Jurnal Info Kesehatan
Vol. 23, No. 2, June 2025, pp. 410-419
P-ISSN 0216-504X, E-ISSN 2620-536X
DOI: *10.31965/infokes.Vol23.Iss2.1703*
Journal homepage: *https://jurnal.poltekkeskupang.ac.id/index.php/infokes*

RESEARCH **Open Access**

The Impact of Oxytocin Massage with Lemongrass Leaf Massage Oil and Aromatherapy of Biliting Oil on Breast Milk Production

Atik Purwandari[1a*], Sandra Tombokan[1b], Sjenny Tuju[1c]

[1] Department of Midwifery, Poltekkes Kemenkes Manado, Manado City, North Sulawesi, Indonesia

[a] Email address : atikpurwandari75@gmail.com
[b] Email address : sandragjt@gmail.com
[c] Email address : sjennytuju@gmail.com

Received: 23 September 2024 Revised: 11 March 2025 Accepted: 30 June 2025

Abstract
One of the main problems experienced by breastfeeding mothers is insufficient breast milk production. Oxytocin massage with lemongrass aromatherapy is a solution to increase breast milk production. This study aims to measure the effectiveness of oxytocin massage using Lemongrass Leaf Massage Oil and Aromatherapy of Biliting oil using on breast milk production in breastfeeding mothers. This research method is a quasi-experiment with a one group design with pre-test and post-test design. The population in this study were breastfeeding mothers who had babies aged 0-2 years as many as 30 people. The sampling technique was accidental sampling. Data processing was carried out univariately and bivariately, using the Wilcoxon Signed-Rank Test and SPSS. This study uses a nonparameric test with Wilcoxon Signed-Rank Test analysis with non-normally distributed data. The sample data scale is a ratio scale. Data collection was conducted at PMB Yulin, Tomohon City using observation sheets and measuring cups from April to September 2024. Breast milk production was measured during the Pre-test before Oxytocin Massage was carried out using Lemongrass Leaf Massage Oil and Aromatherapy of Biliting oil for 3 days, 2 times a day, morning and evening, after that in the Post-test breast milk production was measured again with a measuring cup by means of after 1 hour the mother breastfeeds by manually expressing the right and left breasts for 5 minutes. The stages of the study were the preparation, implementation, monitoring and evaluation stages. The results of the study showed the Wilcoxon P Value Statistical Test of 0.000 <0.050. Breast milk production was measured using a breast measuring cup before and after oxytocin massage where breast milk production <10 ml = 28 people (93.3%) and> 10 ml = 2 people (6.7%) and after oxytocin massage production <10 cc = 0 and> 10 cc. After the massage, there was an increase in breast milk production of 26.03. The results of the study showed that oxytocin massage with Lemongrass Leaf Massage Oil and Aromatherapy of Biliting oil on breast milk production was effective in increasing breast milk production.

Keywords: Oxytocin, Lemongrass Massage Oil, Aromatherapy.

Corresponding Author:

Atik Purwandari
Department of Midwifery, Poltekkes Kemenkes Manado, Manado City, North Sulawesi, Indonesia
Email: atikpurwandari75@gmail.com

1. INTRODUCTION

In recent years, Indonesia has experienced a notable decline in breastfeeding rates, prompting UNICEF and WHO to advocate for stronger measures to safeguard, promote, and support breastfeeding practices—particularly for women in the workforce. Data from 2021 indicate that only 48.6% of newborns in Indonesia were breastfed within the first hour of birth, a significant drop from 58.2% in 2018. Similarly, the proportion of infants exclusively breastfed for the first six months fell sharply from 64.5% in 2018 to 52.5% in 2021. In observance of World Breastfeeding Week (1–7 August), both UNICEF and WHO have emphasized the importance of workplace support to enable mothers to continue breastfeeding effectively. With women comprising nearly 40% of Indonesia's labor force, the organizations are calling for the implementation of maternity leave policies and workplace accommodations that facilitate breastfeeding. They also urge employers to ensure that working mothers have sufficient time and suitable spaces to breastfeed or to express and store breast milk (UNICEF, 2023).

Massage therapy is considered a beneficial intervention for breastfeeding mothers, as it may contribute to enhancing breast milk production (Widiastuti, Arini & Yuniati, 2022). Over the past decade, massage has been increasingly utilized by maternity care professionals as a complementary method to support and stimulate breast milk production (Sriasih et al., 2019; Widiastuti, Arini, & Yuniati, 2022). One contributing background to the study is data from UNICEF indicating that approximately 30,000 infant deaths in Indonesia and 10 million child deaths globally each year could potentially be prevented through the provision of exclusive breastfeeding for the first six months of life, without the introduction of any supplementary food or fluids (Nurfirdaus, & Bassey, 2021; Sari, & Prasetyani, 2021). The obstacle is that a mother when breastfeeding her milk production is low (Ramadhini, & Kurniati, 2022). Various efforts have been made by health professionals, especially midwives, to prevent an increase in infant mortality by increasing breast milk production (Baiduri et al., 2024). The infant mortality rate due to lack of breast milk is often highlighted in Indonesia as part of national development efforts because it is an indicator of a nation's welfare (Irawaty, Elfiyan & Purwoko, 2020). Complementary massage therapy is often mentioned by researchers as being able to be performed by midwives as the front line of maternal and child health services in the community (Taufiqoh, 2021). Researchers also agree that complementary massage therapy can stimulate an increase in breast milk (Widiastuti, Arini & Yuniati, 2022).

Many findings recommend that breastfeeding can reduce infant mortality due to infection by 88% (Sinaga, 2020). Breastfeeding also contributes to reducing the risk of stunting, obesity, and chronic diseases (Lisnawaty et al., 2020; Sirajuddin et al., 2021). Breastfeeding helps survival and supports the optimal growth and development of children (Anggraini, & Dilaruri, 2022). Conversely, the inability to breastfeed makes mothers feel less confident and anxious so breast milk production decreases (Triansyah et al., 2021). Integrated health worker support is needed in providing exclusive breastfeeding. For example, support through providing information and education on exclusive breastfeeding to mothers and family members (Sadovnikova et al., 2020). The latest research that raised the issue of the use of oxytocin and aromatherapy stated that the duration of oxytocin massage can be around 15 minutes and should be done every day to get the optimal amount of breast milk (Pratamaningtyas, Hardjito & Hamim, 2020). Lemongrass oil has bactericidal, antifungal, and wound-healing effects (Saidah, & Dewi, 2020; Jayanti, & Patriani, 2023). In addition, lemongrass oil can also be used in aromatherapy to stimulate appetite, diuretic, and sweat excretory (Jayanti, & Patriani, 2023). Lemongrass oil aromatherapy is also an aromatherapy that can provide a relaxing effect on breastfeeding mothers so that it will stimulate breast milk production. Lemongrass oil aromatherapy functions as an antidepressant, namely suppressing and eliminating depression or stress so that it can help primiparous mothers avoid postpartum blues. Untreated anxiety or

depression during the postpartum period will certainly affect mothers in caring for and providing breast milk to their babies (Jayanti & Patriani, 2025).

Studies suggest that oxytocin massage on the area along the spine (vertebra) to the fifth-sixth costae bone, stimulates the hormones prolactin and oxytocin (Mahulette, Mundarti & Masini, 2022). Massage significantly affects the peripheral nervous system, increases stimulation, and reduces pain, so that mothers feel relaxed from fatigue will disappear (Hassan, Mokabel & Radwan, 2019). Several other studies have done the same thing with different approaches, places, and times (Triansyah *et al.*, 2021; Endelawati, Widiastini & Sumawati, 2023; Sandriani, Fitriani, & Rahayu, 2023). The benefits of lemongrass oil in various industrial fields can be used as aromatherapy.

Aromatherapy is an alternative treatment using fragrances derived from essential oils that can help improve or maintain health and provide emotional comfort (Lestari, 2022) It is not yet known directly whether oxytocin massage using lemongrass leaf and aromatherapy has impact on breast milk production. This background is what differentiates this research from the previous studies described above, regarding methods and design, population, place and time. A preliminary study conducted through interviews with 10 breastfeeding mothers who have babies in Tomohon City regarding breastfeeding their babies, 8 (80%) mothers stated that breast milk production was not optimal, so that babies did not want to breastfeed. This quasi-experimental research conducted in Tomohon, North Sulawesi aims to measure the impact of increasing breast milk after massage therapy using oxytocin with Lemongrass Leaf Massage Oil and Aromatherapy of Biliting oil. The implications of this research are expected to enrich the traditional approach to increasing breast milk production that is cheap, practical, efficient, and academically acceptable. The research gap several studies have explored the general benefits of lemongrass (Cymbopogon citratus) in aromatherapy and massage such as its antimicrobial, anti-inflammatory, and relaxing properties there is a lack of studies that specifically examine its application in the context of maternal health, particularly in postpartum women or its effect on anxiety, pain relief, or sleep quality. Moreover, most existing research tends to focus on the pharmacological aspects rather than its practical use as a complementary therapy in clinical or community midwifery settings. Our study addresses this gap by evaluating the use of lemongrass massage oil aromatherapy Biliting oil.

2. RESEARCH METHOD

This study employed a quasi-experimental design using a one-group pretest-posttest approach to evaluate the effect of oxytocin massage and aromatherapy on breast milk production. The research was conducted at the Yulin Independent Midwife Practice in Tomohon City from April to September 2024.

The population in this study consisted of breastfeeding mothers and their babies aged 0–2 years, with a total of 30 respondents. The sampling technique used was accidental sampling (also known as convenience sampling), chosen due to its practicality and efficiency in situations with limited time, energy, and cost. Participants were selected based on their availability and willingness to participate at the time and place of data collection. Inclusion criteria included breastfeeding mothers who had babies aged 0–2 years, were in good health, lived in Tomohon, and consented to participate. Mothers who were not currently breastfeeding were excluded from the study.

The research was carried out in three stages: preparation, implementation, and monitoring/evaluation. In the preparation stage, oxytocin massage techniques were introduced to midwives and health workers through a socialization process. During the implementation stage, the mothers received assistance from family members and midwives to perform oxytocin massage using Lemongrass Leaf Massage Oil combined with Biliting aromatherapy oil. This

intervention was conducted over three consecutive days, with each massage session lasting 10–15 minutes, performed twice daily (morning and evening). The posttest was conducted on the fourth day to measure the impact of the intervention.

Breast milk production was measured both before (pretest, Day 1) and after (posttest, Day 4) the intervention. One hour after breastfeeding, mothers manually expressed milk from both breasts for five minutes, and the output was measured using a measuring cup. The researcher was assisted by five enumerators with a background in Applied Midwifery who helped monitor and record milk production data on observation sheets.

The instruments used in this study included a validated pretest-posttest questionnaire adapted from Siregar, Harahap & Nasution, (2022). The questionnaire comprised three main sections: demographic information, indicators of breast milk production, and perceptions of oxytocin massage and aromatherapy. The indicators of breast milk production included the volume of milk per feeding (5–10 ml within the first 24 hours), frequency of breastfeeding (10–12 times per day), baby's urine output (30–50 ml), frequency of urination (6–8 times daily), urine color (clear yellow or concentrated), infant sleep duration post-feeding, and breastfeeding frequency. In addition, the questionnaire included one open-ended question to explore the mothers' opinions regarding the effectiveness and sensory experience of using lemongrass massage oil and Biliting aromatherapy oil.

Data collection involved both primary and secondary sources. Primary data were obtained directly from the respondents, while secondary data were gathered through a literature review of relevant, peer-reviewed journals published within the last five years. Initial insights were also gained through interviews with breastfeeding mothers in Tomohon to better understand their breastfeeding practices and needs.

Data were analyzed using univariate and bivariate techniques with the help of SPSS software. Given that the data were not normally distributed and used a ratio scale, the Wilcoxon signed-rank test—a non-parametric statistical test—was employed to examine differences between pretest and posttest outcomes.

This study followed ethical procedures in accordance with international research standards, including the World Health Organization (WHO) and the 2021 CIOMS Guidelines (Haunschild et al., 2024). All participants provided informed consent, ensuring they fully understood the research objectives, risks, benefits, and their rights. Ethical approval was granted by the Ethics Committee of the Manado Ministry of Health Polytechnic (Approval No. KEPK.01/07/148/2024).

3. RESULTS AND DISCUSSION

Table 1. Frequency Distribution based on Respondent Characteristics (n=30).

Characteristics	**n**	**(%)**
Age (years)		
< 20 years	2	6.7
20 -35 years	24	80
> 35 years	4	13.3
Parity		
Primipara	18	60
Multipara	12	40
Education		
Elementary school	1	3.3
Junior High School	5	16.7
Senior High School	13	43.3
College	11	36.7
Work		
Employed	10	33.3

Characteristics	**n**	**(%)**
Unemployed	20	66.7
Types of Childbirth		
Normal	9	10
Cesarean Section	21	70

Table 1 shows the largest percentage of breastfeeding mothers aged 20-35 years (80%). The percentage of parity of breastfeeding mothers is mostly Primipara (60%). The education of breastfeeding mothers is mostly from a college education background (36.7%). The majority of jobs are unemployed (66.7%). The history of childbirth is mostly through C-section (70%).

Table 2. Distribution of Breast Milk Production Before and After Oxytocin Massage with Lemongrass Leaf Massage Oil and Aromatherapy of Biliting Oil on Breastfeeding Mothers (n=30)

Variables	**Test Results**					
	Pre	**n**	**%**	**Post**	**n**	**%**
Baby Urine	30	6	20	40	8	26.07
	40	20	66.07	45	2	6.07
	50	4	13.03	50	20	66.07
Urination	3-5 times	12	40	5 times	1	3.3
	6-8 times	18	60	6-8 times	27	90
Breast milk production	< 10 cc	28	93.3	< 10 cc	0	0
	> 10 cc	2	6.7	> 10 cc	30	100
Breastfeeding Frequency	< 10 times	28	93.3	< 10 times	10	33.3
	> 10 times	2	6.7	> 10 times	20	66.7
Average Sleep	< 2 Hours	25	83.3	< 2 Hours	10	33.3
	> 2 Hours	5	16.7	> 2 Hours	20	66.7

Table 2 shows breast milk production measured through Breast Milk Pumping (measuring cup) before and after being done before Oxytocin massage, breast milk production <10= 28 people (93.3%) and> 10 – 2 people (6.7%) and after massage breast milk production <10 cc = 0 and>10 cc. Urine pattern before massage baby urine 30-50 cc and after massage 40-50 cc. Urination before breastfeeding mothers in oxytocin massage baby urination 3-8 times a day and after breastfeeding mothers in massage baby urination range from 5-10 times/day. Breastfeeding frequency before massage <10 times (93.3%) and after massage <10 times = 33.3%. Average sleep before massage <2 hours (83.33%), and after massage average baby sleep <2 hours 33.3%.

Table 3. Effectiveness of Oxytocin Massage with Lemongrass Leaf Massage oil and Aromatherapy of Biliting oil on Breast Milk Production

Variables	**(n)**	**Mean**	**Std. Deviation**	**Difference**	**p-value**
Breast milk production before oxytocin massage with Lemongrass Leaf Massage oil and Aromatherapy of Biliting oil	30	10.80	7,867	26.03	0,000
Breast milk production after oxytocin massage with Lemongrass Leaf Massage oil and Aromatherapy of Biliting oil	30	36.83	8,758		

Table 3 shows that the average breast milk production before massage and lemongrass aromatherapy was 10.80, and after Oxytocin Massage and lemongrass aromatherapy was 36.83. This means that there was a significant change with an increase in breast milk production of 26.03. The results of the P-value with a nonparameric test Wilcoxon test analysis were 0.000 <0.050, which means that oxytocin massage with Lemongrass Leaf Massage oil and Aromatherapy of Biliting oil is effective in increasing breast milk production.

Table 4. Wilcoxon Signed Rank Test Results of Oxytocin Massage with Lemongrass Leaf Massage oil and Aromatherapy of Biliting oil on Breast Milk Production

Variables	Z	p-value
Oxytocin Massage with Lemongrass Leaf Massage oil and Aromatherapy of Biliting oil	- 4,240	0.000

Table 4 shows the results of bivariate analysis using the Wilcoxon test obtained a Z value of -4.240 and a ρ value = 0.000 (α = <0.05, meaning Ha is accepted and Ho is rejected. This indicates an increase in breast milk production after Oxytocin Massage with citronella oil in breastfeeding mothers at PMB Yulin, Tomohon City.

DISCUSSION

The limited breastfeeding coverage associated with breast milk production, as presented in Table 2, is influenced by a range of contributing factors. Numerous studies have identified variables affecting lactation, including breastfeeding frequency, infant birth weight, gestational age at delivery, maternal age and parity, psychological stress, acute illnesses, early initiation of breastfeeding, as well as lifestyle and health-related factors such as smoking, alcohol consumption, breast care practices, contraceptive use, and maternal nutritional status (Anggraini, & Dilaruri, 2022). In this study, most of the parity was Primipara (60%). Parity is related to the beginning of lactation.

The initial phase of lactation plays a critical role in determining the overall success of breastfeeding. Additionally, maternal education has been shown to influence the likelihood of exclusive breastfeeding. Mothers with higher educational attainment and prior breastfeeding experience tend to exhibit greater self-efficacy, which is positively associated with the practice of exclusive breastfeeding (Manjarres-Posada, Onofre-Rodríguez, & Benavides-Torres, 2020).

This study reveals that a substantial proportion of mothers who delivered vaginally (80%) experienced adequate breast milk production, whereas a majority of those who underwent cesarean delivery (72.2%) reported insufficient lactation. Notably, most participants in this study had a history of cesarean section (70%). These findings are consistent with expert opinions suggesting that the mode of delivery plays a significant role in influencing breast milk production (Rusdiarti, 2023). Following the administration of oxytocin massage combined with lemongrass leaf oil aromatherapy, an improvement in breast milk production was observed. It is generally recognized that mothers who deliver via cesarean section tend to experience a delayed onset of lactogenesis compared to those who undergo vaginal delivery (Wen et al., 2020). Other factors such as improper breastfeeding position, pain after giving birth, inhibited mobility, delayed mother-child care, and lack of areola massage rolling intervention may play roles in the breast milk production (Mahulette, Mundarti, & Masini, 2022; Tania and Huriah, 2023). Therefore, health workers can provide more intensive assistance to mothers who plan to give birth by Cesarean section, by providing education and motivation for early breastfeeding.

Table 2, In addition to its impact on breast milk production, the study also presents data on increased urine output, improved breastfeeding frequency, and enhanced sleep patterns. Oxytocin massage may influence psychological factors by promoting relaxation and comfort in mothers, thereby stimulating the release of oxytocin and positively affecting breast milk

production (Triansyah et al., 2021). The impact of oxytocin massage stimulates the glandular cells in the breast to secrete milk, thereby ensuring the infant receives an adequate supply. This is reflected in the infant's weight gain, the frequency of urination (30-50 mg every 24 hours, approximately 6-8 times), bowel movements (2-5 times daily), and sleep duration (2-3 hours) (Putri et al., 2024; Zulfatunnisa' & Dewi, 2024). Breast milk production can be evaluated through various methods, one of which involves measuring the infant's urine output over a 24-hour period. A normal urine volume for an infant ranges from 30-50 mg, with urination occurring 6-8 times within this period, and the urine typically appearing clear yellow. When breast milk intake is sufficient, the infant will generally remain calm or fall asleep for 2-3 hours following breastfeeding (Machmudah & Khayati, 2014).

In this study, prior to the massage, 93.3% of participants breastfed fewer than 10 times a day. After the massage, 33.3% of participants breastfed fewer than 10 times, while 66.7% breastfed more than 10 times per day. An optimal breastfeeding frequency is typically 10 to 12 times daily, with at least 8 feedings per day, each lasting 10 to 20 minutes per breast, and occurring at intervals of approximately one and a half to two hours. This frequency is essential for stimulating the mammary glands to increase milk production (Jayanti & Patriani, 2023). In line with this research, the plant used is lemongrass which has been proven to be an excellent tonic for the nervous system. Lemongrass has sedative and hypnotic properties that improve sleep quality and reduce symptoms of depression caused by fatigue and stress. In line with this study, to measure breast milk production can be done by looking at the urine of newborns.

Urine production in newborns was measured over a 24-hour period following the administration of oxytocin massage to the mothers. The results revealed a significant difference in the average urine output between newborns whose mothers received oxytocin massage and those whose mothers did not (Nufus, 2019). Infant characteristics indicative of adequate breastfeeding include signs of contentment post-feeding, such as calm and prolonged sleep, minimal crying, a healthy physical appearance, and consistent weight gain (Sadovnikova et al., 2020). This study also shows the average sleep before massage was < 2 hours (83.33%) and > 2 hours (16.7%), and after oxytocin massage, the average baby sleep < 2 hours 33.3% and > 2 hours 66.7%. On average, breastfed babies slept for 11 hours at night and the majority of babies reported waking up at night (96.8%) and were breastfed at least once during the night (93.5%) (Ramadhini and Kurniati, 2022). Several studies have shown that babies in the 9–12 month age group tend to sleep less than babies in the 6–8 month age group.

The results of the study showed that babies who get enough breast milk will show signs of satisfaction such as sleeping soundly, crying less, looking healthy, and experiencing consistent weight gain. References from various studies also support these findings, which confirm that adequate breast milk is closely related to infant well-being and growth. Practical Implications: These findings provide important guidance for health workers, especially midwives, in monitoring adequate breast milk through signs that are easily observed in infants. By knowing the characteristics of a satisfied baby after being breastfed, early intervention can be carried out if there are signs of insufficient breast milk. This study has several limitations, including the small sample size, so the generalizability of the findings is limited, Potential bias due to accidental sampling, which may not represent the population as a whole and Maternal nutritional factors that are not discussed in depth, even though maternal nutritional intake directly affects breast milk production and quality.Therefore, although the benefits of oxytocin massage from the above description are clear in increasing breast milk production, urine production, breastfeeding frequency and baby sleep quality, this study recommends breastfeeding should not be scheduled and adjusted to the baby's needs without time limits. Instead, breastfeed according to the baby's request (on demand). This research has limitations

such as sample size, research setting, possible bias in data collection, and generalization of findings.

4. CONCLUSION

In conclusion, the study has tried to answer the hypothesis that oxytocin massage with lemongrass oil and aromatherapy oil could be used to stimulate breast milk production in breastfeeding mothers, increase oxytocin, reduce physical discomfort and improve mood. In addition, lemongrass oil can also provide a relaxing effect on breastfeeding mothers. However, the limitations of this study are the number of samples and the research area, which do not represent a provincial or national scale. In addition, this study did not include breastfeeding mothers with some disorders, including non-communicable diseases. Therefore, future research is needed to add the number of respondents and breastfeeding mothers with non-communicable diseases/disorders that do not endanger the baby.

ACKNOWLEDGEMENT

The researcher wishes to acknowledge the Director of the Manado Ministry of Health Polytechnic and the faculty members for their invaluable support throughout the research process. Gratitude is also extended to all individuals involved, particularly the breastfeeding mothers in Tomohon, whose active participation was crucial to the success of this study.

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