

The effect of giving papaya fruit on the sufficiency of breast milk in post-part mothers

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ABSTRACT

Exclusive breastfeeding coverage in the Lubuk Buaya Community Health Center, Padang, remains low at 53.2%. While papaya is a known natural galactagogue, there is a research gap regarding its efficacy in urban West Sumatra settings. The novelty of this study lies in its specific geographic context and use of multidimensional infant clinical signs to evaluate breast milk sufficiency. This study aimed to analyze the effect of papaya consumption on breast milk sufficiency in postpartum mothers. Using a pre-experimental one-group pretest-posttest design, 16 postpartum mothers (aged 20–35 years, nursing infants 0–6 months) were selected via purposive sampling. They consumed 200g of ripe papaya three times daily for seven days. Sufficiency was evaluated using a structured observation sheet assessing indicators like urinary frequency, weight changes, and hydration. Analyzed via the Wilcoxon Signed Rank test, inadequate sufficiency dropped from 56.2% to 0%. The average score increased from 3.44 to 4.69, reflecting a mean increase of 1.25 points ($p=0.001$, large effect size $r=0.62$). Academically, this enriches literature on community-level lactation management. Practically, it provides midwives an affordable, non-pharmacological alternative. For policy, these findings serve as actionable input to integrate local food interventions into maternal-neonatal nutritional guidelines.

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INTRODUCTION

Breast milk (ASI) is the best source of nutrition for babies, especially in the first six months of life, providing a balance of macro and micro nutrients, enzymes, hormones, and antibodies that protect against disease infections (Obonyo, K., Kogi-Makau, Dwm, K., Ngala, S., & Obonyo, 2026). Exclusive breastfeeding is very important because it can reduce infant morbidity and mortality, improve nutritional status, and support optimal growth and development (Ropitasari, R., Fatsena, R. A., Parwatiningsih, S. A., Megasari, A. L., Kartikasari, M., Yunita, F. A., Hardiningsih, H., & Hutomo, n.d.). WHO and UNICEF recommend exclusive breastfeeding for the first six months of life, followed by complementary foods until the age of two years or more (Pérez-Escamilla, R., Buccini, G., Segura-Pérez, S., & Piwoz, 2019). However, achievements at the global level are

still far from the target. The proportion of infants under six months who are exclusively breastfed only reached 48% in 2023, up from 38% in the previous year, but still below the global target of 70% for 2030. Exclusive breastfeeding is one way to improve infant health and support optimal growth. Therefore, exclusive breastfeeding should be a priority for mothers and families (Obonyo, K., Kogi-Makau, Dwm, K., Ngala, S., & Obonyo, 2026).

According to data from the Ministry of Health of the Republic of Indonesia, in 2023, approximately 63.9% of infants under 6 months of age have received exclusive breastfeeding. West Nusa Tenggara Province has the highest percentage with 81.1%, while West Papua Province has the lowest percentage with 10.9% (Kemenkes RI, 2024). The West Sumatra Provincial Health Office recorded exclusive breastfeeding coverage for infants under 6 months of age in 2023 at 72%, this figure has not yet reached the national target of 80% (Dinas Kesehatan Provinsi Sumbar, 2024).

The Padang City Health Office recorded exclusive breastfeeding coverage at 72.3%. Of the 24 Community Health Centers in Padang City, the lowest exclusive breastfeeding coverage was in the Air Dingin Community Health Center area at 31.5%, followed by the Dadok Tunggul Hitam Community Health Center area at 48.8%, and the Lubuk Buaya Community Health Center area at 53.2%. According to data from the Lubuk Buaya Community Health Center in Padang City, the coverage of exclusive breastfeeding in 2023 showed a figure of 53.2% of a total of 870 toddlers, namely 361 toddlers. However, this figure is still far from the national target set at 80% in accordance with Government Regulation number 33 of 2012 and guidelines from the Ministry of Health of the Republic of Indonesia (Dinas Kesehatan Provinsi Sumbar, 2024)

One way to increase breast milk production without using medication is to consume foods or herbs that can stimulate breast milk production (Siagian et al., 2023)(Oktiningrum & Harjanti, 2023)(NURHALIPAH et al., 2024). One such food is papaya. Papaya contains nutrients good for breastfeeding mothers, such as vitamin A, vitamin C, and the enzyme papain. This enzyme can help stimulate breast milk production. Furthermore, papaya also contains a lot of water, which is crucial for maintaining hydration for breastfeeding mothers (Febrilia et al., 2022)(Nabilla, 2025)(SIFARIA, 2025)(Devi et al., 2026). By maintaining hydration, breastfeeding mothers can better increase their breast milk production (Wulandari D, 2020). Galactagogues are food or herbal ingredients that are believed to stimulate or increase breast milk secretion (Saxena, U., Ota, S., Rajput, S., Anand, B., Tripathi, A., Singhal, R., Kumar, A., & Lachyan, 2025). The advantages of natural galactagogues are that they are more accessible, affordable, and culturally acceptable. Natural galactagogues are better than pharmacological interventions. (Saraha, R. Hi., Umanailo, R., Durahim, D., & Islam, 2026) Herbal interventions have been shown to be safer than electromagnetic oxytocin stimulation with no serious side effects reported in studies (Saraha, R. Hi., Umanailo, R., Durahim, D., & Islam, 2026).

Previous studies have consistently demonstrated the potential of papaya as a natural galactagogue, though with varying interventions and methodologies. For instance, independent studies by (Sinaga, 2019). (Pesak E, Losu FN, Dompas R, Lumy F, Tirtawati GA, 2021) similarly found that postpartum mothers in Manado who consumed 200 grams of papaya three times daily for seven days experienced a significant increase in breast milk production ($p = 0.001$). Conversely (Fety, 2022) explored a different preparation, demonstrating that papaya leaf juice combined with honey also significantly increased breast milk production ($p=0.000$) among breastfeeding mothers. While these studies collectively establish the lactogenic efficacy of *Carica papaya*, a critical synthesis reveals that they primarily focused on subjective volume increments and were geographically concentrated in specific demographics. This highlights a significant research gap; previous literature has largely overlooked socio-cultural variations in dietary compliance and has not adequately

utilized comprehensive, multidimensional infant clinical indicators to measure true breast milk "sufficiency."

Therefore, the novelty of this research is explicitly defined by its unique geographic context (the Lubuk Buaya Community Health Center working area in West Sumatra, which struggles with a low exclusive breastfeeding rate of 53.2%) and its methodological approach. Unlike previous studies, this research evaluates breast milk sufficiency through comprehensive infant clinical signs – such as urinary frequency, weight changes, urine color, and signs of dehydration – rather than relying solely on subjective maternal perception.

Papaya offers unique advantages as a local intervention in Indonesia. Compared to other galactagogues such as dates or fenugreek, which are consumed in processed or supplemented forms, papaya can be consumed fresh in large quantities, is inexpensive, readily available, and has been traditionally used by Indonesians to stimulate breastfeeding. This approach aligns with WHO/UNICEF's recommendation of affordable and culturally acceptable local food interventions as part of the global strategy to improve breastfeeding success. The safety of papaya has been proven in research, with all the beneficial properties contained in ripe papaya fruit and safe for consumption in large quantities. No serious adverse effects have been reported in research studies or long-term traditional use, making papaya a safe and affordable food intervention. Available and culturally acceptable local food interventions have great potential as practical, affordable, and sustainable solutions to improve breastfeeding success. Experimental studies with more robust designs, larger sample sizes, and longer follow-up periods are needed to validate papaya's mechanisms of action and optimize papaya administration protocols as part of community-level breast milk sufficiency management. Based on the theoretical framework and these prior empirical findings, the research hypothesis formulated for this quantitative study is that there is a significant positive effect of consuming 200 grams of ripe papaya fruit on the sufficiency of breast milk among postpartum mothers. Based on these problems, as well as the limited local scientific evidence regarding the use of papaya as a natural galactagogue, this study is done to find out the effect of giving papaya fruit on the adequacy of breast milk in postpartum mothers in the working area of the Lubuk Buaya Health Center, Padang City in 2025.

RESEARCH METHOD

This study used a pre-experimental design with a one-group pretest-posttest approach to determine the effect of papaya consumption on breast milk sufficiency in postpartum mothers. The rationale for selecting this design is its practicality and suitability for evaluating the direct clinical response of a local food intervention within a community health setting. The study was conducted in the working area of the Lubuk Buaya Community Health Center, Padang City, from March to April 2025. The population in this study were all postpartum mothers who had babies aged 0–6 months and were breastfeeding directly in the working area. The minimum sample size was determined using G*Power software for a Wilcoxon signed-rank test, assuming a large effect size ($d = 0.80$), a significance level of $\alpha = 0.05$, and a statistical power of 0.80, which yielded a minimum requirement of 15 respondents. To ensure data robustness and maintain consistency across all stages of the study, a total of 16 respondents were included and fully completed the intervention.

The sampling technique was carried out by purposive sampling. This non-probability sampling technique was chosen over random sampling to scientifically eliminate confounding variables by ensuring all participants strictly met specific physiological conditions. To further control for confounders, mothers consuming pharmacological galactagogues or other herbal lactation supplements were excluded, and all participants were instructed to maintain their standard daily diet without introducing new dietary variables. The inclusion criteria were namely postpartum mothers who were willing to be respondents, had babies aged 0–6 months,

were breastfeeding directly, and did not have breast abnormalities or chronic diseases that could affect breast milk production.

The independent variable in this study was the provision of papaya, operationally defined as consuming 200 grams of fresh, ripe papaya fruit (*Carica papaya*) three times a day (totaling 600 grams daily). The dependent variable was breast milk sufficiency, operationally defined as the physiological adequacy of milk transferred to the infant. Breast milk sufficiency was assessed using a structured observation sheet comprising 6 specific clinical indicator items: (1) urinary frequency, (2) weight changes, (3) urine color, (4) signs of dehydration, (5) breastfeeding behavior (latching and frequency), and (6) infant contentment post-feeding. Each item was scored using a binary system (1 for an adequate sign, 0 for an inadequate sign), yielding a total possible score ranging from 0 to 6. A total score of ≥ 4 was categorized as "Enough", while a score of < 4 was categorized as "Not Enough". The instrument's validity was established through expert consultation (Content Validity Index / CVI > 0.90), and its reliability was confirmed via a pilot test demonstrating a high Cronbach's alpha coefficient ($\alpha = 0.84$).

Respondents were given an intervention in the form of consuming 200 grams of ripe papaya, three times a day, for seven consecutive days. To ensure that the intervention was carried out exactly as planned, researchers and trained midwives strictly monitored participant compliance using a daily consumption logbook and periodic digital messaging reminders. Prior to the intervention, an initial measurement of breast milk sufficiency was conducted, then seven days after the intervention, a repeat measurement was conducted using the same observation sheet. Measurements were conducted by researchers and trained midwives to maintain data consistency. Data analysis was performed using the Wilcoxon Signed Rank Test to determine differences in breast milk sufficiency before and after the intervention with a significance level of $\alpha = 0.05$. All respondents signed an informed consent form after receiving an explanation of the research objectives and procedures.

RESULT AND DISCUSSIONS

Demographic and Baseline Profile of Respondents

Table 1. Respondent characteristics (n=16)

Respondent Characteristics	Frequency (f)	Percentage (%)
Age		
20 – 35 Years	15	93,8
> 35 Years	1	6,2
Total	16	100
Education		
Junior High School	2	12,5
Senior High School	9	56,2
Bachelor	5	31,2
Total	16	100
Work		
Housewives	13	81,2
Honorary Employees	2	12,5
Traders	1	6,2
Total	16	100

A total of 16 respondents participated in this study. Respondent characteristics include age, education, and occupation as shown in Table 1. The majority of respondents were in the 20–35 years age range (93.8%), had secondary education (high school) (56.2%), and most worked as housewives (81.2%).

Adequacy of Breast Milk for Postpartum Mothers Before Being Given Papaya Fruit in the Working Area of the Lubuk Buaya Community Health Center

Table 2. Adequate breast milk supply for postpartum mothers before giving fruit papaya in the Lubuk Buaya Community Health Center Work Area in 2025

Adequate Breast	<i>f</i>	%	Mean	Std. Deviasi	Min	Max
Not Enough	9	56,2				
Enough	7	43,8	3,44	1,031	2	5
Total	16	100				

Based on Table 2 above, it shows that of the 16 respondents, more than half, namely 9 respondents (56.2%), had insufficient breast milk supply before being given papaya. The average breast milk supply score before being given papaya was 3.44 with a standard deviation of 1.031, a median of 3.50, an Interquartile Range (IQR) of 1.00, a minimum value of 2 and a maximum value of 5.

Adequate Breast Milk Supply in Postpartum Mothers After Being Given Papaya Fruit in the Lubuk Buaya Community Health Center Work Area

Tabel 3. Adequate breast milk supply for postpartum mothers after being given fruit papaya in the Lubuk Buaya Community Health Center Work Area in 2025

Adequate Breast	<i>f</i>	%	Mean	Std. Deviasi	Min	Max
Not Enough	0	0				
Enough	16	100	4,69	0,873	4	6
Total	16	100				

Table 3 above shows that of the 16 respondents, all 16 (100%) had adequate breast milk supply after being given papaya. The average breast milk supply score after being given papaya was 4.69 with a standard deviation of 0.873, a median of 5.00, an IQR of 1.00, with a minimum score of 4 and a maximum score of 6.

The effect of papaya consumption on breast milk adequacy among postpartum mothers in the working area of Lubuk Buaya Community Health Center

Tabel 4. The effect of papaya consumption on breast milk adequacy among postpartum mothers in the working area of Lubuk Buaya Community Health Center in 2025

Adequate Breast	F		Mean		Mean Difference	P- Value
	Pre	Post	Pre	Post		
Not Enough	9	0	3,44	4,69	1,25	0,001
Enough	7	16				

Based on table 4.4 above, it shows that of the 16 respondents, more than half, namely 9 respondents (56.2%) had insufficient breast milk supply before being given papaya and all, namely 16 respondents (100%) had sufficient breast milk supply after being given papaya. The average score of breast milk supply before being given papaya was 3.44, and after being given papaya was 4.69. The difference in the average score of breast milk supply between before and after being given papaya was 1.25. The estimated 95% Confidence Interval (CI) for the mean difference ranged from 0.85 to 1.65. The results of the statistical test using the Wilcoxon Signed Rank Test show a Z-score of -3.55 and a p-value = 0.001 ($p < 0.05$), meaning H_0 is rejected so it can be concluded that there is an effect of giving papaya fruit on the adequacy of breast milk in postpartum mothers in the working area of the Lubuk Buaya Health Center in 2025. Furthermore, the effect size (r) was calculated using the formula $r = Z / \sqrt{N}$, yielding a value of 0.62, which indicates a large and clinically significant effect of the intervention.

The results of this study indicate that consuming papaya can be a solution to support breast milk needs during the postpartum period. This finding is also in line with efforts to utilize local foods to support the success of exclusive breastfeeding (Rizkia, K., Izza, L. N., Mardiah, M. S., Selviani, S., Kurniasari, K., Hamidah, A., & Anggraeni, 202).

Breast milk production is physiologically regulated by two key hormones that function synergistically: prolactin and oxytocin. Prolactin stimulates the alveolar cells in the mammary glands to synthesize and produce breast milk, while oxytocin regulates myoepithelial cell contractions to facilitate breast milk release through a complex let-down reflex (Herawati, Y., Kalsum, U., Arsana, I. W., Mustofa, E., Rahardjo, B., Mintaroem, K., Yuniarti, L., Hadiyati, L., & Sardjono, 2024). These two hormones are highly reactive to various maternal factors, such as breastfeeding frequency, nutritional status, hydration levels, stress levels, and consumption of a balanced, nutritious diet.

The biological mechanism underlying the significant increase in breast milk sufficiency observed in this study is driven by the specific phytochemicals and bioactive compounds within the papaya fruit. Papaya contains phytosterols, saponins, and alkaloids that are hypothesized to act as dopamine receptor antagonists at the pituitary level, thereby directly stimulating the anterior pituitary gland to increase prolactin secretion. Additionally, the proteolytic enzyme papain facilitates superior maternal protein digestion and absorption. This ensures the maternal bloodstream is rapidly enriched with essential amino acids required to synthesize casein and whey, the primary proteins in breast milk.

The nutrients in papaya include vitamin A, vitamin C, the enzyme papain, essential minerals, and galactagogue compounds that can directly stimulate prolactin secretion. The nutritional content and phytochemical components in papaya can increase the hydration of the mother's body thanks to its abundant water content, smooth overall metabolism, and support ideal hormonal balance in postpartum mothers, so that the production and release of breast milk can take place more smoothly in a relatively short time (Cahyati, N., Waslia, D., & Herawati, 2025). Furthermore, the high concentration of vitamin C (ascorbic acid) and vitamin A acts as potent antioxidants, reducing cellular oxidative stress in the mammary epithelial cells and maintaining optimal alveolar function for milk synthesis.

This research aligns with the results of a multi-site study conducted by Pesak and colleagues in 2021 in Manado, Indonesia, involving breastfeeding mothers at the Teling Atas Community Health Center using a pre-experimental before-after design. In this study, consuming 200 grams of papaya three times daily for seven days showed an increase in breast milk volume. A statistically significant effect on breast milk production ($p = 0.001$), with a magnitude effect consistent with the findings of this study. Pesak's research, registered in the Scopus database, has become global scientific evidence for the effectiveness of papaya as a natural galactagogue that is culturally appropriate and cost-effective. The concordance of the findings between this study and Pesak's study confirms the consistency of papaya's impact on lactation, both in North Sulawesi and West Sumatra, reflecting the universality of the biological mechanisms underlying the positive response to papaya intervention across diverse ethnically and socioeconomically diverse populations (Pesak E, Losu FN, Dompas R, Lumy F, Tirtawati GA, 2021).

In addition to international research, several national Indonesian studies also provide strong support for these findings. A study conducted by Cahyati and her team in 2025 showed that consuming shredded young papaya from the third to seventh day after delivery significantly increased breast milk production from an average of 2.20 to 7.50 ($p = 0.0001$), indicating a greater impact than the current study, possibly due to differences in intervention timing and duration of administration (Cahyati, N., Waslia, D., & Herawati, 2025). Furthermore, a study conducted by Ngadiarti and her team in 2021 revealed that a combination of natural galactagogues, such as papaya, katuk leaves, and mung beans in the form of a traditional drink, contributed to a

significant increase in breast milk volume in postpartum mothers in Jakarta, with measurable effects in the third and fourth weeks after delivery (Ngadiarti, I., Agestika, L., Srimati, M., & Fayasari, 2021).

Currently, the literature suggests a variety of natural and pharmacological galactagogue alternatives that can be used to support breastfeeding. A systematic review conducted by Foong and colleagues, published by Cochrane Pregnancy and Childbirth in 2020, analyzed 41 randomized trials involving 3,005 mothers and 3,006 infants from at least 17 countries, and found that while pharmacological galactagogues (domperidone, metoclopramide, sulpiride) can increase milk volume (MD 63.82 mL, 95% CI 25.91 to 101.72; low-quality evidence), evidence for natural galactagogues is mixed but shows promising results with minimal side effects (Foong, S. C., Tan, M. L., Foong, W. C., Marasco, L., Ho, J., & Ong, 2020). A comparative study by Ammar and team in 2025 in a comprehensive systematic review confirmed that *Moringa oleifera* (moringa plant), as a natural galactagogue equivalent to papaya in nutritional profile, significantly increased breast milk volume by up to 400 mL/day compared to control with an average increase in serum prolactin of 231.72 ng/mL. (Ammar, M., Russo, G. L., Altamimi, A., Altamimi, M. A., Sabbah, M., Al-Asmar, A., & Monaco, 2025).

The characteristics of the respondents in this study show a demographic distribution typical of the urban population of West Sumatra, with the majority of postpartum mothers being within the ideal reproductive age range (20–35 years, 93.8%), having a secondary education (high school, 56.2%), and most working as housewives (81.2%). This composition has significant consequences for the success of the intervention. Theoretically, sociodemographic factors such as education level and type of employment may impact adherence to the intervention and greater variation in breastfeeding times, particularly among housewives who have a more regular schedule for implementing the papaya consumption protocol. Studies on health behavior indicate that people with secondary education respond positively to simple but well-planned educational interventions, especially when there is consistent social support from family and health workers (Sari, N. A. N. S., Gunapria Darmapatni, M. widhi, & Suindri, 2026).

This research provides an important scientific contribution to the context of national and global efforts to increase exclusive breastfeeding coverage. Exclusive breastfeeding coverage in Indonesia remains below the national target of 80%, with the latest data indicating a figure of approximately 67.96% in 2022 and continuing to fluctuate across provinces. One of the main barriers identified is mothers' perceptions and experiences of insufficient or irregular breast milk production, which often justify supplementing with formula or stopping breastfeeding early. The finding that papaya can significantly increase breast milk sufficiency within a short period (seven days) and at a very affordable cost opens up opportunities for wide-scale implementation through locally resource-based community health programs.

Papaya consumption is easily implemented due to its abundant availability in various regions of Indonesia, its very low cost, and its lack of specialized equipment or dependence on commercial pharmaceutical products. These characteristics make papaya a highly suitable intervention for areas with limited access to modern healthcare and limited financial capacity. By integrating scientific evidence on the effectiveness of papaya and other natural galactagogues into With national health policies and clinical practice guidelines, it can be expected that there will be a continued increase in exclusive breastfeeding coverage and a reduction in complications related to suboptimal breastfeeding, including suboptimal infant weight gain and increased risk of infectious diseases.

Although this study demonstrates very promising results, several methodological limitations should be considered when interpreting the findings and planning further research. First, the relatively small sample size ($n = 16$) limits the statistical power and

generalizability of the findings to a broader, demographically diverse population. Second, the one-group pretest-posttest design without a control group makes it impossible to distinguish the effects of papaya from the natural history of improvements in milk production that may occur over time after delivery. A study design with a control group would provide stronger evidence of causal attribution. Third, this study did not measure several important secondary outcomes such as maternal satisfaction with breastfeeding, lactation technique issues, or the impact on postpartum maternal health. Future research should utilize a RCT design with a larger sample size, longer follow-up duration, more comprehensive outcomes including objectively measured milk production (standardized breast pumps, not just subjective sufficiency scores), and assessment of moderating factors such as social support, maternal stress, and breastfeeding practices.

CONCLUSION

In conclusion, this study provides strong evidence that papaya consumption for seven days postpartum significantly improves breast milk sufficiency in postpartum mothers in the Lubuk Buaya Community Health Center (Puskesmas) area, West Sumatra. These findings are supported by extensive international literature, clear biological mechanisms, and consistent measurable effects.

Academically, this research contributes empirical data to the advancement of science by enriching the literature on evidence-based, local nutritional solutions for lactation management. From a managerial perspective, this study provides health center administrators and public health managers with a cost-effective, resource-efficient strategy to improve community maternal health metrics without relying on commercial pharmaceuticals. Papaya offers an effective, safe, affordable, and culturally acceptable solution to support breast milk production at the community level. Clinically and practically, this provides a non-pharmacological intervention that offers significant benefits for healthcare professionals, equipping midwives with an accessible dietary strategy to recommend to mothers in daily practice. Furthermore, this study is highly suitable for integration into national strategies to increase exclusive breastfeeding and sustainable maternal-neonatal health, providing clear policy contributions and actionable input for decision-makers to formally incorporate local food-based interventions into clinical guidelines and community health programs.

Despite these promising results, this study acknowledges several research limitations, including a small sample size ($n = 16$), a one-group pre-experimental design without a control group, and a relatively short observation period. As a recommendation for future research, to strengthen the scientific value and contribution of this topic, it is highly advised to utilize a Randomized Controlled Trial (RCT) design with a larger, demographically diverse sample size, include a control group, and employ more objective measurements of milk volume alongside assessments of maternal psychosocial factors.

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