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Oxytocin massage and clary sage aromatherapy on lactation and uterine recovery

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ABSTRACT

The postpartum period is a critical phase in maternal health, during which inadequate lactation and delayed uterine involution may contribute to an increased risk of complications. This study aimed to determine the effectiveness of combined oxytocin massage and clary sage aromatherapy on lactation and uterine involution in women during the postpartum period. A quasi-experimental study was conducted among 30 participants (15 controls; 15 intervention). In the control group, mean breast milk volume increased from 32.00 ± 14.74 mL to 105.33 ± 18.07 mL (Δ = 73.33 ± 17.29; $p < 0.001$). In the intervention group, it increased from 37.00 ± 24.04 mL to 98.33 ± 40.39 mL (Δ = 61.33 ± 36.62; $p<0.001$), with no significant intergroup difference ($p = 0.265$). However, uterine involution differed significantly between groups (Mann-Whitney U = 43.000, Z = -2.932, $p = 0.003$). The combined intervention may serve as a complementary strategy to enhance uterine recovery, although its effect on breast milk production was not statistically superior to standard care.

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1. INTRODUCTION

The postpartum period extends from childbirth until 6 weeks (42 days) after delivery. This phase represents a critical period marked by significant physical, emotional, and social changes following childbirth [1]. During this time, the maternal body undergoes physiological recovery processes, characterized by uterine contractions, lochia discharge, and hormonal adjustments. In postnatal midwifery care, primary attention is directed toward optimizing breast milk production and promoting uterine involution, as both are essential indicators of maternal recovery [2].

The results of the study show that 60-80% of mothers experience problems in the breastfeeding process and difficulties in recovering reproductive organs [3]. Research in Uganda shows that as many as 67.6% of mothers experience postpartum hemorrhage [4]. In Indonesia, only 48.6% of infants initiate breastfeeding within the first hour after birth [5]. Meanwhile, obstetric hemorrhage cases are the largest contributor to postpartum maternal mortality [6]. However, although various post-pregnancy interventions are available, many mothers still face challenges in breast milk production and uterine recovery, so further studies are needed to find effective and safe interventions.

Problems that arise during the postpartum period are largely influenced by the hormones prolactin and oxytocin. These two hormones can be influenced by maternal factors such as nutrition, stress, physical condition, and baby factors, which are assessed from the baby's ability to suck [7]. Oxytocin plays a central

role in various physiological and psychosocial processes in the perinatal period, including childbirth, lactation, bonding between mother and baby, and regulation of maternal emotional responses after childbirth. Physiologically, oxytocin triggers uterine contractions during labor and contributes to the regulation of the milk ejection reflex in the breastfeeding process, thus supporting the success of lactation [8]. From the psychosocial aspect, increased oxytocin levels are associated with strengthening maternal-infant bonding through neurohormonal mechanisms, increased maternal attachment, and modulation of stress and anxiety responses in postpartum mothers. Optimal oxytocin activity plays a role in improving maternal psychological well-being and lowering the risk of postpartum mood disorders, including postpartum depression [9]. Likewise, the hormone prolactin, which is essential for the process of lactogenesis, triggers the growth and differentiation of ductus and alveoli tissues of the mammary gland as well as the proliferation of secretory epithelial cells responsible for the synthesis of breast milk [10]. Oxytocin and prolactin work synergistically in supporting the lactation process, where the synthesis and production of breast milk are dominated by prolactin, while oxytocin contributes to the milk ejection reflex as well as to the psychosocial aspects of breastfeeding. The coordinated activity of these hormones supports optimal lactation outcomes and enhances the physiological and psychological well-being of the mother in the postpartum period.

Non-pharmacological approaches are considered safer alternatives to pharmacological methods for increasing breast milk production, as they do not cause harmful side effects for the mother or infant. These methods include the use of herbs, acupuncture, and oxytocin massage [11], [12]. Previous studies indicate that oxytocin massage increases circulating and prolactin concentration, contributing to improved lactation in postpartum women [13], [14]. Oxytocin levels increased significantly among participants in the intervention group [14]. In addition to oxytocin massage, aromatherapy has also been reported to stimulate oxytocin secretion, including lavender, jasmine, and clary sage [15]. Clary sage (*Salvia sclarea*) is considered safe for both mother and infant and has been reported to promote relaxation, reduce anxiety, and stimulate oxytocin release [16].

A significant difference in the involution process was observed compared to the control group ($p = 0.002$), indicating statistically significant [17]. Postpartum mothers who received clary sage aromatherapy demonstrated improved mood and higher salivary oxytocin levels compared to those who did not receive the intervention. This effect may be attributed to the active compounds in clary sage, such as linalool and linalyl acetate, which act on the limbic system and hypothalamus involved in hormonal regulation [15].

Overall, scientific evidence suggests that oxytocin massage and clary sage aromatherapy each have benefits in supporting breast milk production and uterine recovery. However, most existing studies still evaluate the two interventions separately. To date, there have been no studies that have systematically examined the effects of the oxytocin massage combination with clary sage aromatherapy on lactation and uterine recovery.

Recognizing the significance of improving maternal and neonatal well-being in the postpartum period, efforts are needed to stimulate lactation and accelerate uterine recovery during this period; therefore, this research is important to conduct. The present study investigates more deeply the benefits of clary sage aromatherapy as an adjunct therapy to oxytocin massage in enhancing lactation and accelerating uterine involution, which is measured through breast milk production, height of the fundus uteri, and duration of postpartum bleeding. This study contributes to enriching the scientific evidence by evaluating the synergistic potential of the combination of two nonpharmacological interventions, namely oxytocin massage and clary sage aromatherapy, in postpartum obstetric care, particularly related to breast milk production and uterine recovery. By emphasizing safe, easy-to-implement, and low-cost interventions, the research is expected to strengthen initiatives to improve maternal and infant health, particularly in lowering maternal mortality rates and improving the standard of maternal and neonatal health services.

2. METHOD

A total of 30 participants in this study were allocated into a control group and an intervention group. A power analysis was conducted to determine the required sample size, with a significance level (α) of 0.05, statistical power of 80%, and an estimate of the magnitude of the medium effect (Cohen's $d = 0.5$), which indicated that a minimum of 27 participants was required. To anticipate the possibility of losing subjects, the final sample comprised 30 participants. Initial data collection was carried out by measuring breast milk volume on postpartum day two. Post-intervention data collection was conducted on day 10. After the mother received oxytocin massage for 10 consecutive days, in the intervention group, data were collected after the mother received an intervention. IBM SPSS Statistics version 27 was used to conduct statistical analysis. Breast milk (ml) and height of the fundus uteri (cm) were analyzed using a paired t-test or Wilcoxon Signed-Rank Test for changes in one group, as well as an independent t-test or Mann-Whitney U Test for comparison between groups based on post-pre-differences. The ordinal variable, namely lochia, was analyzed using the Wilcoxon Signed-Rank Test for changes in one group and the Mann-Whitney U Test for

comparison between groups. Uterine recovery was measured only once, namely, a comparison between groups using the Mann-Whitney U Test. The results are presented as mean ± SD for quantitative data or median for ordinal data, with $p < 0.05$ as the significance boundary.

3. RESULTS AND DISCUSSION

3.1. Characteristics of participants

Two different non-pharmacological methods are used in this study: clary sage aromatherapy and oxytocin massage. These methods are used to stimulate lactation and accelerate uterine recovery. The intervention group received both oxytocin massage and clary sage aromatherapy via a diffuser, while the control group received only oxytocin massage. The participants' characteristics in this study are presented in Table 1.

Table 1. Characteristics of participants

No	Question items	Control (n = 15)		Intervention (n = 15)	
		F	%	F	%
1.	Mother's age				
	20-35 years old	13	86.7	15	100
	>35 years old	2	13.3	0	0
2.	Paritas				
	Primipara	6	40.0	4	26.7
	Multipara	9	60.0	11	73.3
3.	Mother's work				
	Not working	10	66.7	12	80
	Work	5	33.3	3	20
4.	Education				
	Elementary school	2	13.3	0	0
	Junior high school	1	6.7	0	0
	Senior high school	7	46.7	11	73.3
	College	5	33.3	4	26.7

Based on participants' characteristics data, most mothers are in the age group of 20–35 years (86.7%), while all participants in the intervention group were within the same age range (100%). In terms of parity, the control group was predominantly multiparous (60.0%), and the intervention group was also dominated by multiparous mothers (73.3%). Regarding occupation, most mothers in both groups were not working. Based on education level, both groups were dominated by high school education level, 46.7% of the control group, 73.3% of the intervention group, followed by college-level education in the control group (33.3%) and the intervention group (26.7%).

3.2. Breast milk production in postpartum mothers

Based on Table 2, breast milk production increased in both groups after the intervention, with a mean change (Δ) of 73.33 ± 17.29 ml in the control group and 61.33 ± 36.62 ml in the intervention group. Within each group, the paired t-test indicates a statistically significant increase ($p < 0.001$). The mean changes between groups were compared using an independent t-test. There was no statistically significant difference in breast milk production between the control and intervention group ($p = 0.265$). Although both groups experienced significant intragroup improvements, the magnitude of increase did not differ significantly between groups. These findings suggest that oxytocin massage combined with clary sage aromatherapy did not produce a greater effect than the intervention administered in the control group.

Oxytocin massage has been shown to promote oxytocin release, hence enhancing milk production in breastfeeding mothers. In the present study, breast milk volume increases significantly after the administration of oxytocin massage compared to baseline. These findings are in line with earlier research that the combination of oxytocin massage and breast care significantly improves breast milk production. The improvement was reflected in increased breastfeeding frequency and longer breastfeeding duration, with statistically significant differences ($p < 0.05$). The results reinforce the evidence that non-pharmacological interventions, particularly oxytocin massage combined with breast care, contributed positively to lactation through the physiological mechanism of oxytocin release [18].

Previous research reported that oxytocin massage significantly increased breast milk production, as assessed by infant weight, breastfeeding frequency, and duration. Post-intervention results showed that 18 mothers who received oxytocin massage experienced improvement in milk production from insufficient to adequate levels, with a statistically significant difference ($p = 0.016$) [19]. Physiologically, lactation occurs

through two main stages: milk production and milk ejection. Prolactin plays a central role in milk synthesis, whereas oxytocin is responsible for the milk ejection reflex [19]. Oxytocin release can be stimulated through nipple stimulation during breastfeeding or through back massage. These findings support the theory that oxytocin massage promotes maternal relaxation, reduces anxiety, and enhances mother-infant bonding, thereby facilitating oxytocin release and improving milk ejection. In this study, oxytocin massage was shown to have a positive impact on breastfeeding outcomes [20].

However, the findings of the present study differ from previous research, which reported a statistically significant effect of combined oxytocin massage and clary sage aromatherapy on breast milk production. In several randomized controlled trials (RCTs), physical interventions such as massage were excluded from the main analysis due to strict design criteria, limiting the availability of high-quality evidence directly evaluating the effectiveness of oxytocin massage. Although oxytocin massage theoretically facilitates oxytocin release through parasympathetic stimulation and relaxation mechanisms, robust RCT-based empirical evidence supporting its direct effect on milk production remains limited. Therefore, the absence of a significant difference observed in this study may not solely reflect a lack of effectiveness of the intervention but may also indicate methodological gaps in previous research, including variations in study design, small sample sizes, and limitations in objective measurement of breast milk production [21]. Comparable results have been documented in previous studies, indicating no significant difference in milk production between the two groups receiving a combination of oxytocin massage and clary sage aromatherapy. Several factors may explain these results. The inhalation process of aromatherapy is difficult to standardize and fully control during intervention. In addition, breast milk volume in this study was measured in a single session, which may not adequately reflect physiological fluctuations in milk production. Furthermore, breast milk production was assessed solely based on expressed milk volume using a breast pump and measuring cup. A more comprehensive assessment should incorporate additional indicators, such as breastfeeding frequency, infant urination frequency, and infant weight gain. Maternal factors, including fatigue and psychological stress during the postpartum period, may also influence lactation outcomes and potentially reduce the measurable effect of clary sage aromatherapy in the intervention group.

Clary sage (*Salvia sclarea*) has anxiolytic and antispasmodic properties that have the potential to affect the balance of the autonomic nervous system as well as hormonal regulation, including oxytocin and prolactin. However, empirical evidence regarding the efficacy of clary sage aromatherapy in increasing breast milk production and uterine recovery remains inconsistent. Several studies report significant benefits on relaxation and physical and psychological comfort of postpartum mothers, but specific research on breast milk production or uterine involution is still minimal and inconclusive [22].

Aromatherapy can support the physical and psychological comfort of postpartum mothers, such as anxiety, mood, and stress disorders [23]. In clinical practice in Japan, foot baths as a method of labor stimulation are applied using clary sage and lavender oils. The use of a combination of clary sage and lavender oils is thought to support increased oxytocin levels through a mechanism of decreasing the oxytocin release barrier due to stress. The results of this study are consistent with previous research, which showed that inhalation of clary sage oil can reduce anxiety and stress through modulation of the autonomic nervous system, but the effects on lactation hormones and the acceleration of uterine involution using clary sage in postpartum mothers are still inadequate and require further research [24].

Table 2. Effect of the combination of oxytocin massage and clary sage aromatherapy on breast milk production in postpartum mothers

Variabel	Groups	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	Δ (Pre-post) (Mean ± SD)	p-value (In a group)	p-value (intergroup)
Breast milk (ml)	Control	32.00 ± 14.74	105.33 ±18.07	73.33 ± 17.29	<0.001	0.265
	Intervention	37.00 ± 24.04	98.33 ±40.39	61.33 ± 36.62	<0.001	

3.3. Height of the uterine fundus of the postpartum mothers

Based on Table 3, for the height of the uterine fundus, the mean decreased from 12.93 ± 2.25 cm to 0.00 ± 0.00 cm in the control group and from 15.07 ± 1.67 cm to 0.00 ± 0.00 cm in the intervention group, with Δ each significant according to Wilcoxon ($p < 0.001$). The Mann-Whitney U test revealed a significant difference in the reduction of uterine fundal height between the groups ($p = 0.003$), indicating that the intervention group experienced uterine involution faster than the control group.

The results of this study are consistent with previous research that in mothers who were given oxytocin massage, there was a very rapid and normal decrease in uterine fundus height [25]. According to the theory, the process of uterine involution, or the return of the size of the uterus to its original size, occurs in the reproductive system of the post-calcined mother with a weight of about 60 grams. However, often this

process does not run optimally. The results of this study support the theory that on the 7th day, the height of the uterine fundus is usually 5 cm from the upper edge of the symphysis or the middle of the symphysis center, and on the 14th day, the height of the uterine fundus is difficult to palpate [26]. The acceleration of the decrease in the size of the uterine fundus occurs due to the response of oxytocin massage given to the mother. The part of the hypothalamus, namely the anterior and posterior pituitary, stimulates the production of the hormone oxytocin through the administration of oxytocin massage so that the hormone oxytocin will trigger the contraction of smooth muscles in the uterus, which is known as the uterine involution process [25], [27].

Table 3. Effect of the combination of oxytocin massage and clary sage aromatherapy on the height of the uterine fundus of the postpartum mothers

Variabel	Groups	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	Δ (Pre-post) (Mean ± SD)	p-value (In a group)	p-value (intergroup)
Height of the uterine fundus (cm)	Control	12.93 ± 2.25	0.00 ± 0.00	12.93 ± 2.25	<0.001	0.003
	Intervention	15.07 ± 1.67	0.00 ± 0.00	15.07 ± 1.67	<0.001	

3.4. Lochia in postpartum mothers

Based on Table 4, lochia in both groups improved after the intervention, with an average of 0.40 ± 0.51 to 2.07 ± 0.26 in the control group and 0.27 ± 0.46 to 2.40 ± 0.51 in the intervention group. The results of the Wilcoxon test showed significant improvement in each group ($p < 0.001$ in the control; $p = 0.001$ in the intervention). There was a change in lochia after 10 days of monitoring, where the results showed that the mother experienced a change in lochia, which was initially rubra, became serous, and then alba. Lochia is the fluid that the uterus excretes during the postpartum period. It contains blood and the necrotic rest of desiccated tissue from the uterus. The process of uterine involution causes changes in the lochia.

According to physiological theory, lochia serosa is typically discharged between the 3rd and 10th postpartum days, characterized by a brownish-red fluid. After approximately the 10th day, lochia alba appears, presenting as a whitish discharge. In this study, most respondents on the 10th postpartum day exhibited lochia alba, indicating a normal progression of uterine involution. These findings are consistent with previous studies evaluating changes in lochia among mothers who received oxytocin massage. Oxytocin massage promotes the secretion of oxytocin, which enhances uterine contractions. Adequate and strong uterine contractions accelerate the involution process and facilitate the expulsion of lochia. Smooth and regular lochia discharged reflect effective uterine contractility. The results support the theory that the oxytocin massage contributes to faster recovery of postpartum reproductive organs, as indicated by a reduction in fundal height and normal, accelerated changes in lochia [26], [28]. Furthermore, back massage combined with clary sage essential oil was associated with accelerated uterine involution compared to the control group. Physiologically, faster uterine involution is related to a more regular lochia pattern after childbirth [29]. However, comparison of lochia between groups using the Mann-Whitney U test showed no statistically significant difference ($p = 0.090$), indicating that lochia recovery was relatively similar in both groups. This finding may be explained by the subjective assessment of lochia, which may be less sensitive in detecting minor changes.

Table 4. Effect of the combination of oxytocin massage and clary sage aromatherapy on lochea in postpartum mothers

Variabel	Groups	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	p-value (In a group)	p-value (intergroup)
Lochea	Control	0.40 ± 0.51	2.07 ± 0.26	<0.001	0.090
	Intervention	0.27 ± 0.46	2.40 ± 0.51	0.001	

3.5. Uterine recovery in postpartum mothers

Based on Table 5, uterine recovery had a median score of 16.00 in both groups, indicating that most mothers were in the fast recovery category. Based on the results of the Mann-Whitney test, a value of U = 43,000 with $p = 0.003$ ($p < 0.05$) was obtained, so it can be concluded that there was a significant difference between the control group and the intervention in the reproductive organ recovery score. The intervention group showed better recovery values than the control group.

The results of the study showed that oxytocin massage also influenced the uterine recovery. The uterine recovery was assessed based on the height of the uterine fundus and changes in the type of maternal lochia. This study shows that after the intervention is given, uterine recovery becomes normal and fast,

without experiencing complications such as infection and bleeding. The study's findings showed a difference between before and after the intervention of oxytocin massage combined with clary sage aromatherapy.

A total of 15 respondents in the same group experienced a significant increase in breast milk volume and a decrease in the height of the uterine fundus and faster lochia changes. This is influenced by the administration of oxytocin massage, which is carried out in conjunction with the administration of clary sage aromatherapy. Aromatherapy is a method of using aromatic oils that are targeted to improve health, and can be applied through massage, inhalation, and as a bath water when bathing. When compared to other methods, such as using herbal medicines, aromatherapy is more practical and has less risk [30]. Aromatherapy is included in the relaxation therapy that works in inducing a relaxation response by stabilizing heart rate, respiratory rate, and blood pressure. This therapy was identified by a Cochrane review as a promising technique for improving lactation outcomes [31].

Aromatherapy clary sage is one of the important sources of essential oils from *Salvia sclarea* plant, which is safe to use as aromatherapy for gynecological problems. Clary sage oil contains the main components linalyl acetate (68.6%), β-bourbonene (10.3%), and germacrene D (6.9%) [32]. Clary sage is considered good because it is high in antibacterial, antifungal, and antioxidant properties and functions in improving the functioning of the nervous system [33]. According to Mahboubi [32] research, as many as 70% of maternity mothers do not need additional oxytocin in childbirth, and 86% of mothers consider clary sage effective in accelerating the slow delivery process.

According to research, the use of aromatherapy clary sage has a calming effect, increases relaxation, anti-inflammatory, improves mood, acts as an antioxidant, and enhances the body's natural healing process [34], [35]. In Russia, clary sage oil is used in childbirth because it is a non-toxic agent, does not cause sensitization, does not irritate, and can increase uterine contractions to speed up labor. As an antispasmodic agent, clary sage oil is recognized to be a successful treatment for postpartum depression and helps lessen discomfort in the muscles and during labour. Owing to its estrogen-like properties, it has been traditionally used as an emmenagogue and for the management of pain related to dysmenorrhea and amenorrhea. In addition, clary sage is used in tobacco to reduce tobacco dependence. Another benefit is that clary sage oil as a tonic is used to regulate menstrual cycles, muscle cramps, and related problems in the uterus [32], [36]. The results of the study support the theory that clary sage oil can increase uterine contractions so that uterine recovery can run optimally.

Table 5. Effect of the combination of oxytocin massage and clary sage aromatherapy on uterine recovery

Variabel	Median	Mann-Whitney U	Z	p-value
Uterine recovery	16.00	43.000	–2.932	0.003

4. CONCLUSION

This study concluded that the combination of oxytocin massage and clary sage aromatherapy did not have a significant effect on increasing the volume of breast milk production but had a significant influence on uterine recovery in postpartum mothers, especially in the process of uterine involution. These findings indicate that the administration of oxytocin massage accompanied by clary sage aromatherapy plays a greater role in accelerating the physiological uterine recovery than in increasing milk production. The results of this study can be applied as a non-pharmacological complementary approach in postpartum obstetric care, especially in supporting the uterine involution process. Further research is recommended to use more comprehensive breast milk production assessment indicators, such as a combination of measuring the volume of breast milk, increased infant weight, and frequency of infant urination, and involving a larger number of samples to obtain more optimal results.

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AUTHOR CONTRIBUTIONS STATEMENT

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

INFORMED CONSENT

This study uses primary data obtained directly through respondents' consent. Each selected respondent was given an informed consent sheet before the research was conducted.

ETHICAL APPROVAL

This research has received approval from the ethics commission of the Faculty of Medicine, Andalas University, with No: 586 /UN.16.2/KEP-FK/2025.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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