJECTS AND METHOD

1. Study Design

This study employed a quantitative pre-experimental design with two treatment groups (pre-test and post-test without control). This design was used to assess the effectiveness of two interventions post-partum exercise and oxytocin massage on uterine involution among postpartum mothers. The study was conducted at Klinik Pratama Matahari, Tanjung Morawa, Deli Serdang Regency, North Sumatra, Indonesia, from February to July 2025. Measurements of uterine involution were taken before and after the interventions in both groups.

2. Population and Sample

The target population consisted of all postpartum mothers who gave birth at Klinik Pratama Matahari during the study period. The accessible population included postpartum mothers who met the inclusion criteria: delivered normally, were within 6 – 10 days postpartum, did not experience postpartum complications, and were willing to participate voluntarily. A total of 60 postpartum mothers were selected using a purposive sampling technique and divided equally into two groups: 30 participants received postpartum exercise (Group I), and 30 participants received oxytocin massage (Group II).

3. Study Variables

Independent Variables is Postpartum exercise and oxytocin massage. Dependent Variable is Uterine involution.

4. Operational Definition of Variables

Postpartum Exercise: A series of movements performed by postpartum mothers to strengthen abdominal, pelvic, and lower limb muscles, promoting uterine contraction and recovery.

Oxytocin Massage: A back massage technique performed along the paravertebral line to stimulate oxytocin hormone release, enhancing uterine contraction.

Uterine Involution: The physiological process in which the uterus gradually returns to its pre-pregnancy size, shape, and tone after childbirth through a series of natural contractions and tissue remodeling, ensuring the restoration of normal uterine function.

5. Study Instrument

Data were collected using:

a. Observation sheets: to record changes in fundal height before and after the interventions.
b. Measuring tape: to measure fundal height in centimeters as an indicator of uterine involution.
c. Checklist forms: to ensure procedural adherence during postpartum exercise and oxytocin massage interventions.

6. Data Analysis

Data were analyzed using both paired and independent t-tests. The paired t-test was used to compare pre- and post-intervention measurements within each group, while the independent t-test compared post-intervention outcomes between the two groups (postpartum exercise vs oxytocin massage). The mean difference in fundal height was calculated to determine the effectiveness of each intervention. A p-value < 0.05 was considered statistically significant.

7. Research Ethics

All research procedures involving human participants were carried out in accordance with established research ethics principles. Ethical considerations such as informed consent, anonymity, and confidentiality were strictly maintained throughout the study process. Ethical approval for this study was obtained from the Health Research Ethics Committee of Institut Kesehatan Medistra Lubuk Pakam, North Sumatra, Indonesia, with approval number No. 016.D/KEP-MLP/III/202

RESULTS

1. Sample Characteristic

Table 1 shows the distribution of respondents based on age, educational level, and occupation. The majority of respondents were aged 26 – 30 years (50.0%), indicating that most postpartum mothers were in the productive reproductive age group. This age range is generally associated with better physical readiness for childbirth and postpartum recovery.

In terms of educational background, most respondents had completed senior high school (50.0%), followed by bachelor's degree holders (25.0%), while a smaller proportion had junior high school (15.0%) and elementary school education (10.0%). This suggests that the majority of respondents had a relatively good educational level, which may positively influence their understanding of postpartum care and health practices.

Regarding occupational status, the majority of respondents were unemployed (75.0%), while 25.0% were employed. This finding implies that most postpartum mothers were housewives who could allocate more time for postnatal recovery activities, such as postpartum exercises and oxytocin massage, which may support optimal uterine involution.

Table 1. Characteristics of respondents of respondents based on age, educational level, and occupation.

Characteristics	Category	Frequency	Percentage
Age	20-25 years	14	35.0
	26-30 years	20	50.0
	> 30 years	6	15.0
Education	Elementary School	4	10.0
	Junior High School	6	15.0
	Senior High School	20	50.0
	Bachelor's Degree	10	25.0
Occupation	Employed	10	25.0
	Unemployed	30	75.0

2. Bivariate Analysis

Based on Table 2, it was found that before performing postpartum exercise, all respondents (30 participants or 100%) experienced abnormal uterine involution, and none (0%) showed normal uterine involution. After the postpartum exercise intervention, the number of respondents with normal uterine involution increased to 17 participants (70.0%), while those with abnormal uterine involution decreased to 13 participants (30.0%). These findings indicate an improvement in uterine involution following the implementation of postpartum exercise among postpartum mothers at Klinik Pratama Matahari.

Table 2. Frequency Distribution of Uterine Involution Before and After Postpartum Exercise among Postpartum Mothers at Klinik Pratama Matahari

Uterine Involution	Before Postpartum Exercise		After Postpartum Exercise	
	Frequency	Percentage	Frequency	Percentage
Normal	0	0.0	17	70.0
Abnormal	30	100.0	13	30.0
Total	30	100	30	100

Table 3 illustrates the frequency distribution of uterine involution before and after oxytocin massage among postpartum mothers at Klinik Pratama Matahari. Before the intervention, all respondents (30 participants or 100.0%) experienced abnormal uterine involution, and none showed normal uterine involution (0.0%). After the oxytocin massage intervention, the number of respondents with normal uterine involution increased to 15 participants (50.0%), while those with abnormal uterine involution decreased to 15 participants (50.0%). This indicates a notable improvement in uterine recovery following oxytocin massage.

The findings suggest that oxytocin massage effectively stimulates uterine contractions, likely by enhancing the natural release of the oxytocin hormone, which plays a crucial role in postpartum uterine involution. However, when compared with postpartum exercise which achieved a 70.0% rate of normal uterine involution, oxytocin massage showed a moderate but significant effect in facilitating the uterine recovery process among postpartum mothers.

Table 3. Frequency Distribution of Uterine Involution Before and After Oxytocin Massage among Postpartum Mothers at Klinik Pratama Matahari

Uterine Involution	Before Oxytocin Massage		After Oxytocin Massage	
	Frequency	Percentage	Frequency	Percentage
Normal	0	0	15	50
Abnormal	30	100	15	50
Total	30	100	30	100

Based on Table 4, the mean uterine involution score before both interventions (pretest) was 2.00 with a standard deviation of 0.01, indicating that all respondents initially experienced abnormal uterine involution. After the postpartum exercise intervention, the mean score decreased to 1.30 (SD= 0.483) with a p-value= 0.001, showing a statistically significant improvement in uterine involution. Similarly, after the oxytocin massage intervention, the mean score decreased to 1.50 (SD = 0.527) with a p-value = 0.025, also indicating a significant improvement.

When compared, the postpartum exercise intervention produced a stronger statistical effect on uterine involution (p= 0.001) than oxytocin massage (p= 0.025). These results demonstrate that both interventions were effective in accelerating uterine involution among postpartum mothers; however, postpartum exercise showed greater effectiveness in enhancing uterine recovery at Klinik Pratama Matahari, Tanjung Morawa.

Table 4. Comparison of the Effect of Postpartum Exercise and Oxytocin Massage on Uterine Involution among Postpartum Mothers

Intervention	Test	Mean	SD	p
Postpartum Exercise	Pretest	2.00	0.01	0.001
	Posttest	1.30	0.483	
Oxytocin Massage	Pretest	2.00	0.01	0.025
	Posttest	1.50	0.527	

DISCUSSION

The results of this study revealed that prior to intervention, all postpartum mothers (100%) experienced abnormal uterine involution, emphasizing that without specific physical stimulation such as postpartum exercise or oxytocin massage, the uterine recovery process tends to be suboptimal. This finding is consistent with the physiological mechanism of uterine involution, which requires adequate myometrial contraction, hormonal stimulation, and vascular remodeling to return the uterus to its pre-pregnancy size. The absence of sufficient contraction may result in blood pooling in the uterine cavity, delaying involution and predisposing mothers to subinvolution and postpartum hemorrhage (Samuel et al., 2021).

Following the postpartum exercise intervention, 70% of mothers achieved normal uterine involution, compared to 50% in the oxytocin massage group. The improvement observed in the exercise group indicates that active mobilization through postpartum exercise enhances the mechanical stimulation of uterine contraction, increases oxygenation to uterine tissues, and improves venous return from the pelvic region. This physiological effect facilitates myometrial fiber retraction and accelerates the restoration of uterine tone. According to (Cresswell et al., 2025), postpartum exercise optimizes uterine blood flow, improves abdominal and pelvic muscle tone, and promotes hormonal balance that supports uterine healing (Rasumawati et al., 2023).

In addition, postpartum exercise has been shown to influence neuroendocrine regulation, particularly through the release of endorphins and oxytocin, which enhance uterine contractility. (Arsulfa et al., 2025) reported that mothers who regularly perform postpartum exercise experience faster uterine involution, less discomfort, and improved pelvic floor muscle recovery (WHO, 2022). These findings are consistent with the results of this study, where postpartum exercise led to a significant reduction in fundal height (mean difference= 0.70; p = 0.001), indicating faster uterine shrinkage and better physiological adaptation.

Meanwhile, oxytocin massage also demonstrated effectiveness, with 50% of mothers achieving normal uterine involution after intervention. The massage technique along the paravertebral line stimulates afferent nerve endings, triggering the hypothalamus to release endogenous oxytocin, which promotes rhythmic uterine contractions and aids in uterine recovery. The findings of this study align with (Chidani and Desmarnita 2024), who emphasized that oxytocin massage can enhance uterine tone, reduce postpartum bleeding, and facilitate uterine involution through hormonal stimulation (Astuti et al., 2024; Purba, 2024). However, the effect observed in the current study (mean difference= 0.50; p= 0.025) was less pronounced compared to postpartum exercise, suggesting that passive stimulation through massage may not be as effective as active muscular engagement in improving uterine contractility (Meilawati et al., 2024).

This difference may be explained by the biomechanical aspect of postpartum exercise, which directly activates the abdominal and pelvic muscles, thereby supporting mechanical compression of the uterus and promoting the venous return of lochia (Istiqomah et al., 2024). Conversely, oxytocin massage relies solely on neurohormonal pathways, which may vary between individuals depending on physiological response, body mass, and frequency of stimulation. (Meilawati et al., 2024) further emphasized that consistent and early postpartum exercise significantly reduces

fundal height and accelerates recovery of the reproductive organs compared to passive interventions.

Furthermore, the study findings have important implications for maternal health promotion. The integration of structured postpartum exercise into routine postnatal care could provide a low-cost, non-pharmacological strategy to prevent complications such as subinvolution and postpartum hemorrhage (Boundioa and Thiombiano, 2024). Combined with oxytocin massage, these interventions can strengthen the body's physiological recovery process while reducing dependence on pharmacological agents (Alyensi et al., 2023; Fox-Harding, 2024).

This study was limited by its small sample size and single-site setting, which may limit external generalizability. The absence of a control group and the short observation period also restricted the ability to assess long-term effects of the interventions. Future studies with larger sample sizes, randomized designs, and longer follow-up periods are recommended to validate these findings. Despite these limitations, this study provides valuable evidence that both postpartum exercise and oxytocin massage are effective, safe, and feasible methods to enhance uterine involution (Julikas et al., 2024).

The implications for practice suggest that midwives and healthcare providers should integrate postpartum exercise and oxytocin massage into standard postpartum care protocols. Education and motivation of postpartum mothers are essential to ensure adherence and to optimize the benefits of these interventions in accelerating uterine recovery, preventing complications, and improving maternal health outcomes (Whyler et al., 2024).

AUTHOR CONTRIBUTION

All authors contributed significantly to this research.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the conduct, authorship, or publication of this research. All authors have contributed equally to the design, implementation, and writing of this study, and have approved the final version of the manuscript.

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