

Manuscript received November 5, 2022; revised November 20, 2022; accepted January 20, 2023; date of publication February 25, 2023

Digital Object Identifier (DOI): <https://doi.org/10.35882/ijahst.v3i1.145>

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How to cite: Alvy Nour Khasana, Teta Puji Rahayu, Nurlailis Sa'adah, and Sunarto, "Comparison of Breast Milk Production Between BOM Methods (Breast Care, Oxytocin Massage, Mermaid Technique) With Breast Care in Postpartum Mothers in Takeran District, Indonesia", International Journal of Advanced Health Science and Technology, vol. 3, no. 1, pp. 1–6, February. 2023.

Comparison of Breast Milk Production Between BOM Methods (Breast Care, Oxytocin Massage, Mermaid Technique) With Breast Care in Postpartum Mothers in Takeran District, Indonesia

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ABSTRACT Breast milk is recognized as the optimal nutrition source for infants, yet many postpartum mothers encounter challenges in achieving sufficient milk production, which may hinder the success of exclusive breastfeeding. The primary research problem centers on identifying effective non-pharmacological interventions to enhance milk production among postpartum mothers. This study aims to compare the efficacy of the BOM (Breast Care, Oxytocin Massage, Mermaid Technique) method against traditional breast care practices in increasing breast milk output in postpartum women in Takeran District, Indonesia. A quasi-experimental post-test only control group design was employed, involving a total of 32 postpartum women selected through simple random sampling. The participants were divided evenly into an intervention group, receiving the BOM method, and a control group, receiving standard breast care. The intervention was administered over a period of 14 days, with massage sessions conducted at least twice daily starting on the 14th postpartum day. Data on milk production were collected and analyzed using the Mann-Whitney statistical test to evaluate differences between groups. Results indicated a statistically significant increase in milk production among mothers who underwent the BOM intervention compared to those receiving conventional breast care, with 87.5% of the BOM group demonstrating smooth milk flow versus only 37.5% in the control group ($p=0.015$). Additionally, the BOM method substantially improved milk sufficiency, facilitating the achievement of exclusive breastfeeding goals. In conclusion, the BOM method proves to be an effective non-pharmacological strategy for augmenting breast milk production in postpartum mothers. Its application can contribute to higher exclusive breastfeeding success rates, offering a practical approach for health practitioners and families to support new mothers in optimizing lactation.

INDEX TERMS Breast milk production, BOM method, postpartum mothers, non-pharmacological intervention, lactation enhancement

I. INTRODUCTION

Breastfeeding is globally recognized as the optimal source of nutrition for infants, providing essential nutrients and bioactive components that support immune development, growth, and overall health [1], [2]. According to the World Health Organization (WHO), exclusive breastfeeding during the first six months of life significantly reduces infant mortality and morbidity caused by infectious diseases such as diarrhea and pneumonia, and promotes healthy development [3], [4]. Despite these well-documented benefits, achieving optimal breastfeeding practices remains a challenge in many settings, including Indonesia, where current exclusive breastfeeding coverage varies significantly across regions, often falling short of national and international targets [5], [6].

A critical factor influencing the success of exclusive breastfeeding is adequate breast milk production. Insufficient milk supply can undermine maternal confidence, leading to early discontinuation of breastfeeding and potential adverse health outcomes for infants [7], [8]. Several physiological and behavioral factors impact milk production, including hormonal regulation, maternal health, and breastfeeding techniques [9], [10]. Globally, various interventions have been explored to enhance lactation, encompassing pharmacological methods such as galactagogues, as well as non-pharmacological approaches including breast massage, nipple stimulation, and behavioral techniques [11], [12].

Recent advances emphasize the effectiveness of non-pharmacological strategies due to their safety profile and

ease of implementation [13], [14]. Among these, methods such as breast care, oxytocin massage, and specialized techniques like the Marmet method and Mermaid technique have gained attention. These techniques aim to stimulate the secretion of prolactin and oxytocin hormones integral to milk synthesis and ejection [15], [16]. Innovations in breastfeeding stimulation protocols such as the BOM (Breast care, Oxytocin massage, Mermaid technique) have shown promising preliminary outcomes, demonstrating increased milk supply and improved breastfeeding success rates [17], [18].

However, the evidence base for the comparative effectiveness of combined stimulation techniques like BOM versus more traditional methods remains limited, especially within specific populations such as postpartum women in Indonesia. Several recent studies suggest that combination approaches may outperform single-method interventions by providing synergistic stimulation of hormonal pathways critical for lactogenesis [19], [20]. Nonetheless, a gap persists concerning contextualized, evidence-based recommendations tailored to local healthcare practices and cultural factors influencing breastfeeding behaviors [21], [22].

The present study aims to address this gap by empirically evaluating the effectiveness of the BOM method comprising breast care, oxytocin massage, and Mermaid technique in comparison to conventional breast care alone for enhancing breast milk production among postpartum mothers in Takeran District, Indonesia. Specifically, this research seeks to quantify differences in milk output and determine the feasibility of integrating BOM into routine postpartum care.

The key contributions of this paper are threefold: first, it provides localized evidence on the efficacy of combined lactation stimulation techniques; second, it proposes a non-pharmacological intervention strategy that can be adopted by health practitioners in resource-limited settings; third, it extends the current understanding of hormonal and behavioral mechanisms underlying milk production enhancement.

II. METHODS

This study employed a quasi-experimental research design with a *post-test only control group*. This design is suitable for evaluating interventions where random assignment is feasible but pre-testing is not performed to avoid sensitizing participants to the outcome variable. The study was conducted in the working area of the Takeran Health Center, Magetan Regency, East Java, Indonesia, over a three-month period from March to May 2022.

A. STUDY POPULATION AND SAMPLING

The population included all pregnant women with an expected delivery date (EDD) in March to April 2022 who were registered at the Takeran Health Center. Based on preliminary screening, 42 women met the general eligibility criteria. Using the Federer formula for sample size calculation in experimental research, a total of 32 postpartum mothers were selected as study participants. Participants were allocated equally into two groups: 16 mothers in the intervention group (BOM method) and 16

in the control group (Breast Care only). Simple random sampling was applied to ensure equal distribution and minimize selection bias.

B. INCLUSION AND EXCLUSION CRITERIA

Participants were included if they met the following criteria:

1. Postpartum mothers who delivered vaginally,
2. Healthy term infants with a birth weight >2500 grams,
3. Infants exclusively breastfed during the study period,
4. Mothers willing to participate and provide informed consent.

Exclusion criteria included:

1. Mothers with postpartum complications (e.g., hemorrhage, infection),
2. Infants requiring hospitalization or diagnosed with congenital anomalies,
3. Mothers with contraindications to massage interventions.

C. INTERVENTION PROTOCOL

Participants in the intervention group received the BOM method, which comprises three non-pharmacological techniques:

1. Breast care maintaining breast hygiene and manual stimulation to improve circulation.
2. Oxytocin massage applied along the spinal area (from the 7th cervical to the 5th and 6th thoracic vertebrae), designed to stimulate the posterior pituitary gland to release oxytocin, thereby promoting milk ejection.
3. Mermaid technique a breast emptying technique involving circular massage and hand expression aimed at preventing engorgement and enhancing milk flow.

The intervention was initiated on postpartum day 14 and continued for 14 consecutive days. The frequency of intervention was twice daily (morning and evening). Trained midwives conducted the massages according to a standardized protocol to ensure consistency and fidelity of intervention delivery. Mothers in the control group received routine Breast Care only, following the same frequency and duration without additional massage techniques.

D. OUTCOME MEASUREMENT

The primary outcome was breast milk production, assessed using an observational checklist with an ordinal scale:

1. "Smooth" milk production (infant satisfied after breastfeeding, visible swallowing, no signs of engorgement), or
2. "Not smooth" (frequent infant crying post-feeding, minimal milk flow, or discomfort during feeding).

All measurements were taken at the same time each day to control for diurnal variations in lactation.

E. DATA COLLECTION INSTRUMENTS

A structured observation sheet served as the primary data collection tool, validated by maternal health experts from the Department of Midwifery. The sheet captured sociodemographic information, type of delivery, infant health status, and breastfeeding indicators. Reliability

testing of the instrument yielded a Cronbach's alpha of 0.85, indicating high internal consistency.

F. ETHICAL CONSIDERATIONS

This study received ethical approval from the Research Ethics Committee of Poltekkes Kemenkes Surabaya (approval no. 04/KEPK/III/2022). All participants provided written informed consent after being fully informed of the study's purpose, procedures, and potential risks. The study complied with the Declaration of Helsinki and local regulations governing research involving human subjects.

G. STATISTICAL ANALYSIS

Descriptive statistics were used to summarize participants' characteristics. Frequency and percentages were reported for categorical variables. To test the hypothesis regarding differences in breast milk production between the two groups, the Mann-Whitney U-test was employed, appropriate for ordinal data and small sample sizes. A p-value of <0.05 was considered statistically significant. Data analysis was conducted using IBM SPSS Statistics version 26.

H. REPLICABILITY AND VALIDITY

To enhance replicability, a manual of procedures detailing massage steps, timing, and observational protocols was developed and made available to the research team. To improve internal validity, blinding was used during outcome assessment, and standardized intervention training was conducted for field workers. External validity was strengthened through random selection and inclusion of mothers with varying sociodemographic backgrounds.

This methodological approach is consistent with current best practices for evaluating non-pharmacological maternal interventions [23]–[27]. Previous studies have validated massage-based methods such as oxytocin stimulation and the Marmet or Mermaid techniques as effective in promoting lactation outcomes [28]–[30].

III. RESULT

TABLE 1

Differences in breast milk production in post partum mothers with BOM method with BC

Variabel		Breast Milk Production				Amount		p-value
		Fluent		Influent		n	%	
		n	%	n	%			
Met hod	BO M	13	87,5	3	12,5	16	100	0,015
	BC	2	37.5	14	62.5	16	100	

The tabulation of breast milk production between the BOM method and the BC method can be seen in the table. Based on TABLE 1, it can be explained that in the BOM group there were 13 respondents (87.5%) whose milk production was smooth, the rest had non-current milk production of 3 respondents (12.5%). Identification of BOM (Breast Care, Oxytocin Massage, Mermaid Technique).

An over view of the control group (breast care) post partum mother's milk production can be seen in the

following figure: Based on TABLE 2, Identification of milk production in the control group (Breast Care). An over view of the control group (breast care) post partum mother's milk production can be seen in the following TABLE 3. It can be explained that the breast milk production of post partum mothers in the control group by giving the breast care method there were 16 people 14 respondents (62.5%) their milk production was not smooth and the rest had smooth milk production as many as 2 respondents (37.5%). Identification of milk production in the control group (Breast Care). An over view of the control group (breast care) post partum mother's milk production can be seen in the following TABLE 2. Analysis of differences in breast milk production between the BOM method and Breast Care in post partum mothers The tabulation of breast milk production between the BOM method and the BC method can be seen in the TABLE 3. Based on TABLE 1 above, it is concluded that the use of the BOM method has a smooth milk production of 13 people (87.30%), while the use of the BC method has a non-current milk production of 14 respondents (87.50%). Based on the results of the Mann-Whitney statistical test analysis between the intervention group and the control group, $p = 0.015 < 0.05$. The conclusion is that there is a difference in the amount of milk production between the BOM method (Breast Care, Oxytocin Massage and Mermaid Technique) and the Breast Care method. Based on table 3.3, The use of the BOM method had smooth milk production as many as 13 people (87.30%), while the use of the BC method had non-smooth milk production as many as 2 respondents (37.5%).

TABLE 2

BOM Method

Category	Sum	Percentage
Not fluent	3	12,5%
fluent	13	87,5%
Amount	16	100%

TABLE 3

Breast Care Method

Category	Sum	Percentage
Influent	14	62,5%
fluent	2	37,5%
Amount	16	100%

IV. DISCUSSION

V. CONCLUSION

A. INTERPRETATION OF STUDY RESULTS

The findings of this research unequivocally demonstrate that the implementation of the BOM (Breast Care, Oxytocin Massage, Mermaid Technique) method significantly enhances breast milk production among postpartum mothers compared to the conventional breast care approach. The data reveal that 87.5% of mothers in the BOM group experienced smooth (adequate) milk secretion, contrasting sharply with only 37.5% in the control group receiving standard breast care. This disparity underscores the potential of the combined non-pharmacological interventions encompassed within the BOM method to stimulate the physiological mechanisms underpinning lactogenesis effectively.

At the physiological level, nipple stimulation activates sensory nerve endings, transmitting impulses to the

hypothalamus via the limbic system, which subsequently promotes the secretion of prolactin from the anterior pituitary gland [31]. Prolactin plays a pivotal role in milk synthesis, and therefore, interventions that potentiate nipple stimulation can logically augment milk production. The combination of techniques in the BOM method likely synergizes to produce a more robust stimulation of the neuroendocrine pathway, leading to increased hormonal activity conducive to effective lactation.

Furthermore, the application of massage techniques, such as Oxytocin Massage and the Mermaid Technique, enhances the milk ejection reflex by stimulating the release of oxytocin, a hormone critical for milk let-down [32]. The visualization of this mechanism aligns with findings from recent studies indicating that targeted massage can significantly improve milk ejection and overall supply [33]. Notably, the implementation time of the Mermaid Technique, specifically within the 6-hour to 7-day postpartum window, capitalizes on the period where establishing adequate milk supply is most critical.

The results corroborate prior research by Darmasari et al., which identified that combined interventions like BOM could effectively increase milk production and promote a smoother lactation process [34]. Conversely, some studies, such as Titisari's (2016), suggested that breast care alone may not significantly influence milk volume, emphasizing the importance of combining multiple modalities for optimal outcomes [35]. This divergence highlights the multifactorial nature of lactation and suggests that integrative approaches like BOM are more efficacious.

B. COMPARISON WITH EXISTING LITERATURE

The current study's findings align with an emerging body of literature emphasizing non-pharmacological stimuli as vital for promoting lactation. For instance, recent interventions involving massage, acupuncture, or music therapy in conjunction with nipple stimulation have demonstrated positive impacts on milk volume and breastfeeding success rates [36], [37]. These interventions leverage the neurohormonal pathways controlling milk ejection, affirming the physiological plausibility observed in this research.

A contrast emerges with studies that focus solely on breastfeeding education or basic breast care, which have shown limited effectiveness in increasing milk supply when used in isolation [38]. For example, Nova Ningsih et al. reported that when supplemented with techniques like Marmet, oxytocin massage, and breast care, milk production could be significantly increased [39]. The integration of multiple stimulation modalities appears to produce a cumulative effect, aligning with the synergistic model supported by this study.

Recent advances also highlight the importance of early intervention within the critical postpartum window [40]. The timing of the Mermaid Technique application (postpartum 6 hours to day 7 matches this window, which may partly explain the successful outcomes observed. Nevertheless, variations across studies concerning intervention duration, frequency, and personnel training can contribute to heterogeneity in results, which warrants deeper exploration.

While these comparative insights support our findings, it is crucial to recognize the limitations of existing literature, particularly regarding methodological differences and sample sizes. Many studies lack standardized protocols or control groups identical to those used here, which edges the need for rigorous randomized controlled trials to substantiate these preliminary findings further.

C. LIMITATIONS AND IMPLICATIONS OF THE STUDY

Despite the promising outcomes, this study has several limitations that must be acknowledged. Firstly, the sample size was relatively small ($n=32$), which could limit the generalizability of the results. A larger, more diverse population would enhance the external validity of these findings and allow for subgroup analyses, such as the impact of maternal age, parity, or socio-economic status on intervention efficacy.

Secondly, the study's design, a quasi-experimental approach without random allocation to intervention groups, introduces potential biases such as selection bias. Although efforts were made to employ random sampling, the absence of randomization in group assignment means confounding variables may influence the results. Future studies should incorporate randomized controlled trial designs to mitigate such biases.

Thirdly, the reliance on self-reported measures of milk production could introduce measurement bias; incorporating objective measures such as infant weight gain or milk volume quantification via quantitative methods would strengthen the reliability of outcomes.

Furthermore, the short follow-up period confines the evaluation to immediate postpartum milk production, neglecting long-term breastfeeding success and maternal satisfaction. Longitudinal studies extending beyond the initial week postpartum could provide a broader understanding of intervention sustainability.

The implications of the present findings are considerable. Healthcare providers can consider adopting the BOM method as a complementary non-pharmacological strategy to boost milk supply, especially in settings with limited access to pharmacological agents or where such agents are contraindicated. Training health workers to perform these techniques could facilitate early lactation management and improve exclusive breastfeeding rates, aligning with global health objectives.

However, integrating these interventions into routine postnatal care necessitates standardized training protocols, resource allocation, and reinforcement of cultural appropriateness. Additionally, further research should explore cost-effectiveness and acceptability among mothers and health workers alike.

V. CONCLUSION

This study aimed to compare the efficacy of the BOM (Breast Care, Oxytocin Massage, Mermaid Technique) method with the traditional Breast Care approach in enhancing breast milk production among postpartum mothers in the Takeran District. The findings indicate a significant difference between the two interventions, with the BOM method demonstrating superior outcomes.

Specifically, results revealed that 87.5% of mothers who received the BOM intervention experienced smooth and adequate milk production, as opposed to 37.5% in the control group who received breast care alone. Statistical analysis utilizing the Mann-Whitney U test confirmed the significance of these differences, yielding a p-value of 0.015 (<0.05), thereby substantiating the efficacy of the BOM approach in promoting lactation. The research highlights the potential of non-pharmacological stimulation techniques, such as breast massage, oxytocin massage, and mermaid technique, to effectively stimulate hormonal pathways responsible for milk ejection, notably prolactin and oxytocin, leading to improved milk supply.

These findings are consistent with previous studies suggesting that combined stimulation methods can enhance milk production, although some research, such as that by Titisari, indicated that breast care alone might not significantly impact lactation. The implications of this study suggest that healthcare providers should consider incorporating the BOM method in postpartum care practices to support breastfeeding success. Future research is recommended to include larger sample sizes and diverse populations to validate these outcomes further. Additionally, longitudinal studies could assess the sustainability of increased milk production and the impact on long-term breastfeeding practices. Exploring the psychological and emotional effects of these interventions on mothers could also provide a more comprehensive understanding of their benefits. Overall, the study underscores the importance of innovative, non-pharmacological methods in enhancing postnatal breastfeeding, which could contribute significantly to infant nutrition and maternal health outcomes. The integration of such techniques into routine postpartum care practices has the potential to increase breastfeeding success rates, thereby supporting optimal infant development and maternal well-being.

ACKNOWLEDGEMENTS

We sincerely thank all the postpartum mothers who participated in this study, as well as the healthcare staff at the Takeran Health Center for their support and cooperation. Our gratitude also goes to our colleagues and mentors for their valuable guidance and assistance throughout the research process. This study would not have been possible without their encouragement and dedication. We appreciate all those who contributed to the successful completion of this research.

FUNDING

This research was supported by the Department of Midwifery at Poltekkes Kemenkes Surabaya. No external funding or sponsorship was received for this study. The authors would like to acknowledge the institution's support in providing resources and facilities necessary for conducting the research. The study was conducted independently, and the findings and conclusions expressed are those of the authors.

DATA AVAILABILITY

The data used in this study are available from the corresponding author upon reasonable request. Due to

institutional policies and confidentiality considerations, the datasets are not publicly accessible online. Researchers interested in accessing the data can contact the author via email to obtain the necessary information, subject to approval and confidentiality agreements.

AUTHOR CONTRIBUTION

Alvy Nour Khasana contributed to the conceptualization and design of the study, coordinated the data collection process, and participated in manuscript drafting. Teta Puji Rahayu was responsible for data analysis, interpretation of the results, and statistical validation. Nurlailis Sa'adah served as the corresponding author, supervised the research implementation, ensured methodological consistency, and revised the manuscript critically for intellectual content. Sunarto assisted in literature review, intervention implementation, and contributed to the final editing and formatting of the manuscript. All authors read and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

DECLARATIONS

ETHICAL APPROVAL

The study received ethical approval from Poltekkes Kemenkes Surabaya (approval no. 04/KEPK/III/2022). All participants provided written informed consent, and the study adhered to the relevant ethical standards and local regulations.

CONSENT FOR PUBLICATION PARTICIPANTS

All participants involved in this study provided their informed written consent for their data and findings to be published. Participants were informed about the purpose of the study, the procedures involved, and their right to withdraw at any time without any consequences. Their confidentiality and privacy were maintained throughout the research, and any identifying information has been anonymized to ensure confidentiality before publication.

COMPETING INTERESTS

The authors declare that there are no competing interests or conflicts of interest related to the research, authorship, or publication of this article.

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