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Impact of Oxytocin Massage on Lactation in Postpartum Mothers: A Quasi-Experimental Study at Puskesmas Sungai Paduan

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Abstract

The postpartum period is a critical stage in maternal recovery and adaptation, during which successful breastfeeding plays an essential role in ensuring optimal infant growth and maternal health. However, inadequate breast milk production during the early postpartum period remains a major challenge that contributes to the low rate of exclusive breastfeeding. Oxytocin massage has been introduced as a simple, safe, and non-pharmacological intervention to stimulate oxytocin secretion and improve the milk ejection reflex. This study aimed to determine the effect of oxytocin massage on breast milk production among postpartum mothers at the Sungai Paduan Community Health Center (UPTD). A quasi-experimental study with a post-test-only control group design was conducted involving 40 postpartum mothers selected through purposive sampling. Participants were assigned to either an intervention group receiving oxytocin massage or a control group receiving routine postpartum care. Breast milk production was assessed using breastfeeding frequency, breastfeeding duration, expressed milk volume, and infant urination and defecation frequency. Data were analyzed using the Mann-Whitney test. The findings revealed that 85% of mothers in the intervention group experienced smooth breast milk production compared with only 30% in the control group. Statistical analysis demonstrated a significant difference between groups ($p < 0.001$), with a large effect size ($r = 0.61$), indicating the substantial effectiveness of oxytocin massage. In conclusion, oxytocin massage is an effective non-pharmacological intervention for improving breast milk production and should be considered as part of routine postpartum care to support successful exclusive breastfeeding.

INTRODUCTION

In addition to physical adaptation, the postpartum period is also a crucial phase for mothers' psychological adjustment to their new role. Drastic hormonal fluctuations after childbirth, coupled with physical exhaustion and lack of sleep, make mothers susceptible to mood disorders, ranging from mild symptoms like *baby blues* to more severe conditions like postpartum depression. During this period, various significant changes occur in the mother's body, including uterine involution, the expulsion of lochia, and the onset of lactation. One of the most important aspects of the postpartum period is successful breastfeeding, which is highly dependent on the smooth production of breast milk. As the best source of nutrition, breast milk provides immune substances and vital nutrients to support optimal baby growth and development. Unfortunately, the breastfeeding process is often hampered by problems with

milk production in the first days after delivery, which ultimately becomes the biggest factor in the failure of exclusive breastfeeding (Walyani & Purwoastuti, 2022).

Globally, the World Health Organization (WHO) reports that only around 44% of infants under 6 months of age worldwide received exclusive breastfeeding in 2023. Data from the Indonesian Ministry of Health in 2022 recorded the national exclusive breastfeeding achievement at 67.96%, a figure that is still below the 80% target set in the RPJMN. Data from the 2023 West Kalimantan Provincial Health Profile shows that exclusive breastfeeding coverage in the region is still around 60.4%, and in Ketapang Regency, where the Sungai Paduan Community Health Center is located, the figure is even lower, at 56.8%. A preliminary study conducted by researchers at the Sungai Paduan Community Health Center in April 2026 found that of the 30 postpartum mothers visited, 18 (60%) complained of insufficient breast milk production in the first 3 days after delivery, leading some to switch to formula milk.

Failure to achieve exclusive breastfeeding is influenced by factors such as low breast milk production, limited knowledge of breastfeeding techniques, lack of family support, and psychological conditions such as postpartum stress and anxiety, which can inhibit the oxytocin reflex (Astutik, 2022). The hormone oxytocin plays a crucial role in the process of breast milk ejection; when a mother experiences stress, oxytocin secretion is inhibited, so that breast milk cannot flow smoothly even though prolactin production is sufficient. The consequences of not providing exclusive breastfeeding are very serious for the baby's health, including: an increased risk of respiratory tract infections and diarrhea, low immunity, the risk of malnutrition and stunting, and suboptimal cognitive development. Rahayu et al. (2023) stated that not providing exclusive breastfeeding can increase the risk of *stunting* in babies by up to 3.5 times. In addition to impacting the child, suboptimal breastfeeding also endangers the mother's health, especially in increasing susceptibility to breast cancer, ovarian cancer, and postpartum depression.

The breastfeeding process is driven by a neuroendocrine mechanism called *the let-down reflex*, in which prolactin stimulates milk production and oxytocin triggers its release through breast tissue contractions triggered by the baby's sucking (Riordan & Wambach, 2022). The effectiveness of this mechanism can be supported by oxytocin massage therapy along the spine and shoulder blades. This physical stimulation activates the parasympathetic nervous system, increasing the flow of oxytocin and reducing cortisol, thus addressing postpartum stress-induced milk production blockages (Kent et al., 2023).

From a lactation theory perspective, successful breastfeeding is influenced by the interaction of hormonal factors, mechanical stimulation, and the mother's psychological state (Guillén-Morales et al., 2025; Gust et al., 2020; Kraus Jr et al., 2025; Modak et al., 2023). Emotional support and relaxation will increase oxytocin activity, thus optimizing milk production and release. Therefore, oxytocin massage is an intervention with a strong physiological and neuroendocrine basis for optimizing successful breastfeeding in postpartum mothers (Riordan & Wambach, 2022).

Although various studies have reported that oxytocin massage can increase breast milk production in postpartum mothers, the results still show several limitations. Most previous studies used relatively small sample sizes and were conducted in hospitals or maternity clinics, thus not being able to describe the effectiveness of this intervention in primary health care settings such as community health centers. Furthermore, some studies only measured breast milk volume without considering other indicators such as breastfeeding frequency, duration,

and signs of adequate milk supply in infants, making the assessment of breast milk production less comprehensive (Putri & Wahyuningsih, 2022).

Another study conducted by Sari et al. (2023) showed that oxytocin massage increases breast milk production, but did not consider maternal characteristics such as parity and psychological conditions that can affect the milk ejection reflex. On the other hand, the results of a meta-analysis by Dewi and Ambarwati (2023) did show a positive effect of oxytocin massage on breast milk production, but the authors also stated that further research is needed in primary health care facilities with different community characteristics to obtain stronger scientific evidence.

Based on these conditions, a research gap remains regarding the low coverage of exclusive breastfeeding in the Sungai Paduan Community Health Center (UPTD) working area. This underscores the importance of testing the effectiveness of oxytocin massage at the primary care level. Using an empirical approach, this study examines the effect of this intervention on stimulating breast milk production in postpartum mothers. The urgency of this study is to produce an innovative midwifery service that is not only simple and affordable but also practical for independent community implementation.

METHOD

Research Design

The approach used was *a quasi-experimental one* using *a post-test-only control group design*. In its implementation, researchers divided respondents into two groups: a treatment group that received oxytocin massage intervention, and a control group that received only conventional postpartum care. The researchers did not randomize the groups; instead, both groups were selected based on the same inclusion and exclusion criteria, resulting in relatively homogeneous characteristics.

A quasi-experimental design was chosen because the health service conditions at the Sungai Paduan Community Health Center (UPTD) did not allow for full randomization of respondents. Breast milk production measurements were conducted after the entire intervention series was completed, thus conforming to the post-test-only control group design (Polit & Beck, 2022).

Population and Sample Size

This study utilized a population consisting of all postpartum mothers who visited or received postpartum services at the Sungai Paduan Health Center UPTD during the research period from May to June 2026, totaling 48 postpartum mothers based on midwifery service register data.

The sample size was determined based on simple experimental research recommendations, which state that each treatment group should consist of at least 15–20 respondents to adequately detect differences in intervention effects at a 95% confidence level and 80% power (Dharma, 2021). Based on these considerations, the total number of participants was 40, with 20 respondents each in the treatment and control groups.

The use of this sample size is considered to have met the needs of nonparametric statistical analysis using the Mann-Whitney test and taking into account population availability during the research period.

Sampling Techniques

Sampling uses a *purposive sampling approach*, where research subjects are selected selectively based on specific criteria set by the researcher to answer the research objectives. The inclusion criteria include:

1. Postpartum mothers from the first day to the tenth day.
2. Willing to be a respondent by signing the informed consent.
3. Has no contraindications for breastfeeding.
4. Do not take any medication that can affect breast milk production.
5. The baby was born alive and in good health.

Meanwhile, the exclusion criteria include:

1. Mothers with severe postpartum complications.
2. Mothers who have a history of breast surgery.
3. Babies with congenital abnormalities that interfere with breastfeeding.

To minimize selection bias, researchers conducted simple matching between the treatment group and the control group based on maternal age, parity, and education level characteristics so that both groups had a relatively comparable distribution of characteristics before the intervention.

Oxytocin Massage Intervention Procedure

The intervention in the form of oxytocin massage was carried out based on the Standard Operating Procedure (SOP) for midwifery services which refers to lactation management guidelines.

Before the study began, all midwives participated in a one-day training session on oxytocin massage techniques, conducted by the coordinating midwife and a midwifery lecturer with expertise in lactation care. Demonstrations and skills tests were then conducted to ensure all midwives had consistent technique.

The massage procedure is carried out in the following stages:

1. The mother is in a sitting position with her body slightly bent forward.
2. The midwife performs massage along both sides of the spine starting from the upper thoracic vertebrae to the scapula area using both thumbs.
3. The movements are done slowly, circularly, and rhythmically with moderate pressure.
4. The massage lasts 15 minutes per session.
5. The intervention was given once daily for three consecutive days.

To maintain consistency in intervention implementation, all actions were carried out using the same standard operating procedures (SOP) and monitored using a procedural compliance observation sheet (SOP checklist). Evaluation of uniformity of implementation showed that all midwives carried out all stages according to established standards.

Breast Milk Production Measurement

Breast milk production variables were measured using a structured observation sheet compiled based on indicators of breast milk sufficiency in infants and clinical indicators of breast milk production recommended in midwifery practice.

The indicators observed include:

1. Frequency of breastfeeding the baby in 24 hours.
2. Length of breastfeeding per session.
3. Volume of breast milk pumped for 15 minutes using a manual breast pump.

4. Frequency of urination (BAK) of babies in 24 hours.
5. Frequency of baby's bowel movements (BAB) in 24 hours.

Each indicator is scored as follows:

- Meets criteria = 1
- Does not meet criteria = 0

So the total score ranges from 0–5.

Breast milk production categories are determined based on the total observation score as follows:

- Smooth Breast Milk Production: 4-5
- Poor Breast Milk Production: 0-3

The observation instrument was developed based on indicators of breast milk sufficiency recommended in lactation practice and was tested for content validity by three obstetrics and lactation experts. A pilot test was conducted on ten postpartum mothers outside the study sample, resulting in a Content Validity Index (CVI) of 0.92, indicating excellent validity. Reliability testing using Cronbach's Alpha yielded a value of 0.87, indicating the instrument was deemed reliable for use in the study.

Measurements were carried out by observers who did not know the respondent's group status (blinded observer) to minimize observation bias.

Data analysis

Researchers used SPSS version 26 to analyze the research data. The initial stage involved univariate analysis to describe the respondent profile based on percentages, frequency distributions, means, and standard deviations. Furthermore, because the total sample size was less than 50 people, the Shapiro-Wilk test was chosen to evaluate the normality of the data before proceeding to bivariate analysis. Prerequisite results showed non-normal data distribution, so the effect of the oxytocin massage intervention was tested using a Mann-Whitney analysis with an error level of $\alpha = 0.05$. For results with very low probability, the reporting of the significance value is written as $p < 0.001$.

RESULTS AND DISCUSSIONS

Respondent Characteristics

This study involved 40 postpartum mothers who were stratified into two groups, namely the intervention group (20 respondents) who were given oxytocin massage and the control group (20 respondents) who only received standard postpartum care without additional treatment.

Table 1. Distribution of Respondent Characteristics at UPTD Puskesmas Paduan River in 2026

Characteristics	Frequency (n)	Percentage (%)
Age		
20–25 years	16	40
26–30 years	14	35
31–35 years	10	25
Parity		
Primipara	18	45
Multipara	22	55

Education		
Elementary/Middle School	10	25
SENIOR HIGH SCHOOL	20	50
College	10	25
Work		
Housewife	28	70
Work	12	30
Total	**40**	**100**

The distribution of respondent characteristics in Table 1 shows that the 20–25 age group constituted the largest percentage, reaching 40% (16 individuals). Based on childbirth history, more than half of the sample were multiparous (55% or 22 individuals). Regarding education and occupation, high school graduate status (50%) and background as a housewife (70%) were the most dominant profiles. These characteristics reflect that the majority of postpartum mothers in this study were in their productive reproductive years. According to Maritalia (2022), this age group and phase are physiologically very potential and support the smooth process of breast milk production and release.

Normality Test Results

Before conducting bivariate analysis, breast milk production data were tested using the Shapiro-Wilk test because the sample size was less than 50 respondents.

Table 2. Results of the Shapiro-Wilk Normality Test

Variables	Group	p-value
Breast milk production	Treatment	0.018
Breast milk production	Control	0.011

The Shapiro-Wilk test showed a significance level of 0.018 for the intervention group and 0.011 for the control group. Since these values are less than 0.05, this indicates that the distribution of breast milk production data is not normal. Therefore, to analyze the comparison of breast milk production volume between the experimental and control groups, the researchers used a non-parametric analysis using the Mann-Whitney test.

Breast Milk Production in the Treatment Group and Control Group

Table 3. Distribution of Breast Milk Production After Intervention

Breast milk production	Treatment (n=20)	Control (n=20)	Total
Fluent	17 (85%)	6 (30%)	23 (57.5%)
Not that smooth	3 (15%)	14 (70%)	17 (42.5%)
Total	**20 (100%)**	**20 (100%)**	**40 (100%)**

The data in Table 3 shows a stark difference between the two groups, with the majority of the intervention group, 17 women (85 percent), successfully expressing breast milk, while only 3 women (15 percent) experienced less smooth milk production. This contrasts with the control group, where only 6 women (30 percent) experienced smooth milk production, while 14 women (70 percent) experienced less smooth milk production. This difference indicates that providing oxytocin massage to postpartum mothers is very effective in increasing the likelihood of smooth milk production compared to care without intervention.

Analysis of the Effect of Oxytocin Massage on Breast Milk Production

Table 4. Mann-Whitney Test Results

Variables	Mean Rank Treatment	Mean Rank Control	p-value
Breast milk production	28.05	12.95	< 0.001

Analysis using the Mann-Whitney test yielded a p-value of less than 0.001, thus concluding that there was a significant difference in breast milk flow between the intervention and control groups. This positive effect was confirmed by the mean rank of the treatment group, which reached 28.05, compared to 12.95 in the control group. This difference in average scores indicates that oxytocin massage has been proven effective in optimally increasing breast milk production.

Effect *Size*

In addition to measuring statistical significance, this study also calculated an effect size. This step was taken to identify the strength and magnitude of the effect of the oxytocin massage intervention on increasing breast milk production.

Table 5. Effect Size of Oxytocin Massage on Breast Milk Production

Parameter	Mark
Risk Ratio (RR)	2.83
Odds Ratio (OR)	13.22
95% Confidence Interval OR	2.73 – 64.01
Effect Size (r)	0.61

The results of the analysis showed that the Risk Ratio (RR) value was 2.83, which means that postpartum mothers who received oxytocin massage were 2.83 times more likely to experience smooth breast milk production compared to the control group.

An Odds Ratio (OR) of 13.22 with a 95% Confidence Interval (2.73–64.01) indicates that the likelihood of smooth breast milk production in the treatment group was more than thirteen times greater than in the control group. A confidence interval that did not exceed one indicates that the relationship was statistically significant.

An effect size of 0.61 demonstrates that oxytocin massage has a significant effect on stimulating breast milk production. According to Cohen's theory, an effect size index exceeding 0.50 is considered a large effect. This indicates that the intervention is not only statistically significant but also provides significant clinical benefits for breastfeeding mothers (Cohen, 1988).

Thus, the results of this study indicate that oxytocin massage is an effective non-pharmacological intervention in increasing breast milk production in postpartum mothers at the Sungai Paduan Health Center UPTD.

Field findings demonstrated improved breast milk production in the group of postpartum mothers who received oxytocin massage intervention compared to the untreated group. The proportion of smooth lactation in the treatment group reached 85 percent, while the control group only achieved 30 percent. A Mann-Whitney analysis found a p-value of less than 0.001, accompanied by an effect size index of 0.61, confirming the significant influence of oxytocin massage on breast milk production.

Physiologically, oxytocin massage involves mechanical pressure on the vertebral pathway, which activates the parasympathetic nervous system to the hypothalamus. This signal prompts the posterior pituitary gland to secrete the hormone oxytocin into the bloodstream, which triggers contraction of the myoepithelial cells surrounding the breast alveoli. As a result, milk is pushed into the lactiferous ducts and out toward the nipple. According to Riordan and Wambach (2022), this release mechanism is known as the let-down reflex, which is crucial for the continuation of breastfeeding.

The results of this study also align with an empirical study by Putri and Wahyuningsih (2022), which explained the role of oxytocin massage in accelerating the ejection reflex and increasing breast milk volume in postpartum mothers. Furthermore, a meta-analysis by Dewi and Ambarwati (2023) concluded similar benefits, indicating that oxytocin massage had a consistent positive effect on breast milk supply for postpartum mothers in Indonesia.

Although most respondents in the treatment group experienced increased milk production, the study found that 15% of postpartum mothers still experienced decreased milk supply after receiving oxytocin massage. These results indicate that milk production is not solely influenced by oxytocin stimulation but is a multifactorial process influenced by the mother's physiological, psychological, and environmental conditions.

One factor suspected to play a role is the mother's psychological state during the postpartum period. Anxiety, fatigue, and stress can increase the secretion of cortisol and catecholamine hormones, which inhibit the release of oxytocin, resulting in a suboptimal milk let-down reflex. Even if stimulation through oxytocin massage is provided, emotional instability can reduce the effectiveness of this intervention (Uvnäs-Moberg et al., 2020).

In addition to psychological factors, a mother's nutritional status also significantly impacts breast milk production. Insufficient intake of energy, protein, fluids, vitamins, and minerals can reduce the body's ability to produce optimal breast milk. Postpartum mothers who experience an energy deficit tend to have lower nutrient reserves, resulting in reduced milk secretion capacity (Victora et al., 2023).

Another factor that can affect milk production is breastfeeding technique. Incorrect latch-on positioning prevents optimal breast emptying, reducing stimulation of the hormones prolactin and oxytocin. This can lead to low milk production, even after oxytocin massage (WHO, 2023).

The results of this study indicate that oxytocin massage is an effective intervention, but its success still requires the support of other factors such as good psychological condition, adequate nutrition, and correct breastfeeding techniques.

Breast milk production is a variable influenced by various factors besides oxytocin massage. In this study, several confounding variables were identified that could potentially influence the results.

The success of the lactation process is also influenced by the mother's parity. According to Maritalia (2022), multiparous mothers are relatively more technically prepared for breastfeeding and have a more mature hormonal response due to their experience with previous children. This is why breast milk production tends to increase more rapidly in multiparous mothers compared to primiparous mothers, or those having their first child.

Another equally important physical factor is maternal nutritional fulfillment and Body Mass Index. Adequate energy reserves in mothers with good nutritional status are crucial for

supporting breast milk production. However, for mothers who are malnourished, breast milk production is at risk of being hampered due to limited intake of metabolic substrates necessary during breastfeeding (Kent et al., 2023).

Mechanically, smooth lactation is regulated by the frequency of breastfeeding through the laws of supply and demand. Riordan and Wambach (2022) explain that the more intensive the baby's breast emptying process, the greater the neuroendocrine stimulation of the hormones prolactin and oxytocin, resulting in optimal milk production.

Psychological aspects, such as support from partners and family, are also key. Positive emotional stimulation has been shown to effectively reduce postpartum stress levels and foster maternal self-efficacy, thereby preventing inhibition of the oxytocin reflex. Findings from Zuhana et al. (2022) confirm that strong family support significantly increases a postpartum mother's chances of successful exclusive breastfeeding.

Postpartum stress also needs to be considered, as it can increase cortisol levels, which physiologically inhibits oxytocin release. Therefore, the success of oxytocin massage as an intervention is inextricably linked to comprehensive management of the mother's psychological well-being.

Although these variables were not analyzed specifically in this study, their presence needs to be considered as factors that can influence the magnitude of the effect of oxytocin massage intervention on breast milk production.

The practical implications of this study's results indicate that oxytocin massage can be implemented as a non-pharmacological treatment in postpartum maternal health services at community health centers or primary care clinics. Its safe, practical, inexpensive, and easy-to-master nature makes it a distinct advantage. Through appropriate education, these massage skills can be delegated to family members or performed independently to assist healthcare professionals.

However, the implementation of oxytocin massage should be combined with breastfeeding counseling, education on correct attachment techniques, meeting the mother's nutritional needs, and psychosocial support to optimally increase breast milk production.

Interpretation of the results of this study must be carried out wisely by paying attention to a number of existing limitations.

One weakness is the relatively small number of participants, 40, which limits the generalizability of the study results to a broader population. To obtain a more valid and precise assessment of the effects, future similar research is strongly recommended using a larger sample size.

Second, the study used a quasi-experimental design without randomization, which still poses the possibility of selection bias and the influence of confounding variables. Although respondents were selected based on the same criteria, factors other than the intervention could not be fully controlled.

Third, the research was only conducted at one health service facility (single center), namely the UPTD Sungai Paduan Health Center, so that the characteristics of the respondents may differ from the postpartum maternal population in other areas that have different socio-cultural conditions and health services.

Fourth, breast milk production is measured using a combination of clinical indicators, including breastfeeding frequency, duration, milk volume, and the frequency of urination and

defecation. This approach provides a more comprehensive picture, but does not yet use a single objective method (gold standard), allowing for variation in measurement results between observers.

Based on this, future research is recommended to apply a randomized controlled trial design involving a much larger sample size, involving several health care facilities, and using a more objective method of measuring breast milk production in order to obtain stronger scientific evidence regarding the effectiveness of oxytocin massage on breast milk production in postpartum mothers.

CONCLUSION

Through the analysis and discussion of the effects of oxytocin massage therapy on the smooth flow of breast milk in postpartum mothers at the Sungai Paduan Community Health Center (UPTD), it was concluded that most mothers who received the intervention showed better lactation achievements than those who did not receive the massage. Statistical comparison results using the Mann-Whitney method confirmed a significant difference between groups with a p-value of less than 0.001, supported by a relatively strong effect size value. This confirms the positive correlation of the intervention with increasing breast milk capacity.

Physiologically, this massage stimulation activates the neuroendocrine system, stimulating oxytocin, which promotes smooth milk ejection. However, the fact that some mothers still experienced less smooth milk flow after the intervention suggests the influence of other factors. Factors such as maternal mental health, nutritional status, breastfeeding frequency, infant latch technique, previous breastfeeding experience, and family involvement are crucial factors that were not fully controlled for in this research.

The quasi-experimental nature of this study, without randomization, with a small sample size and a single location, requires caution in generalizing the results. Nevertheless, oxytocin massage has been shown to potentially help meet postpartum breastfeeding needs and can be considered in midwifery care management, especially when combined with breastfeeding education, nutritional improvements, and emotional support from the surrounding community to achieve exclusive breastfeeding goals.

Further researchers are advised to use a pure experimental design in the form of a randomized controlled trial with a larger sample, conduct multicentric studies in various health facilities, and use objective breast milk volume measurement techniques to obtain more valid and robust scientific data regarding the benefits of oxytocin massage.

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