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Husband-Performed Oxytocin Massage and Changes in Breast Milk Adeacy During Early Postpartum: Evidence from Infant Defecation and Sleep Indicators

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ABSTRACT

Introduction: Perceived breast milk insufficiency during early postpartum is a major contributor to the failure of exclusive breastfeeding. Oxytocin massage is a non-pharmacological intervention that may enhance milk ejection reflex, particularly with spousal involvement.
Objective: This study aimed to analyze changes in breast milk adequacy indicators following husband-performed oxytocin massage based on infant defecation frequency and sleep duration.
Methods: A quasi-experimental one group pretest–posttest design was conducted among 29 postpartum mothers selected purposively in Bajeng and Pabbentengan Primary Health Centers, Gowa Regency. Husbands performed oxytocin massage for three consecutive postpartum days. Breast milk adequacy was assessed using infant defecation frequency and sleep duration. Data were analyzed using the Wilcoxon test ($p < 0.05$).
Results: Infant defecation frequency increased significantly from pretest to day three posttest ($p < 0.001$). Infant sleep duration showed no significant difference on day one ($p = 0.141$), but significant increases were observed on day two ($p = 0.032$) and day three ($p = 0.007$).
Conclusion: Husband-performed oxytocin massage was associated with improvements in breast milk adequacy indicators during early postpartum. However, due to the absence of a control group, causal inference should be interpreted cautiously.

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INTRODUCTION

Exclusive breastfeeding during the first six months of life is a fundamental strategy for ensuring optimal infant nutrition and health protection. Breast milk provides essential nutrients, immunological components, enzymes, and bioactive factors that support physical growth, cognitive development, and protection against infectious diseases. Accordingly, the World Health Organization (WHO) has established a global target to increase the prevalence of exclusive breastfeeding to at least 50% by 2025. However, current achievements remain suboptimal. Globally, fewer than one-third of infants are exclusively breastfed until six months of age (UNICEF, 2014; WHO, 2013). In Indonesia, although an increasing trend in exclusive breastfeeding coverage has been reported, its distribution remains uneven across regions and continues to face multiple challenges, particularly during the early postpartum period (Ministry of Health of the Republic of Indonesia, 2013; Kanang, 2020).

One of the primary factors contributing to early breastfeeding failure is maternal perception of insufficient milk supply. This perception commonly arises within the first three days postpartum, when milk production and secretion are still undergoing physiological adaptation. Many mothers interpret frequent feeding or infant crying as signs of inadequate milk production, although these conditions are often associated with delayed milk ejection reflex (let-down reflex) rather than true insufficient milk synthesis. Such perceptions may lead to early formula supplementation, which can disrupt lactation mechanisms and reduce the likelihood of successful exclusive breastfeeding (Kanang, 2020).

Physiologically, milk production is regulated by prolactin, whereas milk ejection is mediated by oxytocin, which stimulates contraction of myoepithelial cells surrounding the mammary alveoli. Oxytocin release is highly influenced by maternal psychological conditions. Stress, anxiety, fatigue, and lack of emotional support may inhibit the oxytocin reflex and decrease the effectiveness of milk transfer from mother to infant (Astutik, 2014; Lowdermilk et al., 2002). Therefore, support from the immediate environment, particularly from the husband, plays a crucial role in creating psychological conditions conducive to successful breastfeeding.

Husband involvement in postpartum care may enhance maternal feelings of security, comfort, and relaxation, thereby indirectly promoting oxytocin release. One non-pharmacological intervention that integrates physiological stimulation and emotional support is oxytocin massage. This technique involves massaging along the vertebral column to the scapular region to stimulate parasympathetic neural pathways and enhance oxytocin secretion. Several studies have reported that oxytocin massage is associated with improved milk ejection and favorable indicators of milk production (Wulandari et al., 2018; Doko et al., 2019).

Nevertheless, most previous studies have evaluated the effectiveness of oxytocin massage based on maternal subjective perceptions or indicators focused primarily on maternal conditions. Such approaches present limitations, as direct measurement of milk production during the early postpartum period is challenging. The use of infant-based indicators, such as defecation frequency and sleep duration, may provide clinically relevant parameters for assessing adequacy of breast milk intake, as they reflect the effectiveness of milk transfer from mother to infant. However, studies specifically examining husband-administered oxytocin massage using infant indicators as primary outcomes remain limited, particularly in primary healthcare settings.

Based on this gap, the present study aims to analyze changes in breast milk adequacy indicators following husband-administered oxytocin massage, as measured by infant defecation frequency and sleep duration among postpartum mothers. This study is expected to contribute to the scientific understanding of husband involvement in family-based interventions to support breastfeeding practices during the early period of infant life.

METHODS

This study employed a quasi-experimental design with a one-group pretest–posttest approach to evaluate changes in breast milk adequacy indicators before and after husband-administered oxytocin massage among postpartum mothers. This design was selected to observe short-term longitudinal changes during the early puerperal period within the same group of participants. The study was conducted in the working areas of Bajeng Primary Healthcare Center and Pabbentengan Primary Healthcare Center, Gowa Regency, South Sulawesi Province, Indonesia.

The study population comprised all postpartum mothers who delivered vaginally within the working areas of the two healthcare centers during the study period. A total of 29 postpartum mothers were recruited using purposive sampling based on predefined inclusion and exclusion criteria. Inclusion criteria were: mothers on the first to third day postpartum, vaginal delivery, having a healthy full-term infant, and willingness to participate together with their husbands. Mothers with delivery complications, cesarean section, or infants with medical conditions that could affect feeding patterns and elimination were excluded. This approach was intended to minimize clinical variability that could potentially influence the study outcomes.

The intervention consisted of oxytocin massage performed by the husband after receiving structured education and training on lactation physiology and massage techniques. The training was conducted over two days and included theoretical explanations and supervised practical sessions on massage techniques applied along the thoracic vertebrae to the scapular region, aimed at stimulating parasympathetic neural pathways and promoting oxytocin secretion. Oxytocin massage was initiated six hours after delivery and continued routinely until the third postpartum day, with each session lasting 15–20 minutes.

The independent variable was husband-administered oxytocin massage, while the dependent variable was breast milk adequacy, assessed indirectly using infant-based indicators: frequency of defecation (times per 24 hours) and infant sleep duration (hours per 24 hours). These indicators were used as proxy clinical parameters of adequate breast milk intake, as they reflect the effectiveness of milk transfer from mother to infant during the early neonatal period. However, these measures do not represent direct assessments of milk production or volume; therefore, findings were interpreted with caution.

Baseline measurements (pretest) were obtained on the first postpartum day prior to the intervention, followed by posttest assessments on the second and third postpartum days after the intervention. Data were collected through observation and structured interviews with mothers, with daily recording over a 24-hour period. To improve reporting consistency, respondents were provided with written guidance on how to calculate infant defecation frequency and sleep duration.

Statistical analysis was conducted in several stages. Descriptive analysis was used to summarize participant characteristics and variable distributions. Normality testing was performed to assess data distribution. As the data were not normally distributed and repeated measurements were obtained from the same group, comparisons between pretest and posttest values were analyzed using the Wilcoxon signed-rank test, with statistical significance set at $p < 0.05$.

This study did not include a control group; therefore, observed changes following the intervention cannot be fully attributed to a direct causal relationship. In addition, potential confounding factors—such as breastfeeding frequency, latch quality, maternal psychological condition, and neonatal physiological adaptation during the first days of life—were not specifically controlled within the study design. Accordingly, the findings are interpreted as post-intervention changes within a quasi-experimental framework rather than definitive evidence of causality.

RESULTS

As presented in Table 1, the majority of husbands were aged 26–35 years (n = 17; 58.6%), while 6 (20.7%) were aged 17–25 years and 6 (20.7%) were aged 36–45 years. Among mothers, most participants were aged 20–35 years (n = 26; 89.7%), followed by 15–19 years (n = 2; 6.9%) and >35 years (n = 1; 3.4%).

Regarding educational attainment, most husbands had completed senior high school (n = 12; 41.4%), followed by elementary school (n = 8; 27.6%), junior high school (n = 7; 24.1%), and bachelor's degree (n = 2; 6.9%). Among mothers, educational level was predominantly senior high school (n = 16; 55.2%), followed by junior high school (n = 10; 34.5%), diploma (n = 2; 6.9%), and bachelor's degree (n = 1; 3.4%).

In terms of occupation, most husbands were farmers (n = 11; 37.9%), followed by self-employed workers (n = 9; 31.0%). Other occupations included laborers (n = 3; 10.3%), contract employees (n = 2; 6.9%), private-sector employees (n = 2; 6.9%), and drivers (n = 2; 6.9%). The majority of mothers were housewives (n = 22; 75.9%), while 7 (24.1%) were self-employed. Based on parity, most mothers were multiparous (n = 22; 75.9%), whereas 7 (24.1%) were primiparous.

Table 1. Characteristics of Postpartum Mothers and Husbands (n=29)

Characteristics	Category	Husbands n (%)	Mothers n (%)
Age (years)	15–19	–	2 (6,9)
	17–25	6 (20,7)	–
	20–35	–	26 (89,7)
	26–35	17 (58,6)	–
	36–45	6 (20,7)	–
	>35	–	1 (3,4)
Educational Level	SD	8 (27,6)	–
	SMP	7 (24,1)	10 (34,5)
	SMA	12 (41,4)	16 (55,2)
	D3	–	2 (6,9)
	S1	2 (6,9)	1 (3,4)
Occupation	Ibu rumah tangga	–	22 (75,9)
	Petani	11 (37,9)	–
	Wiraswasta	9 (31,0)	7 (24,1)
	Buruh	3 (10,3)	–
	Honorer	2 (6,9)	–
	Karyawan swasta	2 (6,9)	–
	Sopir	2 (6,9)	–
Parity	Primipara	–	7 (24,1)
	Multipara	–	22 (75,9)

As shown in Table 2, prior to the intervention (pre-test), nearly all infants exhibited below-normal breastfeeding frequency (n = 28; 96.6%). Following husband-performed oxytocin massage, the proportion of infants with normal breastfeeding frequency increased to 6 (20.7%) on post-test day 1 and 14 (48.3%) on day 3, although day 2 remained predominantly in the below-normal category. Regarding infant sleep frequency, all infants were categorized as poor at pre-test (100%). After the intervention, the proportion classified as good increased to 27 (58.5%) on post-test day 1, increased further on day 2, and reached 29 (100%) by day 3.

Table 2. Distribution of breast milk adequacy based on infant indicators before and after husband-performed oxytocin massage (n = 29)

Breast Milk Adequacy Indicators	Category	Pre-test n (%)	Post-test Day 1 n (%)	Post-test Day 2 n (%)	Post-test Day 3 n (%)
Breastfeeding Frequency	Below normal	28 (96.6)	23 (79.3)	28 (96.6)	15 (51.7)
	Normal	1 (3.4)	6 (20.7)	1 (3.4)	14 (48.3)
Infant Sleep Frequency	Poor	29 (100)	3 (43.1)	3 (13.1)	0 (0)
	Good	0 (0)	27 (58.5)	26 (86.9)	29 (100)
Infant Sleep Duration Quality	Poor	10 (34.5)	9 (31.1)	6 (20.7)	0 (0)
	Good	19 (65.5)	20 (69.0)	23 (79.3)	29 (100)
Infant Defecation Frequency	Inadequate	25 (86.2)	10 (34.5)	1 (3.4)	0 (0)
	Adequate	4 (13.8)	19 (65.5)	28 (96.6)	29 (100)
Infant Stool Characteristics	Abnormal	1 (3.4)	23 (79.3)	28 (96.6)	29 (100)
	Normal	28 (96.6)	6 (20.7)	1 (3.4)	0 (0)

In terms of sleep duration quality, before the intervention most infants were already categorized as good (n = 19; 65.5%), while 10 (34.5%) were classified as poor. Following oxytocin massage, the proportion of infants with good sleep quality increased progressively, reaching 29 (100%) on post-test day 3. For infant defecation frequency, the majority were categorized as inadequate at pre-test (n = 25; 86.2%). After the intervention, the proportion with adequate defecation frequency increased to 19 (65.5%) on post-test day 1, 28 (96.6%) on day 2, and 29 (100%) on day 3. Regarding stool characteristics, most infants were classified as normal at pre-test (n = 28; 96.6%). Following the intervention, the distribution shifted on post-test days 1 and 2, and by day 3 all infants were again recorded as having normal stool characteristics.

Table 3. Changes in infant defecation frequency and sleep duration before and after husband-performed oxytocin massage

Variable	Comparison	Direction of Change	n	Mean Rank	p-value*
Infant Defecation Frequency (times/day)	Post-test Day 1 vs. Pre-test	Decreased	1	8.50	<0.001
		Increased	26	14.21	
		No change	2	–	
	Post-test Day 2 vs. Pre-test	Decreased	0	0.00	<0.001
		Increased	27	14.00	
		No change	2	–	
	Post-test Day 3 vs. Pre-test	Decreased	0	0.00	<0.001
		Increased	29	15.00	
		No change	0	–	
Infant Sleep Duration (hours/day)	Post-test Day 1 vs. Pre-test	Decreased	10	13.85	0.141
		Increased	18	14.86	
		No change	1	–	
	Post-test Day 2 vs. Pre-test	Decreased	8	12.50	0.032
		Increased	19	14.63	
		No change	2	–	
	Post-test Day 3 vs. Pre-test	Decreased	5	13.66	0.007
		Increased	22	15.50	
		No change	2	–	

As presented in Table 3, the Wilcoxon signed-rank test demonstrated a statistically significant difference in infant defecation frequency between pre-test and post-test measurements on days 1 through 3 following husband-performed oxytocin massage (all $p < 0.001$). For infant sleep duration, no statistically significant difference was observed on post-test day 1 compared with pre-test ($p = 0.141$). However, significant differences emerged on post-test day 2 ($p = 0.032$) and were more pronounced on post-test day 3 ($p = 0.007$)

DISCUSSION

This study demonstrates that husband-performed oxytocin massage was associated with improvements in breast milk adequacy during the early postpartum period, as reflected by changes in infant physiological indicators, namely defecation frequency and sleep duration over the first three days after delivery. These findings highlight the potential value of family-based interventions—particularly active spousal involvement—in supporting lactation success during the critical early puerperium.

Oxytocin Massage and Infant Defecation Frequency

A significant increase in infant defecation frequency was observed from the first to the third day following the intervention. Prior to oxytocin massage, most infants exhibited defecation patterns that did not yet reflect adequate milk intake. By the third post-intervention day, all infants had reached the category of adequate defecation frequency. Although indirect, defecation frequency is recognized as a sensitive clinical indicator of sufficient breast milk intake in early neonates.

Physiologically, these findings are consistent with the role of oxytocin in facilitating the milk ejection (let-down) reflex. Stimulation of oxytocin release through back massage promotes contraction of myoepithelial cells surrounding the mammary alveoli, thereby enhancing milk flow and increasing the effective volume of milk transferred to the infant. Improved milk intake may optimize neonatal digestion, reflected in increased elimination frequency and the transition from meconium to transitional stools.

These results align with previous studies reporting that oxytocin massage is associated with enhanced milk production and improved infant feeding indicators. International evidence further supports these findings. For example, Dağli and Çelik (2021) reported that oxytocin massage significantly increased milk volume and reduced maternal anxiety. A recent systematic review concluded that oxytocin massage interventions consistently improved milk production compared with pre-intervention conditions. Other intervention studies have shown that oxytocin massage, particularly when combined with breast care, improves milk flow and is associated with favorable infant outcomes, including weight gain.

From a physiological perspective, increased milk flow enhances daily nutrient intake, thereby accelerating neonatal gastrointestinal adaptation and promoting more regular bowel movements. Adequate breast milk intake supports intestinal motility due to lactose and bioactive components that stimulate peristalsis. Nevertheless, it should be acknowledged that neonatal elimination patterns are also influenced by normal physiological adaptation during the first days of life. Therefore, the observed increase in defecation frequency should be interpreted within the context of early neonatal transition, rather than as definitive evidence of a direct causal effect.

Oxytocin Massage and Infant Sleep Duration

In addition to defecation frequency, a progressive improvement in infant sleep duration was observed following the intervention. No statistically significant difference was identified on the first post-intervention day; however, significant increases were evident on the second and third days. This

pattern suggests that the effect of oxytocin massage on breast milk adequacy may be cumulative and may require physiological adaptation over time.

Infant sleep duration is an important indicator of satiety and post-feeding comfort. Infants who receive adequate breast milk generally exhibit longer and more stable sleep patterns due to sufficient energy and fluid intake. Empirical evidence indicates that breastfeeding practices during early infancy are associated with sleep trajectories, including total sleep duration and diurnal patterns. Other studies have reported associations between breastfeeding and sleep patterns in infants and preschool-aged children, although these relationships are influenced by developmental and environmental factors.

In this context, oxytocin massage may exert both physiological and psychological effects. Beyond stimulating milk ejection, the intervention may enhance maternal relaxation and emotional stability, thereby facilitating sustained oxytocin release and more effective breastfeeding. Biological variation in breast milk composition, including circadian fluctuations in hormones and bioactive compounds, has also been implicated in infant sleep regulation. Furthermore, feeding methods have been reported to influence maternal and infant sleep quality, although findings remain heterogeneous across populations.

The present findings are consistent with previous reports demonstrating that oxytocin massage significantly improves infant sleep duration among postpartum mothers. Husband involvement may further amplify this effect by providing emotional support, reducing maternal stress, and reinforcing positive hormonal responses. Maternal hormonal stability during lactation has been linked to sleep patterns and milk macronutrient composition, which conceptually may influence infant satiety and sleep duration.

Taken together, the observed increase in infant sleep duration may reflect the interaction between improved milk intake, enhanced oxytocin-mediated hormonal regulation, and improved maternal psychological well-being. However, given the absence of a control group, improvements in sleep duration cannot be entirely disentangled from normal neonatal physiological adaptation during the first days of life. Therefore, the findings should be interpreted cautiously within the quasi-experimental framework employed.

The Role of Husbands in Lactation Success

An important contribution of this study lies in emphasizing the strategic role of husbands in supporting lactation. The structured training provided enabled husbands to perform oxytocin massage consistently during the early postpartum period, resulting in measurable improvements in infant-based indicators of milk adequacy. Husband involvement functioned not only as a mechanical facilitator of massage but also as a source of emotional reassurance that enhanced maternal confidence and comfort during breastfeeding.

Spousal support has been widely recognized as a determinant of exclusive breastfeeding success, particularly through its influence on maternal psychological status and the continuity of the oxytocin reflex. In this study, most husbands were of productive age and had at least secondary-level education, facilitating effective knowledge transfer and skill acquisition. These findings suggest that family-centered interventions may be feasibly implemented in primary healthcare settings.

Public Health Nutrition Implications

The findings indicate that husband-performed oxytocin massage represents a simple, low-cost, and feasible intervention that may be integrated into maternal and child health programs at the primary care level. By utilizing practical infant-based physiological indicators—such as defecation frequency and sleep duration—this study offers a field-relevant approach to assessing breast milk adequacy. These results support the expansion of lactation education and oxytocin massage training for husbands as part

of antenatal and early postpartum care to strengthen exclusive breastfeeding practices during the critical neonatal period.

CONCLUSION

This study demonstrates that maternal sexually transmitted infections during pregnancy are independently associated with an increased risk of stunting among infants in Makassar, Indonesia. The association remained significant after multivariable adjustment for maternal age and parity, highlighting maternal STIs as an important but often overlooked determinant of childhood stunting.

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