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Effect of Consuming Papaya Leaves, Almond Milk, Green Beans, Moringa Leaves, Ajwa Dates, Soy Milk, and Fennel Leaves on Breast Milk Production in Postpartum Mothers

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Abstract: Exclusive breastfeeding rates are often low due to suboptimal breast milk production, which impedes infants' nutritional needs. This issue is frequently attributed to poor maternal nutrition, unbalanced diets, and irregular food consumption. Breast milk production relies on hormonal changes, notably the dominance of prolactin over progesterone and estrogen during childbirth. To address this, a study was conducted to evaluate the impact of specific foods boiled papaya leaves, almond milk, green beans, moringa leaves, ajwa dates, soy milk, and fennel leaves—on breast milk production. Employing a quasi-experimental design with a one-group pretest-posttest approach, the study involved 56 postpartum mothers whose milk production was substandard. These participants were selected in March 2023 using purposive non-probability sampling. A paired t-test was performed for bivariate analysis. Results indicated a significant improvement in milk production, with a p-value of 0.000, demonstrating that the consumption of these foods positively affects lactation. Consequently, it is recommended that breastfeeding mothers incorporate these foods into their diet to enhance milk production and support exclusive breastfeeding. Regular consumption of these specific foods can help meet infants' nutritional needs more effectively.

Keywords: Breast milk production; Exclusive breastfeeding; Lactation; Postpartum nutrition; Supplementary foods

Introduction

State The United Nations International Children's Emergency Fund (UNICEF) in 2020 reported that the average coverage of exclusive breastfeeding in the world for infants aged 0-6 months only reached 38%. Meanwhile, exclusive breastfeeding in developing countries can prevent 90% of under-five deaths due to diarrhea and acute respiratory infections (UNICEF, 2020). The results of the 2018 Indonesian Demographic and Health Survey (IDHS) state that there has been an increase in the coverage of exclusive breastfeeding in Indonesia, from 42% in the 2013 IDHS to 52% in the 2018 IDHS, but this increase is still far away, from the national target set by the Ministry of Health, that is equal to 80%. Breastfeeding that is not optimal has an impact on the occurrence of death due to neonatal infections 45%, schematian due to diarrhea 30%, and due to respiratory tract infections in toddlers 18% (Ministry of Health RI, 2020). Data from the Provincial Health Service West Java in 2020 shows that the coverage of exclusive breastfeeding for babies in Bogor City in the last three years has fluctuated, namely in 2018 it was 49.95%, in 2019 coverage decreased to 54.74%, and in 2020 coverage increased again to 53 .71%. This coverage is still less than

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the national standard set at 80% (West Java Provincial Health Service, 2020).

The low coverage of exclusive breastfeeding can be caused by various factors, one of which is the production of breast milk which is not optimal, so that many babies have less nutritional needs because mothers cannot provide maximum breast milk according to the nutritional needs of babies. The reason is due to the mother's poor nutritional intake, an unbalanced diet, and also consuming food that is less regular (Tjahjani, 2017). The impact of breast milk that is not smooth makes mothers think about taking steps to stop breastfeeding and replace it with formula milk. Another impact of non-current milk production is that it can hamper the exclusive breastfeeding process for infants up to the age of 6 months, so that the scope of breastfeeding is not fulfilled. Babies who are not given exclusive breastfeeding can affect their growth and development and protect them from various diseases (Roesli, 2019).

Milk production is a process of forming breast milk that involves the hormone prolactin and the hormone oxytocin, during childbirth the hormones progesterone and estrogen will decrease and the hormone prolactin will be more dominant resulting in milk secretion. The problem that arises from breastfeeding mothers is that milk production is not optimal, so that many babies whose nutritional needs are not met because mothers cannot provide maximum breast milk according to the nutritional needs of babies, due to maternal nutritional intake, an unbalanced diet, and also consuming food irregularly so that breast milk production is insufficient to be given to the baby (Wahyuni et al., 2019). Efforts to increase production and breastfeeding that have been carried out based on the results of studies are counseling, besides that there is also family assistance and hypnolactation. The results of the study show that counseling or counseling/education about exclusive breastfeeding is the most widely used effort. Midwifery care that is often applied to breastfeeding mothers in promoting breastfeeding is by doing breast care, gently massaging the breast, applying warm compresses to the breast, reducing stress, and expressing or pumping milk at least once every 3 hours to increase milk production (Husanah, 2020).

Facilitating breast milk production can be done pharmacologically, one of which is by consuming supplements such as Moloco+B12, Lactaman, Asifit, Smooth ASI, BlackMores Pregnancy and Breastfeeding Gold, etc. Some supplements may have side effects for the mother and it is possible that the herbal ingredients from these supplements may also be consumed by the baby through breast milk. If consuming supplements has side effects for both mother and baby, there are several suggestions that need to be considered by mothers who are breastfeeding their babies, namely consuming vegetables and fruits that can increase the volume of breast milk (Soetiarso, 2017). These vegetables are proven to be able to increase the volume of breast milk. Apart from these vegetables, fruits that contain lots of water will help mothers produce abundant breast milk, such as melons, watermelons, pears and many other juicy fruits which are very good for breastfeeding mothers to consume (Kappara et al., 2018). Mother's dietary factors that affect milk production because the mother's daily calorie needs must consist of 60-70% carbohydrates, 10-20% protein, and 20-30% fat. Calories from food consumed by the mother in a day (Saraung et al., 2017). Several researchers in Indonesia have developed various plants or fruits that can help produce breast milk, prolactin hormone levels or increase baby weight. Plants that increase breast milk production include papaya leaf juice, katuk leaf extract, melon and soybeans (Winarni et al., 2020).

Method

This research adopts a quantitative approach with a quasi-experimental design, specifically utilizing a one-group pretest-posttest model. This experimental design involves conducting the study with a single group of participants without the use of a control group. The primary objective is to assess the impact of specific dietary interventions on breast milk production among postpartum mothers. The study is scheduled to be conducted in March 2023, focusing on health service centers located in the West Java Province of Indonesia. The research will be carried out across eight selected health service centers within West Java. The population for this study comprises postpartum mothers who are attending these health centers during the research period. In total, 56 participants will be included in the study, as this number represents the full sample required to achieve the research objectives. To select these participants, the Accidental Sampling technique will be employed. This technique involves including individuals who are conveniently available and meet the study criteria, ensuring that the sample is representative of the target population.

Data collection for this study will involve gathering primary data, which is information directly obtained from respondents rather than secondary data sources. The data collection process will be conducted through direct observation of the participants. This approach ensures that the data collected is accurate and relevant to the research objectives, allowing for a comprehensive analysis of the effects of the dietary interventions on breast milk production. The observational method will facilitate a thorough assessment of changes in milk production before and after the dietary interventions,

providing valuable insights into the effectiveness of the dietary changes implemented.

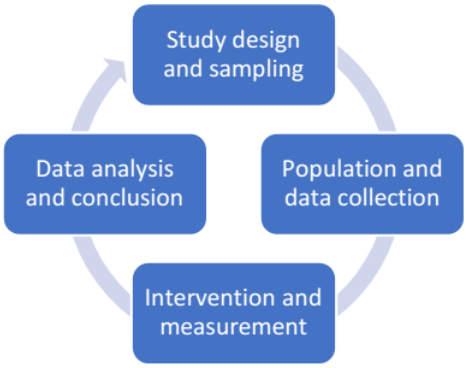

Figure 1. Stages of the research

Result and Discussion

Z-count value of 6.28 with a sig. (0.000) < 0.05, there is a difference in the average score of the fluency of milk production in mothers before and after consuming soy milk. This means that there is an effect of consumption of soy milk on the smooth production of breast milk in postpartum mothers where the average score before consumption of soy milk increased to 5.88 to 8.48 after consumption of soy milk. The results of this study provide empirical evidence that consuming soy milk can increase the smoothness of breastfeeding in postpartum mothers.

Table 1. Wilcoxon Test Results (Test of Differences in Smoothness of Breastfeeding for Postpartum Mothers Before and After Consumption of Soy Milk)

Level	Average Breast Milk Fluency Score	Z-count	Say.
Before Consuming Soy Milk	5.88	6.28	0.000
After Consuming Soy Milk	8.48		

The results of this study indicate that there is a difference between before and after giving soy milk to postpartum mothers on increasing milk production so that there is an influence of soy milk consumption on milk production in postpartum mothers at the Cibeber Health Center. This is supported by previous research by Sari et al. (2021) in which his research on the effect of giving soy milk on milk production in postpartum mothers found that there was an influence between giving soy milk on breast milk production because soy milk has ingredients that can increase milk production in accordance with the theory of Huang et al. (2017) which states that soy milk contains isoflavones which contain amino acids in soybeans. Isoflavo is a plant compound that has an estrogen-like effect. Soybeans are made from nuts which can increase metabolism and increase the hormone estrogen which is naturally produced by the body and can help the mammary glands of nursing mothers to produce more milk.

Table 2. Effect of Consumption of Papaya Leaf Decoction on Milk Production for Breastfeeding Mothers

Breast milk production	Mean	Mean Difference	P Value
Before	3.27	3.41	0.000
After	6.68		

The results of this study indicate that there is an effect of consumption of boiled papaya leaves on the smooth production of breast milk in nursing mothers where the Kolmogorov Smirnov test results show a sig. < 0.05. Based on the average smoothness score of breast milk production, there was an increase in the smoothness score of milk production after consuming papaya leaf stew compared to before consuming papaya leaf stew. This indicates that consumption of papaya leaf decoction is proven to be able to increase milk production in nursing mothers. Research by Aprilia et al. (2020) also proves that consuming boiled papaya leaves can increase milk production in nursing mothers.

The results of this study indicate that there is an effect of consuming papaya leaf decoction on the smooth production of breast milk in breastfeeding mothers at PMB Midwife Neneng Kampung Cimenteng in 2023, where the Kolmogorov Smirnov test results show a sig. < 0.05. Based on the average smoothness score of breast milk production, there was an increase in the smoothness score of milk production after consuming papaya leaf stew compared to before consuming papaya leaf stew. This indicates that consumption of papaya leaf decoction is proven to be able to increase milk production in nursing mothers. Research by Aprilia et al. (2020) also proves that consuming boiled papaya leaves can increase milk production in nursing mothers.

Table 3. The Effect of Almond Milk Consumption on Smooth Milk Production

Smooth breast milk production	Mean	Mean Difference	P Value
Before	3.43	3.59	0.000
After	7.02		

The results of the paired simple t test show a significance value of 0.000 <0.05, so it can be concluded that Ho is rejected and Ha is accepted, thus it can be concluded that there is an effect of consumption of almond milk on the smooth production of breast milk. Indications of smooth milk production can vary, each mother is unique in how her body responds and regulates milk production. Based on the results of the

study, some of the main indications of non-smooth breastfeeding before consumption of almond milk were babies not sleeping for 3-4 hours, urinating less than 6-8 times a day, babies defecating less than 3-4 times a day and the mother did not feel amused because the flow of milk in breastfeeding mother. Where 56 mothers, the proportion of mothers who have babies who do not sleep for 3-4 hours is 55%, the proportion of mothers who have babies with less BAK 6-8 times a day is 52%, mothers who have babies with bowel movements less than 3-4 times a day 54% of mothers who do not feel tickled when breastfeeding are 57%. Most babies don't fall asleep indicating that the baby may not be full or not getting enough milk for that period. The baby urinates less than 6-8 times a day, indicating that the baby may not be getting enough fluids and breast milk as needed. Babies defecating less than 3-4 times a day can also indicate that the baby's digestion may not be going well or the baby is not getting enough nutrition from breast milk. The tickling feeling felt by the mother while breastfeeding can be an indication of good milk flow and sufficient to meet the baby's needs (Sudargo et al., 2018).

Table 4. The Effect of Consumption of Mung Bean Extract on Smooth Milk Production in Postpartum Mothers

Smooth breast milk production	Mean	Difference	P Value
Before	3.30	3.70	0.000
After	7.00		

The table above shows a Z-count value of 6.280 with a sig. (0.000) < 0.05, there is a difference in the average score of the fluency of milk production in mothers before and after consuming soy milk. This means that there is an effect of consumption of soy milk on the smooth production of breast milk in postpartum mothers where the average score before consumption of soy milk increased to 5.88 to 8.48 after consumption of soy milk. The results of this study provide empirical evidence that consuming soy milk can increase the smoothness of breastfeeding in postpartum mothers (Fungtammasan et al., 2022; Ravi et al., 2020).

The results of the paired simple t test show a significance value of 0.000 <0.05, so it can be concluded that Ho is rejected and Ha is accepted, thus it can be concluded that there is an effect of consumption of mung bean extract on the smooth production of breast milk in postpartum mothers. Mung bean extract contains Vitamin B1 (thiamin) which functions to convert carbohydrates into energy, strengthens the nervous system and is responsible for the production of breast milk, where thiamin will stimulate the work of neurotransmitters which will convey messages to the posterior pituitary to secrete the hormone oxytocin so that this hormone can stimulate contraction of the smooth muscle of the mammary glands in the alveolar walls and duct walls so that the milk is pumped out, besides that it is also useful for maximizing the work of the nervous system so that it is easy to concentrate and be more excited (Roesli, 2019). Mothers who easily concentrate, are excited and are in a good mood will trigger the brain to work to provide information to the nervous system to stimulate the hypothalamus in the formation of the hormones prolactin and oxytocin so that the process of forming breast milk and expelling milk runs smoothly (Astutik, 2019). The effect of consuming moringa leaves on the production of breast milk for post-partum mothers.

Table 5. The Effect of Giving Moringa Leaves on Breast Milk Production

Breast milk production	Mean	Difference	P Value
Before	3.36	3.68	0.000
After	7.04		

The results of the paired simple t test show a significance value of 0.000 <0.05, so it can be concluded that Ho is rejected and Ha is accepted, thus it can be concluded that there is consuming moringa leaf decoction with milk production in nursing mothers. The results of the paired simple t test show a significance value of 0.000 <0.05, so it can be concluded that Ho is rejected and Ha is accepted, thus it can be concluded that there is an effect of giving Moringa leaves on milk production at PMB Mila Karmila, Kamal Village, Kalideres District, West Jakarta in 2023. According to Khasanah (2020), the hormone prolactin plays a role in making colostrum.

This hormone stimulates the alveoli cells which function to make milk. Astutik (2019) argues that the process of forming breast milk starts with the process of breast milk being formed, during childbirth and the placenta comes out it causes a sudden decrease in the hormones progesterone, estrogen and human placental lactogen (HPL), but levels of the hormone prolactin remain high which causes milk production. This phase is called lactogenesis II phase. The process of lactogenesis II begins around 30-40 hours after giving birth, however, after giving birth, women feel full breasts about 2-3 days after giving birth. In this phase, when the breast is stimulated, the prolactin level in the blood will increase and will increase again for a period of 45 minutes and will return to its initial level before stimulation three hours later. Prolactin levels will decrease if the breasts feel full. The hormone prolactin that comes out can stimulate cells in the alveoli to produce milk, the hormone prolactin will also come out in the milk (Bravi et al., 2016; Idris et al., 2021). The level of prolactin in milk will be higher if there is more milk

production, by consuming Moringa leaves, milk production will increase.

The table 6 shows the Z-count value of -6,407 with a sig. (0.000) < 0.05, there is a difference in the average score of the fluency of milk production in mothers before and after consuming ajwa date honey juice. This means that there is an effect of consuming ajwa date honey juice on the smooth production of breast milk in postpartum mothers. Where the average score before consuming Ajwa Honey Dates juice was 2.75 which increased to 28.95 after consuming Ajwa Honey Dates juice. The results of this study provide empirical evidence that consuming ajwa date honey juice can improve the smoothness of breastfeeding in postpartum mothers.

Table 6. Wilcoxon Test Results (Test of Differences in Smoothness of Breast Milk for Postpartum Mothers Before and After Consumption of Ajwa Date Honey Juice)

Level	Average Breast Milk Fluency Score	t-count	Say.
Before Consuming Ajwa Date Honey Juice)	2.75	-6.407	0.000
After Consuming Ajwa Date Honey Juice)	28.95		

The results of the Wilcoxone Signed Test obtained a value of p = 0.000 <0.05 so that it can be concluded that Ajwa Honey Dates Juice is Effective for Breast Milk Production at the Kotabaru Health Center, Kotabaru District, Karawang Regency in 2023. This research is in line with the results Prianti (2024) that date palms contains iron and calcium two effective elements contained in dates are very important for the growth of babies two elements contained in dates are the most influential elements in the formation of blood and bone marrow. By consuming date palm juice in breastfeeding mothers in addition to date palm juice, it can replace the mother's energy that is drained during childbirth (Gibson et al., 2020). To see the smoothness of the mother's milk production itself, it can be seen from the indicators of mother and baby, indicators for babies include the frequency and characteristics of BAK (where a baby who produces enough milk, in 24 hours the baby will urinate at least 6 times (clear yellow), frequency the color and characteristics of the bowel movements (the pattern of elimination of the baby depends on what the baby gets, the baby who drinks breast milk, generally the pattern of defecating/chasing is 2-5 times per day, the resulting bowel movements are golden yellow in color (not too runny and not too thick), duration sleep (for 2 to 3 hours), as well as the baby's weight. The production of breast milk is said to be smooth if it is less than 4 it is said to be not smooth (Prianti, 2024).

Table 7. Results of the Wilcoxon Test (Test of Differences in the Fluency of Breast Milk for Postpartum Mothers Before and After Consumption of Fennel Leaves)

Level	Average Breast Milk Fluency Score	t-count	Say.
Before Consuming Fennel Leaves	13.00		
After Consuming Fennel Leaves	21.11	5.18	0.000

The table 7 shows a Z-count value of 5.18 with a sig. (0.000) < 0.05, there is a difference in the average score of the fluency of milk production in mothers before and after consuming fennel leaves. This means that there is an effect of consumption of fennel leaves on the smooth production of breast milk in postpartum mothers where the average score before consumption of fennel leaves increased to 13.00 to 21.11 after consumption of fennel leaves. The results of this study provide empirical evidence that consuming fennel leaves can increase the smoothness of breastfeeding in postpartum mothers (Palacios et al., 2023).

The results of this study indicate that there is an effect of consumption of fennel leaves on the smooth production of breast milk in postpartum mothers in Kebon Nanas, Tangerang in 2023, where the Wilcoxon test results show a sig. < 0.05. Based on the average score of fluency in milk production, there was an increase in the fluency score of milk production after consuming fennel leaves compared to before consuming fennel leaves. This indicates that the consumption of fennel leaves is proven to be able to increase milk production in the puerperium (Abdou et al., 2018; Ryan et al., 2024). Fennel leaves contain certain nutrients such as In 100 grams of fennel, it contains 30 calories and a variety of nutrients, namely 1.2 grams of protein, 3 grams of fiber, 7 grams of carbohydrates, 50 milligrams of phosphorus, 50 milligrams of calcium, 17 milligrams of magnesium, 0.7 milligrams of nutrients, iron, 4 milligrams zinc, 400 milligrams potassium, 12 milligrams vitamin C, 950 IU vitamin A.

Conclusion

Based on the tests carried out, it can be concluded that the smoothness of breast milk production can be significantly influenced by the dietary consumption of nursing mothers. A diverse and balanced diet that includes foods known to impact breast milk production positively can enhance lactation in postpartum mothers.

This is particularly crucial given the current statistics and challenges surrounding breastfeeding practices. Exclusive breastfeeding rates remain alarmingly low, primarily due to several factors, one of which is suboptimal breast milk production. Many mothers struggle to meet their infants' nutritional needs due to inadequate milk supply. This issue often stems from poor maternal nutrition, unbalanced diets, and irregular eating patterns. Effective milk production relies on a complex interplay of hormones, including prolactin and oxytocin. During childbirth, there is a natural decrease in progesterone and estrogen levels, while prolactin becomes more dominant, facilitating milk secretion. However, when lactation is compromised, it leads to insufficient milk production, leaving many babies with unmet nutritional needs. To address this issue, a study was conducted to determine the effects of consuming specific foods on breast milk production. The focus was on the consumption of boiled papaya leaves, almond milk, green beans, moringa leaves, ajwa dates, soy milk, and fennel leaves. The research employed a quasi-experimental design with a one-group pretest-posttest approach. The sample comprised 56 breastfeeding mothers, who were three days postpartum with previously substandard milk production, selected using purposive non-probability sampling techniques in March 2023. A paired simple t-test was utilized for bivariate analysis to assess changes in milk production. The results revealed a significant improvement in milk production following the consumption of the specified foods. The t-test yielded a p-value of 0.000, which is less than the significance level of 0.05, indicating a statistically significant difference in milk production before and after the intervention. This suggests that the dietary intake of boiled papaya leaves, almond milk, green beans, moringa leaves, ajwa dates, soy milk, and fennel leaves has a beneficial effect on enhancing breast milk production in postpartum mothers.

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Author Contributions
The following statements should be used Conceptualization IH, LL, NDR, CN, FS, DM, IS, RK contributed to the data collection process, data processing, article writing.

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Conflicts of Interest
The authors declare no conflict of interest.

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