# A Scientific Investigation of Factors Related to Breast Milk Adequacy in Banjar Regency, South Kalimantan, Indonesia

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**Abstract:** Various maternal factors potentially influence breast milk sufficiency. This study aims to analyze maternal factors associated with breast milk sufficiency in Banjar Regency. This analytical study used a cross-sectional design and was conducted from April to July 2025 in the Banjar Regency Community Health Center. A total of 70 postpartum mothers were selected using a probability sampling method. The dependent variable was breast milk adequacy, while the independent variables included maternal age, gestational age, parity, psychological condition, sociocultural factors, breast and nipple condition, delivery method, contraceptive use, and early initiation of breastfeeding (IMD). Data were analyzed using the chi-square test and logistic regression. Bivariate analysis showed that nipple condition (p = 0.01; OR = 5.25), maternal age (p = 0.011; OR = 4.92), vaginal delivery (p = 0.03; OR = 2.89), and early initiation of breastfeeding (p = 0.039; OR = 2.89) were significantly associated with breast milk adequacy. Multivariate logistic regression confirmed that nipple condition was the most dominant factor (p = 0.04; AOR = 0.15; 95% CI: 0.02–0.99). The regression model showed good predictive power (R² = 0.61; classification accuracy = 82.90%). In conclusion, nipple condition is the most influential maternal factor in determining breast milk adequacy. These findings underscore the importance of early assessment of nipple anatomy and appropriate supportive interventions during pregnancy.

**Keywords:** Adequacy; Banjar; Breast milk; Factors; Mothers

## Introduction

Maternal education and knowledge about breastfeeding are crucial in determining breastfeeding outcomes. Research shows that mothers with better knowledge regarding breastfeeding practices are more likely to engage in exclusive breastfeeding; However, even those with good knowledge may struggle to breastfeed exclusively due to a lack of familial support or physiological complications (Katmawanti et al., 2023). This aligns with findings indicating that systemic educational interventions can enhance maternal awareness and confidence, promoting better nutrition for infants through breastfeeding (Kapti et al., 2023). The emotional experiences of mothers during breastfeeding directly impact milk production and breastfeeding duration. Studies indicate that difficulties in breastfeeding can lead to negative feelings such as frustration and anxiety, which interfere with a mother's self-efficacy and ability to continue breastfeeding (Giannì et al., 2020). These psychological factors are often compounded by postpartum conditions like depression, which have been linked to lower rates of breastfeeding (Whipps & Demirci, 2021; Neupane et al., 2025). The emotional burden associated with perceived insufficient milk supply frequently hinders mothers from maintaining adequate breastfeeding practices, underscoring the need for emotional and psychological support systems (Intiful et al., 2025).

Hormonal responses, particularly the role of oxytocin and prolactin, are critical for facilitating milk production and enhancing the breastfeeding experience (Nagel et al., 2022; Yukinaga & Miyamichi, 2025). Evidence suggests that positive breastfeeding experiences can enhance maternal emotional well-being through increased oxytocin secretion, which alleviates anxiety and promotes bonding with the infant (Huang et al., 2022). Conversely, pain or discomfort during breastfeeding, often due to improper latch or positioning, can detract from mothers' ability to produce sufficient milk. Therefore, maternal health providers must focus on educating mothers about effective breastfeeding techniques while addressing potential obstacles to successful feeding practices.

Socioeconomic factors present additional complexities in considering breast milk adequacy. Numerous studies have documented a relationship between socioeconomic status and breastfeeding outcomes, asserting that higher educational attainment and financial stability correlate with better breastfeeding rates (Rasaei et al., 2023; Khudri & Hussey, 2025). Furthermore, employment status can serve as a significant barrier to maintaining breastfeeding, particularly for working mothers who may lack access to appropriate lactation facilities. Practical interventions that bridge the gaps between knowledge, emotional support, and socioeconomic challenges are essential for improving breastfeeding outcomes in Banjar Regency. Evidence suggests that multidisciplinary approaches involving healthcare providers, mental health specialists, and peer support groups can improve both maternal mental health and breastfeeding practices (Pezley et al., 2022; Rodríguez-Gallego et al., 2024).

This research's novelty focuses on factors associated with breast milk sufficiency in Banjar Regency, using a cross-sectional analytical approach that integrates maternal variables. This study highlights the importance of a comprehensive understanding of the interaction between knowledge and support in facilitating optimal breastfeeding practices. This research is expected to provide more effective policy recommendations to support breastfeeding mothers in Banjar Regency.

## Method

### Research Design

This study used a cross-sectional analytical survey design to analyze maternal factors associated with breastfeeding sufficiency. This design was chosen because it allows data collection at a single point in time, thus providing a clear picture of the relationships between the variables analyzed. The study was conducted from April to July 2025, taking into account respondent availability and the time required for data analysis.

### Population and Sample

The population in this study was all postpartum mothers within the Banjar Regency Community Health Center coverage area. The sample size was determined using probability sampling, which ensures that every member of the population has an equal chance of being selected as a participant. The total [10] number of respondents involved in this study was 70 postpartum mothers.

### Inclusion and Exclusion Criteria

Inclusion and exclusion criteria in research on postpartum mothers and breast milk production are crucial to ensure the validity and reliability of the data obtained. The inclusion criteria stipulate that respondent must be mothers who have given birth within a maximum of one year prior to the study. This aims to focus on the early postpartum period, when breast milk production is critical. Furthermore, mothers who are willing to participate and provide the necessary information are expected to provide representative data. On the other hand, exclusion criteria include mothers with certain medical conditions, such as hormonal disorders or autoimmune diseases, that can affect breast milk production. This is crucial to ensure that research results are not distorted by irrelevant medical variables. Mothers who are unable to provide accurate information or who are uncooperative are also excluded to ensure data integrity. Thus, selecting these criteria contributes to better research quality.

### Research Variables

In this study, variables are divided into two main categories: dependent variables and independent variables. The dependent variable in this study is breast milk sufficiency, which is measured using a questionnaire referring to indicators of exclusive breastfeeding achievement. Breast milk sufficiency as a dependent variable will provide an overview of the effectiveness of exclusive breastfeeding during the first six months of a baby's life. Meanwhile, the independent variables analyzed include various maternal factors that can influence breast milk sufficiency. These factors consist of maternal age, gestational age at delivery, parity, maternal psychological condition, sociocultural factors, breast and nipple condition, delivery method (between vaginal and cesarean delivery), contraceptive use, and early initiation of breastfeeding (IMD). By analyzing the relationship between these independent and dependent variables, the study aims to identify determinants that contribute to the success of exclusive breastfeeding.

*Data Collection*

Data collection in this study was conducted using a two-part questionnaire. The first part covered demographic information and respondent characteristics, including age, education level, occupation, economic status, and parity. This information is important for understanding the respondents' backgrounds and for data analysis. The second part of the questionnaire focused on aspects related to breast milk sufficiency, total breastfeeding duration, respondents' psychological state (measured using standardized anxiety and depression instruments), and the social support received by respondents. The questionnaire was then tested for validity using Pearson Product Moment analysis. The test results showed that the value of each question was greater than 0.5. Cronbach's alpha was used to test the instrument's reliability. The reliability test results showed a Cronbach's alpha value >0.98, thus concluding that the variables were reliable and consistent in their measurements.

*Data Analysis*

Data were analyzed using the latest version of SPSS statistical software using a structured analysis approach. The first stage is a univariate analysis aimed at presenting the frequency distribution of each variable involved, providing an initial overview of the data characteristics. Next, a bivariate analysis will be conducted using the chi-square test to explore the relationship between the independent variables and breastfeeding adequacy, with a significance level set at $p < 0.05$, allowing for the identification of statistically significant relationships. Finally, logistic regression will be applied to analyze the influence of various independent factors simultaneously on breastfeeding adequacy, taking into account the factors identified as significant from the bivariate analysis. In this regression analysis, the Odds Ratio (OR) and Adjusted Odds Ratio (AOR) will be calculated to assess the magnitude of the influence of each independent factor in more depth. With this comprehensive analysis design, the study aims to provide a better understanding of the factors that influence breastfeeding adequacy.

*Research Ethics*

Prior to the study, ethics approval was obtained from the relevant institution at the Poltekkes Kemenkes Banjarmasin under number HK.11.12/EC/PKB. Information regarding the study's objectives, benefits, and procedures was clearly communicated to all respondents. Participation was voluntary, and all data collected was kept confidential and used solely for the purposes of this study.

## Results and Discussion

**Table 1.** Characteristics of Research Respondents

| Variable | n | % |
|---|---|---|
| Gestational Age | | |
| - Aterm | 62 | 88.60 |
| - Pre / Post term | 8 | 11.40 |
| Parity | | |
| - No Risk | 40 | 57.10 |
| - Risky | 30 | 42.90 |
| Delivery Method | | |
| - Vagina | 32 | 45.70 |
| - SC | 38 | 54.30 |
| IMD | | |
| - Yes | 32 | 45.70 |
| - Not | 38 | 54.30 |
| Breast Condition | | |
| - Nipples Are Not Abrasive | 66 | 94.30 |
| - Nipple Blisters | 4 | 5.70 |
| Psychological conditions | | |
| - Not Anxious | 39 | 55.70 |
| - Anxious | 31 | 44.30 |
| Nipple Condition | | |
| - Usual | 58 | 82.90 |
| - Flat nipples | 12 | 17.10 |
| Use of birth control pills | | |
| - Not | 46 | 65.70 |
| - Yes | 24 | 34.30 |
| Cultural Engagement | | |
| - Not | 58 | 82.90 |
| - Yes | 12 | 17.10 |
| Mother's Age | | |
| - No Risk | 56 | 80 |
| - Risky | 14 | 20 |
| Adequacy of breast milk | | |
| - Adequate | 49 | 70 |
| - In adequate | 21 | 30 |

Table 1 illustrates that based on gestational age, most mothers gave birth at thermal gestational age, namely 62 respondents (88.60%), based on parity, it is known that 40 respondents (57.10%) had non-risk parity (≤3 births), the method of delivery was mostly through Sectio Caesarea (CS) as many as 38 respondents (54.30%). As many as 38 respondents (54.30%) did not practice IMD. Judging from the condition of the breasts, most mothers had non-abrasive nipples, namely 66 respondents (94.30%). In addition, seen from the psychological condition of the mother, as many as 39 respondents (55.70%) did not experience anxiety. The majority of nipple conditions were normal in 58 respondents (82.90%). The use of birth control pills was also observed, and it was found that 46 respondents (65.70%) did not use birth control pills. Most respondents did not have cultural involvement that influenced breastfeeding practices, namely 58 respondents (82.90%). Based on maternal age, the majority of mothers were at a non-risk age, namely 56

respondents (80%). The results of the analysis of breast milk sufficiency showed that 49 respondents (70%) had sufficient breast milk.

Table 2 shows that several maternal factors have a significant relationship with breast milk adequacy. Nipple condition is the variable with the strongest relationship, where mothers with normal nipples have a 5.25 times greater chance of getting adequate breast milk compared to mothers with flat nipples (p = 0.01; OR = 5.25; 95% CI: 1.38–19.87). In addition, maternal age is also significantly related, where mothers at non-risk age have a 4.92 times greater chance of providing adequate breast milk compared to mothers at risk (p = 0.01; OR = 4.92; 95% CI: 1.42–17.05). This indicates that maternal maturity plays a role in breastfeeding success. Mode of delivery and implementation of early initiation of breastfeeding (IMD) also showed a significant relationship with breast milk adequacy (p = 0.039).

Mothers who delivered vaginally and who practiced early breastfeeding were 2.89 times more likely to have sufficient breast milk than mothers who delivered by caesarean section or did not practice early breastfeeding (OR = 2.89; 95% CI: 1.007–8.29). Other factors such as psychological condition, breast condition (blisters), parity, gestational age, use of birth control pills, and cultural involvement did not show a statistically significant association (p > 0.05), although some showed a trend towards an association that should be considered in multivariate analysis. Overall, these results confirm that anatomical aspects (nipple condition), maternal age, and supportive birth practices (such as early breastfeeding and normal delivery) are important determinants of breast milk adequacy, and should be the focus of interventions in promoting effective breastfeeding.

**Table 2.** Relationship between Maternal Factors and Breast Milk Adequacy

| Variables | Adequate breast milk supply | Enough | % | No | % | p*) value | OR (95% CI) |
|---|---|---|---|---|---|---|---|
| | Enough | % | No | % | | | |
| Gestational Age | | | | | | | |
| - Aterm | | 42 | 67.70 | 20 | 32.30 | 0.26 | |
| - Pre / Post term | | 4 | 50 | 4 | 50 | | |
| Parity | | | | | | | |
| - No Risk | | 29 | 72.50 | 11 | 43.30 | 0.13 | |
| - Risky | | 17 | 56.70 | 13 | 34.30 | | |
| Delivery Method | | | | | | | |
| - Vagina | | 25 | 78.10 | 7 | 44.70 | 0.03 | 2.89 |
| - SC | | 21 | 55.30 | 17 | 34.50 | | (1.00-8.29) |
| IMD | | | | | | | |
| - Yes | | 25 | 78.10 | 7 | 44.70 | 0.03 | 2.89 |
| - Not | | 21 | 55.30 | 17 | 34.50 | | (1.00-8.29) |
| Breast Condition | | | | | | | |
| - Nipples Are Not | | 45 | 68.20 | 21 | 31.80 | 0.11 | |
| Abrasive | | 46 | 65.70 | 3 | 34.30 | | |
| - Nipple Blisters | | | | | | | |
| Psychological conditions | | | | | | | |
| - Not Anxious | | 24 | 61.50 | 15 | 38.50 | 0.28 | |
| - Anxious | | 22 | 71 | 9 | 29 | | |
| Nipple Condition | | | | | | | 5.25 |
| - Usual | | 42 | 72.40 | 16 | 27.60 | 0.01 | (1.38-19.87) |
| - Flat nipples | | 4 | 65.70 | 8 | 66.70 | | |
| Use of birth control pills | | | | | | | |
| - Not | | 28 | 60.90 | 18 | 39.10 | 0.18 | |
| - Yes | | 18 | 75 | 6 | 25 | | |
| Cultural Engagement | | | | | | | |
| - Not | | 39 | 67.20 | 19 | 32.80 | 0.39 | |
| - Yes | | 7 | 58.30 | 5 | 41.70 | | |
| Gestational Age | | | | | | | 4.92 |
| - Aterm | | 41 | 73.20 | 15 | 26.80 | 0.01 | (1.42-17.05) |
| - Pre / Post term | | 5 | 35.70 | 9 | 64.30 | | |

Logistic regression analysis showed that of the various maternal factors studied, nipple condition was the only variable statistically significantly associated with breast milk adequacy. This variable had a p-value of 0.049 with an Adjusted Odds Ratio (AOR) of 0.15 (95% CI: 0.02–0.99). This indicates that mothers with abnormal

nipple conditions have a significantly lower chance of getting adequate breast milk compared to mothers with normal nipples, after controlling for other factors. Although parity showed a trend towards an association (p-value = 0.093), this result did not reach the limit of statistical significance (p < 0.05). The AOR value for parity was 0.303 (95% CI: 0.075–1.22), which indicates a negative association, but with a confidence level that is still too broad to be conclusive. Other factors such as delivery method, IMD, breast condition, use of birth control pills, and maternal age did not show a statistically significant association (p > 0.05). Several variables, such as delivery method, IMD, and maternal age, had very high coefficients and standard errors, suggesting possible multicollinearity, extreme outliers, or insufficient numbers of cases in certain categories. Overall, these results emphasize that anatomical and physiological aspects, particularly nipple condition, are important factors in breast milk sufficiency (Jones & Spencer, 2007), while obstetric and demographic factors have not shown significant contributions in this model.

**Table 3.** Maternal Factors Most Associated with Breast Milk Adequacy

| Variable | Coefficient (B) | SE (B) | Value p*) | AdjOR (95% CI) |
|---|---|---|---|---|
| Parity | -1.19 | 0.71 | 0.09 | 0.30 (0.07-1.22) |
| Method of childbirth | -37.36 | 9465.07 | 0.99 | |
| IMD | -37.36 | 9465.07 | 0.99 | |
| Breast Condition | -18.85 | 6552 | 0.99 | |
| Nipple Condition | -1.85 | 0.94 | 0.04* | 0.15 (0.25-0.99) |
| Use of birth control pills | 1.40 | 0.80 | 0.079 | 4.08 (0.85-19.65) |
| Mother's Age | -37.85 | 9465.07 | 0.99 | |

Several maternal factors have a significant relationship with breast milk sufficiency. In this study, the condition of the mother's nipples emerged as the factor with the strongest correlation. Mothers with normal nipples were 5.25 times more likely to obtain sufficient breast milk compared to mothers with flat nipples, with a p-value of 0.013 and an OR (Odds Ratio) of 5.25, with a 95% confidence interval ranging from 1.387 to 19.87 (Gebretsadik et al., 2022). These results support previous findings that nipple anatomy influences a baby's ability to breastfeed effectively, which in turn impacts breast milk adequacy (Beggs et al., 2021; Moret-Tatay et al., 2025). Understanding these dynamics is important especially in the context of providing interventions to mothers facing challenges in breastfeeding (Nanthakomon et al., 2023).

Furthermore, maternal age also showed a significant association with breast milk adequacy. Mothers who were not in the risk category were more likely to provide adequate breast milk, with an OR of 4.92 (p = 0.011) and a 95% CI ranging from 1.42 to 17.05 (Nisman et al., 2021). This study reflects evidence that maternal emotional and physical maturity contribute significantly to breastfeeding success, where age can influence breastfeeding beliefs and skills (Tarabeih et al., 2025). Psychological aspects also serve as an important determinant in the continuation of breastfeeding, which suggests that appropriate mental support and antenatal education need to be prioritized (Owiah Sampson et al., 2020; Sandhi et al., 2020). Good birth practices, including early initiation of breastfeeding (IMD) and delivery method, also showed a significant association with breast milk sufficiency.

Mothers who delivered vaginally and practiced IMD were 2.89 times more likely to have sufficient breast milk compared to those who delivered by cesarean section or did not practice IMD (p = 0.039) (Quinones, 2023). This shows how important it is to practice successful breastfeeding starting immediately after birth and to have support from health workers throughout this process (Alahmed et al., 2023). While other variables, such as psychological well-being, breast tenderness (e.g., blisters), parity, gestational age, birth control pill use, and cultural involvement, did not show statistically significant associations (p > 0.05), some of them did show interesting trends that warrant further consideration.

Further research is needed to further explore these factors and their impact in a multivariate context, which could be key to identifying challenges mothers face in breastfeeding (Gray et al., 2023; Topothai et al., 2022). Overall, the evidence from this study supports the importance of understanding the various factors that can influence breast milk sufficiency. With appropriate focus on anatomical aspects such as nipple condition, maternal maturity, and appropriate labor and delivery support and practices, intervention strategies can be developed to improve overall breastfeeding success rates (Claudia Lopes & Lousada, 2024; Rodríguez-Gallego et al., 2021). Therefore, community involvement and the development of policies that support the entire breastfeeding process are crucial in efforts to increase breast milk sufficiency (Gaal, 2022; Kubuga & Tindana, 2023).

Discussions about cultural practices and environmental factors that influence breastfeeding

should also be part of this intervention approach to achieve better outcomes for mothers and their babies (Babu & Patnaik, 2021). Logistic regression analysis showed significant results related to breast milk adequacy based on maternal nipple condition. The analysis showed that abnormal nipples were associated with a lower chance of obtaining adequate breast milk, with a p-value of 0.049 and an Adjusted Odds Ratio (AOR) of 0.157 (95% CI: 0.025–0.992) (Yoga et al., 2024). Previous research has shown that physical factors, particularly the anatomical condition of the breast and nipple, significantly influence a mother's ability to breastfeed. For example, the effects of nipple shape and health can hinder breastfeeding, which has implications for breast milk adequacy (29.30).

The findings also indicate that although parity had a p-value approaching significance (p = 0.093), this association was not strong enough to confirm a significant relationship. This is reflected in the AOR value of 0.303 (95% CI: 0.075–1.221) for parity, indicating that this factor may have a negative impact on breast milk sufficiency, but with a confidence interval too wide to draw firm conclusions. Several studies have shown that previous breastfeeding experience can indeed influence future breastfeeding success, with higher parity sometimes seen as a positive factor (Rachmadiani & Nadhiroh, 2024; Yani et al., 2025). Meanwhile, other factors such as delivery method, Early Initiation of Breastfeeding (IMD), and contraceptive use did not show a significant relationship with breast milk sufficiency, with a p value > 0.05. This finding is in line with the literature stating that other parameters related to the birth process and early breastfeeding support actually have wider and inconsistent variations among the mothers examined (Simanungkalit, 2023). In addition, the high coefficients and standard errors for these variables highlight the potential for multicollinearity and outliers that need to be taken into account in this analysis model (Rachmadiani & Nadhiroh, 2024).

A mother's psychological state also plays a role in breastfeeding success. Postpartum stress and other psychological factors can influence breastfeeding behavior, as demonstrated in previous research showing a link between psychological distress and breast milk sufficiency (Muhani et al., 2020; Stia Pusporini et al., 2023). Social and emotional support for breastfeeding mothers is considered important in ensuring adequate milk production, which indicates that not only physiological factors, but also psychological and social aspects, must be considered in the model of pregnancy and breastfeeding (Mastina & Lestari, 2024). From the results of this analysis, it can be concluded that nipple condition is the single factor that most influences breast milk sufficiency, while other

obstetric and demographic factors do not show a significant contribution. This indicates the need for greater attention to the physical anatomy of breastfeeding mothers, which may imply more focused medical interventions and support on nipple-related issues. Thus, further research is needed to delve deeper into other factors that may contribute to breastfeeding challenges, as well as efforts to improve the quality of training and support for breastfeeding mothers with special anatomical conditions.

When providing interventions to increase breast milk supply, it's important to consider therapies that can boost maternal confidence in breastfeeding. Several therapeutic approaches, such as acupressure and massage therapy, have been shown to be beneficial in increasing breast milk production and reducing anxiety experienced by breastfeeding mothers. In addition, a better understanding of breast anatomy and education on proper breastfeeding techniques are also crucial to help address the issue of breast milk sufficiency (Ramadani et al., 2021; Gomes et al., 2024). Efforts to improve public policies related to breastfeeding should also involve appropriate education for pregnant and breastfeeding mothers, considering that knowledge about the importance of physical conditions that support breastfeeding can contribute to the success of breastfeeding practices in the community.

By strengthening this knowledge, it is hoped that we can achieve an increase in the success of exclusive breastfeeding and the adequacy of breast milk among mothers at risk (Yani et al., 2025). Opportunities for innovation in educational approaches for breastfeeding mothers should also be optimized by introducing simple physical exercises, improving mental and social conditions that support breastfeeding. This leads to the hope of improving the quality of life for both mothers and babies, while simultaneously supporting the achievement of global health goals related to pregnancy and breastfeeding. Given the importance of comprehensive interventions, policy measures aimed at improving training and resource availability for mothers at high risk of not being able to optimize breastfeeding are urgent. By prioritizing anatomical factors such as nipple condition, as well as education and psychological support, health systems can contribute significantly to improving breastfeeding sufficiency rates in the community.

## Conclusion

Based on the analysis, several maternal factors significantly influence breast milk sufficiency. First, the anatomical condition of the nipples indicates that mothers with normal nipples have a higher chance of providing sufficient breast milk compared to mothers

with flat nipples. Furthermore, maternal age also contributes to breastfeeding success, where low-risk mothers have a greater potential to provide adequate breast milk compared to mothers at risk. Birth practices, especially early initiation of breastfeeding (IMD), show a significant relationship, with mothers who give birth vaginally having a better chance of providing sufficient breast milk compared to those who give birth by cesarean section. Other factors, although not statistically significant, still show important trends for the development of future interventions. This study emphasizes the importance of a holistic approach to breastfeeding promotion, focusing on relevant education and support.

**Author Contributions**

Concept: RR, TT, HH Methodology and Software: RR, TT, HH, NS, ZA; Validation and Formal Analysis: RR, TT, HH, NS, ZA; Writing—Original Draft Preparation: RR, TT, HH, NS, ZA; Project Administration: RR, TT, HH, NS, ZA; Funding Acquisition: RR, TT, HH, NS, ZA.

**Conflicts of Interest**

The authors declare no conflict of interest.

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