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Role of Soy-Based Nutritional Extract in Enhancing Breast Milk Production After Childbirth

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A B S T R A C T

Exclusive breastfeeding refers to feeding infants solely with breast milk, without introducing any other liquids such as formula, juice, honey, or water, and without solid foods such as bananas, papaya, powdered milk, biscuits, porridge, or mashed rice. The investigation will be conducted during the period of June to July 2025 at the operational area of UPTD Kedaton Health Center, Cirebon Regency. The research applied a quasi-experimental approach, a method designed to identify cause-and-effect relationships between two variables through deliberate intervention while reducing or eliminating potential confounding influences. According to the Mann-Whitney test, soy milk significantly influenced breast milk production, as evidenced by a p-value of 0.028 (< 0.05). The study concluded that the administration of soy milk has a significant positive effect on breast milk production among postpartum mothers.

INTRODUCTION

The World Health Organization (WHO) advises that infants should be exclusively breastfed during the first six months of life and that breastfeeding be continued up to two years. Breast milk provides a complete and well-balanced source of nutrition for newborns, serving as the only food they need until six months of age, while remaining a vital nutritional supplement alongside solid foods until the age of two. However, despite its well-documented advantages, WHO reports that only about 40% of infants globally receive exclusive breastfeeding for the recommended six-month duration (Wahyuningsih, 2018).

Exclusive breastfeeding refers to feeding infants solely with breast milk, without introducing any other liquids such as formula, juice, honey, or water, and without solid foods such as bananas, papaya, powdered milk, biscuits, porridge, or mashed rice. According to WHO guidelines, at the age of six months, infants should begin complementary feeding with soft or mashed foods such as fruits and vegetables, while breastfeeding continues until the age of two. Exclusive breastfeeding plays a significant role in ensuring a child's optimal growth and long-term health, offering benefits that extend not only to the infant but also to the mother, the family unit, society, and the wider world (Astuti, 2017).

Postpartum mothers often experience challenges with breastfeeding, one of the most frequent being insufficient milk production or a slow milk flow. Several factors contribute to breastfeeding difficulties, including the absence of early initiation of breastfeeding (EIBF) immediately after birth, feeding from only one breast, the use of supplemental nutrition besides breast milk, infants who tend to sleep excessively, shortened feeding times, and incorrect positioning or latching during breastfeeding (Arifianto, 2019).

Based on the 2018 Basic Health Research (Riskesdas), the rate of exclusive breastfeeding in Indonesia was still relatively low at 37.3%. Meanwhile, the Indonesian Health Profile (2020) reported that postpartum maternal care with complete follow-up visits reached 88.3%.

Studies have shown that infants whose mothers regularly consume tofu and soy milk tend to have higher levels of isoflavones. These compounds, naturally present in soy products, are believed to stimulate breast milk production while also lowering the risk of breast cancer. Soy milk, a beverage derived from soybean extract, is recognized for its rich nutritional profile. It contains bioactive elements such as alkaloids, polyphenols, steroids, flavonoids, and isoflavones, which can activate oxytocin and prolactin hormones, thereby enhancing lactation (Puspitasari, 2018).

Essentially, soy milk represents the soluble fraction of soybeans processed into a protein-rich drink. The nutrients found in legumes not only contribute to fetal development during pregnancy but also play a role in improving breast milk secretion and influencing its quality in postpartum mothers, as noted by Dwi (2014).

Further, Siauta (2021) reported a significant improvement in breast milk output and infant weight following the intake of soybean–melon juice by mothers. Owing to its substantial levels of protein, iron, and vitamins, soy milk

functions effectively as a natural galactagogue. Its diverse bioactive components—including alkaloids, polyphenols, steroids, flavonoids, and isoflavones—help stimulate the release of oxytocin and prolactin, which are key to increasing both the volume and smooth flow of breast milk.

Manurung (2021) also found that soy milk intake had a significant effect on increasing breast milk production in Mangga Dua Village, Dusun III, Tanjung Beringin Subdistrict, Serdang Bedagai Regency in 2020, with results showing a p-value of < 0.05.

In a preliminary assessment carried out at Kedaton Health Center in August 2023, it was identified that out of 15 postpartum mothers who visited, nine reported insufficient breast milk supply, which often caused their infants to become irritable. The midwives at the health center had attempted to address this by providing counseling sessions on fulfilling postpartum nutritional needs. Based on these observations, the researcher was motivated to conduct a study on the impact of soy milk consumption on breast milk production among postpartum mothers at Kedaton Health Center, Cirebon Regency, in 2025.

LITERATUR REVIEW

Summary table of Studies (2015-2025)

Author & Year	Country	Design	Sample Size	Intervention (dose/duration)	Outcome Measures	Main Findings	Limitations
Retno et al., 2018	Indonesia	Quasi-experimental (pre-post)	60 postpartum mothers	Soy milk 300 mL/day × 14 days	Expressed breast milk volume, subjective report	Significant ↑ in breast milk volume compared to baseline	Non-randomized, no strict control group
Sari et al., 2020	Indonesia	Quasi-experimental with control	50 postpartum mothers	Soy milk 2×300 mL/day × 10 days	Baby-weighing test for milk volume	↑ breast milk volume, p<0.05	Small sample, some self-report data
Wang et al., 2022	China	RCT	90 lactating mothers	Millet–soy–ginger beverage 200 mL/day × 14 days	Breast milk volume, prolactin levels	↑ milk volume (+25 mL on average) & prolactin compared to control	Intervention was a mixture, not soy alone
Li et al., 2019	China	Randomized cross-over trial	35 lactating mothers	Soy beverage vs control (7 days)	Isoflavone levels in breast milk	Significant ↑ in genistein/daidzein after soy intake	Did not assess milk volume

Author & Year	Country	Design	Sample Size	Intervention (dose/duration)	Outcome Measures	Main Findings	Limitations
Rahmawati et al., 2021	Indonesia	Quasi-experimental	40 postpartum mothers	Soy milk 250 mL/day × 7 days	Feeding frequency, infant urination, maternal report	No significant effect	Reliance on indirect indicators
Zhou et al., 2020	China	Animal experiment (postpartum mice)	24 female mice	Standardized soy isoflavone extract × 21 days	Milk volume, oxidative stress biomarkers	↑ lactation performance, ↓ oxidative stress	Limited human applicability
Smith et al., 2021	Global	Mechanistic review	–	Analysis of plant polyphenols including soy	Prolactin/oxytocin pathways, antioxidant mechanisms	Biological plausibility supported	Theoretical, not clinical evidence

The reviewed evidence from 2015 to 2025 suggests that soy-based nutritional extracts, particularly soy milk and isoflavone supplementation, have the potential to enhance breast milk production and improve lactation-related biomarkers in postpartum women. Several quasi-experimental studies and randomized controlled trials reported significant increases in breast milk volume and prolactin levels following soy-based interventions. However, the findings remain inconsistent, as some studies observed no significant effects or relied on indirect indicators of lactation. Animal and mechanistic studies provide biological plausibility, highlighting the role of isoflavones in modulating prolactin pathways, oxidative stress, and milk composition. Despite these promising outcomes, limitations such as small sample sizes, non-randomized designs, and mixed interventions warrant cautious interpretation. Future large-scale, well-controlled clinical trials are needed to confirm the efficacy of soy-based extracts as a natural galactagogue in postpartum care.

METHODS

The research applied a quasi-experimental approach, a method designed to identify cause-and-effect relationships between two variables through deliberate intervention while reducing or eliminating potential confounding influences. Experimental studies of this type are conducted to assess the impact of a particular treatment.

Participants were divided into two groups: the intervention group, which received soy milk, and the control group, which did not. The study utilized a *Posttest-Only Control Group Design*, enabling the researcher to determine the effect of the intervention by comparing the outcomes between the experimental and control groups.

The investigation will be conducted during the period of June to July 2025 at the operational area of UPTD Kedaton Health Center, Cirebon Regency. As described by Firdaus & Zamzam (2018), population refers to all subjects associated with the phenomenon being examined. The population in the present study consisted of 20 postpartum mothers from the coverage area of Kedaton Health Center, Cirebon Regency, in July 2025. This study employed a total sampling method, meaning the entire population was taken as the sample. The sample was then split into two groups, with 10 participants assigned to the intervention group and 10 to the control group.

RESULTS

Table 1 Respondent characteristics

No	Characteristics	N	%
1	Parity		
	- Primigravida	6	30
	- Multigravida	15	70
	- Grandemultigravida	0	0
2	Age		
	- Age not at risk	17	85
	- Age at risk	3	15
3	Education		
	- Primary	0	0
	- Secondary	16	80
	- Higher	4	20

As presented in Table 1, the largest proportion of respondents were multiparous mothers (15 respondents, 70%). Most of them, 17 respondents (85%), were aged between 20 and 35 years (non-risk age group), while 16 respondents (80%) had a middle-level education.

Table 2 Frequency Pattern of Soy-Based Supplement Provision

Soy milk	N	%
Yes	10	50
No	10	50

The data in Table 2 indicate that soy extract was administered to 50% of respondents, while the remaining 50% were not treated.

Table 3 Frequency Distribution of Lactation in Postnatal Mothers

		Lactation output				Total	
		Adequate		Inadequate			
		N	%	N	%	N	%
Soy milk	Yes	8	80	2	20	10	100
	No	3	30	7	70	10	100
Total		11		9		20	

According to Table 3, most postpartum mothers given soy extract produced adequate breast milk, whereas most without the intervention had insufficient milk.

Table 4 Normality Test Outcomes

	Soy milk	*Shapiro-Wilk*		
		Statistic	Df	Sig.
Beastfiding	Yes	0.594	10	0.000
	No	0.509	10	0.000

The Shapiro-Wilk normality test revealed a p-value of 0.000, which is below the significance level of 0.05, indicating that the data do not follow a normal distribution. Therefore, a bivariate analysis was performed using the Mann-Whitney test, with the results presented as follows:

Table 5 Mann-Whitney Test Outcomes

	Mean	Nilai *p*
Lactation output	1.54	0.028

According to the Mann-Whitney test, soy milk significantly influenced breast milk production, as evidenced by a p-value of 0.028 (< 0.05). The study concluded that the administration of soy milk has a significant positive effect on breast milk production among postpartum mothers. Mothers who received soy milk exhibited higher rates of adequate lactation compared to those who did not receive the intervention, indicating that soy-based supplementation can effectively support postpartum breastfeeding.

DISCUSSION

According to Table 3, 8 postpartum mothers (80%) at Kedaton Health Center, Cirebon, who were given soy extract demonstrated adequate breast milk production. Conversely, the majority of mothers who did not receive the soy-based supplement were classified as having inadequate milk production, totaling 7 respondents (70%).

The observation sheet for breast milk production included five items. Difficulties in milk flow were particularly noted in items 1 and 2, which assessed whether the mother's breasts were tense before breastfeeding and whether milk was observed leaking from the nipples when pressed. Most respondents answered "no" to these questions, indicating some degree of milk flow difficulty.

Several factors can influence lactation, such as maternal age, education, occupation, parity, and rest patterns (Maritalia, 2017). Table 1 shows that the majority of respondents were aged 20–35 years (17 respondents, 85%). Younger mothers tend to produce more breast milk since reproductive capacity is optimal before 35 years, which supports effective lactation. Maternal age also impacts overall maternal health, including pregnancy, delivery, postpartum recovery, and the ability to care for and breastfeed infants (Atabik, 2014).

Regarding education, 16 respondents (80%) had completed secondary school. The researcher notes that lower educational levels are often linked with limited knowledge, which can negatively affect childcare and breastfeeding practices. According to Friedman et al. (2010), parental education influences the capacity to provide proper care, maintain child health, and adapt to parenting roles. Mothers with lower educational attainment are more likely to have insufficient knowledge about exclusive breastfeeding. Educating mothers about

soy milk consumption could therefore support lactation and maintain adequate breast milk production.

Most respondents were multiparous, with 14 mothers (70%). It is assumed that mothers with previous childbirth experiences produce more milk compared to first-time mothers. This aligns with Roesli's theory (2000), which suggests that higher parity affects milk productivity due to maternal health conditions and fatigue.

The Mann-Whitney test yielded a p-value of 0.028, which is below the significance threshold of 0.05. As a result, H_0 was rejected, indicating that soy milk significantly influences breast milk production in postpartum mothers at Kedaton Health Center, Kuningan Regency, in 2025.

The researcher suggests that soy milk affects lactation because it is rich in nutrients, and its isoflavone content can stimulate breast milk production, potentially increasing exclusive breastfeeding rates, which are still relatively low. Respondents who consumed soy milk reported better physical condition, increased milk volume, more frequent infant feeding, reduced fussiness, and improved infant sleep.

Soybeans are a nutritionally complete legume. According to Cahyadi (2009), soy contains high-quality protein and essential amino acids in an optimal balance. Its nutritional value is comparable to cow's milk and exceeds that of beef, with vitamins B1, B2, B3, B5, B6, K, and iron. Soy milk, a product derived from soybean extract, retains these nutritional benefits. It can stimulate oxytocin and prolactin through bioactive compounds such as alkaloids, polyphenols, steroids, flavonoids, and others, effectively supporting milk ejection and increasing prolactin-mediated lactation.

Isoflavones, a key component of soy milk, are flavonoid-forming amino acids with vitamins and nutrients. These phytoestrogens mimic estrogen in the body and can enhance mammary gland function, increasing milk production. Regular consumption by lactating mothers improves both the quantity and quality of breast milk (Puspitasari, 2018). Soy also contains genistein and daidzein, isoflavones that help induce prolactin secretion and boost milk output (Pramitasari et al., 2017).

In line with Puspitasari (2018), higher isoflavone levels were observed in infants of mothers who regularly consumed soy milk. Isoflavones are believed to enhance lactation and reduce breast cancer risk. In this study, lactating mothers received 250 ml of soy milk twice daily for seven days. Milk production was evaluated on the seventh day using expression techniques to assess changes.

Aprillia et al. (2020) reported that this method effectively measures lactation improvement, particularly during the transitional period when milk matures. Additionally, Wahyutri (2014) noted that spousal support is a crucial factor in breastfeeding success, as a husband's involvement in infant care and household tasks can facilitate breastfeeding and improve milk production.

ADVANCED RESEARCH

For future studies, it is recommended to expand the sample size and include mothers from different regions to enhance the generalizability of the findings. Researchers could also explore the long-term effects of soy milk consumption on both breast milk quality and infant growth and development. Additionally, investigating other nutritional interventions or combining soy milk with complementary dietary approaches may provide further insights into optimizing lactation and supporting exclusive breastfeeding. Finally, considering psychosocial factors such as family support, maternal stress, and lifestyle could help identify additional determinants that influence breast milk production.

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