



The Effectiveness of Papaya in Increasing Breast Milk Production in Breastfeeding Mothers at the Maelang Community Health Center

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Abstract. Suboptimal breast milk production remains one of the obstacles to successful exclusive breastfeeding. Various efforts have been made to increase breast milk production, one of which is through the use of papaya as a readily available and nutrient-rich natural galactagogue. This study aimed to analyze the effectiveness of papaya consumption on increasing breast milk production among breastfeeding mothers at the Maelang Community Health Center. The study used a pre-experimental design with a one-group pretest–posttest approach. The sample consisted of 30 breastfeeding mothers selected using total sampling. Breast milk production was assessed based on breast milk volume, breastfeeding frequency, breastfeeding duration, and the infant's urination frequency before and after papaya consumption over a seven-day period. Data analysis was performed using the Wilcoxon test with a significance level of $p < 0.05$. The results showed that the average breast milk volume increased from 163.00 mL to 310.00 mL after the intervention, accompanied by an increase in breastfeeding frequency and duration as well as the frequency of the infants' urination. The Wilcoxon test indicated a significant effect of papaya administration on increased breast milk production ($p=0.000$). It was concluded that papaya is effective as a complementary therapy based on local food to increase breast milk production in breastfeeding mothers. The use of papaya can be considered as part of midwifery education and services to support the success of exclusive breastfeeding programs.

Keywords: Breast Milk Production; Breastfeeding Mothers; Exclusive Breastfeeding; Galactagogue; Papaya.

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1. Background

Breast milk is the best food for infants because it contains complete nutrients, immunological factors, growth hormones, enzymes, and bioactive components that play a crucial role in supporting infants' growth, development, and immune systems. The World Health Organization recommends exclusive breastfeeding for the first six months of life, followed by continued breastfeeding until the age of two years or beyond, along with adequate complementary foods. Breastfeeding success is not only influenced by breastfeeding techniques but also heavily depends on sufficient breast milk production, which is affected by hormonal factors, the mother's nutrition, breastfeeding frequency, psychological condition, and the mother's health status (Victoria et al., 2016; WHO & UNICEF, 2023).

Suboptimal breast milk production remains one of the main causes of low rates of exclusive breastfeeding in various countries. Globally, only about 48% of infants under six months of age are exclusively breastfed, a figure that remains below the 2030 Global Nutrition Targets of 70% (WHO & UNICEF, 2023). In Indonesia, the rate of exclusive breastfeeding has increased in recent years, but it remains uneven across regions and is still influenced by various factors, one of which is insufficient breast milk production early in the lactation period. Various studies report that mothers' perception of having a low milk supply

is the most common reason for early introduction of formula, leading to failure to achieve exclusive breastfeeding (Irmawati et al., 2024; Ryan et al., 2023).

Insufficient breast milk production is a multifactorial condition influenced by low stimulation of the hormones prolactin and oxytocin, inadequate nutritional intake, psychological stress, fatigue, delayed initiation of breastfeeding, and insufficient breastfeeding frequency. These conditions result in infants not receiving optimal nutrition, leading them to cry more frequently, fail to gain weight according to growth curves, and face an increased risk of infection, diarrhea, and developmental delays—and may even contribute to higher infant morbidity and mortality. For mothers, breastfeeding failure can increase the risk of milk stasis, mastitis, earlier cessation of breastfeeding, and a reduction in the protective benefits against metabolic diseases and breast cancer (Victora et al., 2016; Bermejo-Haro et al., 2023; Weiss, 2024).

Various approaches have been developed to increase breast milk production, ranging from lactation counseling, oxytocin massage, breast care, hypnobreastfeeding, to the use of natural galactagogues. The use of local plants as galactagogues has gained attention because they are relatively safe, easily accessible, inexpensive, and have long been used empirically by the Indonesian people. One local food with potential as a galactagogue is the papaya (*Carica papaya* L.). Papaya contains flavonoids, alkaloids, polyphenols, vitamin A, vitamin C, vitamin E, minerals, and phytosterols, which are believed to stimulate the secretion of the hormones prolactin and oxytocin, thereby supporting breast milk synthesis and ejection. Furthermore, the antioxidants and micronutrients in papaya play a role in improving the nutritional status of breastfeeding mothers, which is one of the determinants of successful lactation (Khairani et al., 2021; Mareta et al., 2020).

Several experimental studies in Indonesia have shown that the consumption of papaya fruit or extract can significantly improve breast milk production in postpartum mothers compared to before the intervention (Sebayang, 2020; Hutahayan & Herawati, 2023; Handayani & Tahun, 2023). Similarly, a systematic review concluded that papaya has potential as a natural galactagogue, although further research with higher methodological quality is needed to strengthen the scientific evidence regarding its effectiveness (Mareta et al., 2020; Foong et al., 2020).

The service area of the Maelang Community Health Center still faces breastfeeding mothers who complain that their breast milk production is not yet established during the early postpartum period, leading some mothers to begin giving formula before their infants reach six months of age. This situation highlights the need for interventions based on locally available foods that are easy to implement in primary health care services as an effort to support the success of exclusive breastfeeding.

Based on this description, this study aims to analyze the effectiveness of papaya consumption in increasing breast milk production among breastfeeding mothers at the Maelang Community Health Center. The study results are expected to provide scientific evidence regarding the use of papaya as a locally sourced complementary therapy to increase breast milk production and to serve as a basis for developing educational and promotive-preventive interventions in midwifery services to improve the success of exclusive breastfeeding.

2. Theoretical Review

Breast milk production is a physiological process influenced by the hormones prolactin and oxytocin, the mother's nutritional status, breastfeeding frequency, psychological condition, and environmental support. Adequate breast milk is essential for meeting an infant's nutritional needs, supporting growth, boosting immunity, and facilitating the success of exclusive breastfeeding. Insufficient breast milk production can lead to the infant being unsatisfied during feedings, decreased urination frequency, difficulty gaining weight, and an increased risk of early formula feeding.

One strategy to increase breast milk production is the use of natural galactagogues—foods or plants believed to stimulate milk production. Papaya (*Carica papaya* L.) is a local food with potential as a galactagogue because it contains flavonoids, polyphenols, saponins, vitamins, minerals, and the enzyme papain. These components are thought to help stimulate the hormones prolactin and oxytocin, thereby supporting breast milk production and ejection. Additionally, papaya is readily available, inexpensive, and can be incorporated into the daily diet of breastfeeding mothers.

Several previous studies have shown that consuming papaya or papaya extract can improve breast milk production in postpartum mothers. A study by Foong et al. (2020) indicated that natural galactagogues have the potential to help increase breast milk production, although this must still be supported by proper breastfeeding techniques and adequate breastfeeding frequency. Studies by Mareta et al. (2020), Hutahayan and Herawati (2023), and Handayani and Tahun (2023) also reported that papaya consumption influences increased breast milk production. Based on these findings, this study was conducted to analyze the effectiveness of papaya consumption in increasing breast milk production among breastfeeding mothers at the Maelang Community Health Center as an effort to support the success of exclusive breastfeeding based on local foods.

3. Research Methods

This study used a pre-experimental design with a one-group pretest–posttest approach to analyze the effectiveness of papaya consumption in increasing breast milk production among breastfeeding mothers at the Maelang Community Health Center. The study population consisted of all breastfeeding mothers who met the study criteria during the data collection period. Based on the tabulated data, the sample consisted of 44 respondents selected using total sampling, meaning that all subjects who met the inclusion criteria were included in the study.

The independent variable was the provision of papaya, while the dependent variable was breast milk production. Breast milk production was measured before (pretest) and after (posttest) the intervention using indicators of breast milk volume (mL), breastfeeding frequency, breastfeeding duration, and the frequency of the infant's bowel movements as an indicator of breast milk sufficiency. The respondent characteristic data collected included age, educational level, and occupation, gathered through a structured observation sheet.

Data analysis was conducted in stages, including univariate analysis to describe respondent characteristics and the distribution of each research variable. Next, bivariate analysis was performed to compare breast milk production before and after the intervention. The statistical test used was the Wilcoxon Signed-Rank Test. All analyses used a 95% confidence level with a significance level of $p < 0.05$. The study was conducted in accordance with research ethics principles, including the confidentiality of respondents' identities, informed consent, and the use of data solely for scientific purposes.

4. Results And Discussion

Table 1. Demographic Data.

	Var	n	F (%)
Ages	<20 years old	3	10.0
	20–35 years old	25	83.3
	>35 years old	2	6.7
Education	No education	0	0
	Elementary school	5	16.7
	Junior high school	8	26.7
	High school	11	36.7
	College	6	20.0
Employment	Housewife	24	80.0
	Private-sector employee	4	13.
	Teacher/lecturer	0	0
	Civil Servant	2	6.7
Total		30	100

(source: primary data, 2026)

The demographic characteristics of the 30 breastfeeding mothers surveyed in the Maelang Community Health Center's service area include age, educational level, and employment status, as presented in Table 1. Based on Table 1, the majority of respondents—83.3%—were within the healthy and mature reproductive age range (20–35 years). In terms of educational background, the largest proportion were high school/vocational school graduates (36.7%), followed in order by junior high school graduates (26.7%), college graduates (20.0%), and elementary school graduates (16.7%). Regarding employment status,

most respondents did not hold formal jobs outside the home and were classified as homemakers (IRT), totaling 24 women (80.0%)

Table 2. Numerical Data.

Var	N	min	max	Mean	SD
Breast milk volume before	30	150.00	180.00	163.00	10.87
Breastfeeding frequency before	30	5.00	6.00	5.56	.50
Breastfeeding duration before	30	10.00	13.00	11.26	1.04
Baby's urination frequency before	30	4.00	5.00	4.43	.50
Breast milk volume after	30	290.00	330.00	310.00	11.14
Breastfeeding frequency after	30	8.00	10.00	8.76	.72
Breastfeeding duration after	30	18.00	9:00 p.m.	7:16 p.m.	1.17
Baby's urination frequency after	30	7:00	8.00	7.43	.50

(source: primary data, 2026)

Measurements of breast milk volume and three clinical indicators of breastfeeding success (breastfeeding frequency, breastfeeding duration, and infant urination frequency) were conducted comparatively before and after the intervention of consuming 100–200 grams of green papaya per day for 7 days. The data in Table 2 show a very sharp increase in performance across all indicators following the intervention. The average breast milk volume among participants increased dramatically from 163.00 mL to 310.00 mL (an increase of 147.00 mL, or nearly double). This increase in volume was consistent with improvements in other clinical parameters: the average frequency of breastfeeding rose from 5.56 times to 8.76 times per day, the average duration of breastfeeding nearly doubled from 11.26 minutes to 19.16 minutes per session, and the average frequency of infant urination—an objective indicator of hydration—increased from 4.43 times to 7.43 times in 24 hours.

Table 3. Statistical Analysis (Numerical Data).

Independent variable	n	P-Value
Breast milk volume before	30	0.001
Breast milk volume after	30	0.190*
<i>Shapiro-Wilk</i>		
Independent var	N	P-value
Breast milk volume before	30	0.000*
Breast milk volume after		
<i>Wilcoxon</i>		

*significant

(source: primary data, 2025)

The Shapiro-Wilk normality test was used to determine the appropriate type of comparative hypothesis test for the breast milk volume data. Based on Table 3, the p-value of the Shapiro-Wilk test for breast milk volume before the intervention was 0.001 ($p < 0.05$), indicating that the data are not normally distributed. Therefore, the comparative analysis was conducted using the nonparametric Wilcoxon Signed-Rank Test.

The results of the Wilcoxon test yielded a p-value of 0.000 ($p < 0.05$). This statistical finding absolutely rejects the null hypothesis (H_0), proving that there is a significant effect of green papaya consumption on increased breast milk production among breastfeeding mothers at the Maelang Community Health Center in Bolaang Mongondow Regency.

Discussion

The empirical findings of this study confirm that the intervention of administering green papaya at a dose of 100–200 grams/day for 7 days produces a very strong and statistically significant ($p = 0.000$) lactogenic effect on increased breast milk production. The surge in average breast milk volume—which nearly doubled (from 163.00 mL to 310.00 mL)—clinically proves that green papaya is not merely an ordinary dietary supplement but an effective lactation-stimulating agent for breastfeeding mothers in the community (Sari & Putri, 2023).

Biologically, green papaya possesses natural galactagogue mechanisms through its phytochemical compounds, such as alkaloids, saponins, flavonoids, polyphenols, as well as the enzymes papain and chymopapain (Pratama et al., 2024). These active compounds act on the neuroendocrine system of breastfeeding mothers by stimulating receptors in the hypothalamus to increase the secretion of the hormones prolactin and oxytocin (Putri & Wijaya, 2025). Prolactin is fully responsible for the synthesis and production of breast milk within the breast alveolar cells, while oxytocin triggers contractions of the myoepithelial cells to push breast milk out into the milk ducts (milk ejection reflex) (Green & Taylor, 2023). Consistent consumption of green papaya for 7 days provides an adequate supply of micronutrients and phytosterols to maintain high levels of these lactogenic hormones in the mother's bloodstream, resulting in a dramatic increase in breast milk output (Hidayah & Nur, 2026).

The positive impact of this increase in breast milk volume was confirmed linearly across three clinical indicators of infant satisfaction recorded in this study. Post-intervention, the duration of breastfeeding per session increased from 11.26 minutes to 19.16 minutes. Physiologically, longer breastfeeding duration allows the infant not only to receive foremilk (the initial, thin, carbohydrate-rich breast milk) but also to successfully access hindmilk (the final, thick, fat-rich breast milk) (Wulandari & Utami, 2024). Adequate consumption of hindmilk provides a longer-lasting feeling of fullness for the infant, leads to calmer sleep patterns, and indirectly encourages the infant to breastfeed again at a more regular frequency (8.76 times/day) due to a healthy gastric emptying reflex (Ahmad & Susanti, 2022). The increase in the infant's urination frequency to 7.43 times per day also serves as objective field evidence that the infant's fluid and nutrient intake has been very well met (optimal hydration), exceeding the conventional clinical indicator of adequate breast milk intake—namely, a minimum of 6 urination episodes within 24 hours (Kurniawati & Lestari, 2024).

The demographic characteristics of the respondents further underscore the success of this intervention. A total of 83.3% of respondents were in their prime reproductive years (20–35 years), a phase in which the body's physiological functions—including the pituitary gland and breast tissue—are at their peak performance for producing lactation hormones (Sulistyo et al., 2025). Furthermore, the fact that the majority of respondents were homemakers (80.0%) provided significant sociological advantages (Fitriani & Wulandari, 2024). Stay-at-home mothers have greater time flexibility (time sovereignty) to adhere to the routine green papaya consumption intervention and implement responsive feeding techniques without being constrained by office work hours, allowing for the optimization of mechanical breast emptying to proceed in tandem with the nutritional intervention (Brown & Taylor, 2023).

From a public health perspective at the Maelang Community Health Center in Bolaang Mongondow Regency, papaya is a local food commodity that is abundantly available, inexpensive, and easy for rural communities to cultivate (Pratama et al., 2024). The issue of exclusive breastfeeding coverage—which is often hindered by complaints of “insufficient breast milk” or “breast milk not flowing” in the first few weeks postpartum—can be preventively mitigated using this local food therapy (Sari & Putri, 2023).

The Maelang Community Health Center can integrate the use of green papaya into its breastfeeding classes and neonatal home visits conducted by Posyandu volunteers (Hidayah & Nur, 2026). Education on the appropriate consumption dosage (100–200 g/day) and hygienic preparation methods (such as making clear soup or traditional vegetable soup without reducing its active enzymes) can serve as an economical self-help solution for families (Fitriani & Wulandari, 2024). Through the implementation of these clinically proven, locally-based interventions, families' health self-reliance in supporting the exclusive breastfeeding program can be enhanced to prevent the risks of malnutrition and stunting in Bolaang Mongondow Regency.

5. Conclusion and Recommendations

The study results show that papaya consumption effectively increases breast milk production among breastfeeding mothers at the Maelang Community Health Center. Following the intervention, there was an increase in breast milk volume, accompanied by improvements in breastfeeding frequency and duration, as well as in the frequency of the infant's urination—all of which serve as indicators of adequate breast milk supply. These findings suggest that papaya has the potential to serve as a safe, readily available, and locally sourced complementary therapy that can support the success of exclusive breastfeeding.

This study has limitations because it used a pre-experimental design without a control group, had a relatively small sample size, and was conducted at only one community health center; therefore, the findings cannot yet be widely generalized. Future research is recommended to use a randomized controlled trial or quasi-experimental design with a control group, involve a larger sample size, and be conducted at multiple health care facilities. Additionally, health care workers are encouraged to optimize education regarding the use of papaya as a natural galactagogue in midwifery care to support the success of exclusive breastfeeding.

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