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Household food security, galactagogue food consumption, and perceived breast milk sufficiency among breastfeeding mothers of the Kaili tribe in Sigi regency, Central Sulawesi: a mixed-methods study

Hepti MULIYATI[1,5], Katrin ROOSITA[2], Sri Anna MARLIYATI[2], I Wayan Gede ARTAWAN EKA PUTRA[3], Rachmalina SOERACHMAN[4]

1 Postgraduate in Nutrition Science, Department of Community Nutrition, Faculty of Human Ecology, IPB University, Bogor, Indonesia.
2 Department of Community Nutrition, Faculty of Human Ecology, IPB University, Bogor, Indonesia.
3 Department of Public Health and Preventive Medicine, Faculty of Medicine, Udayana University, Bali, Indonesia.
4 Research Center for Public Health, BRIN, Jawa Barat , Indonesia.
5 Department of Nutrition, Faculty of Health Sciences, Universitas Widya Nusantara, Palu, Indonesia.

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ABSTRACT

Low exclusive breastfeeding rates are influenced by multiple factors, including household food insecurity and inadequate maternal nutrient intake. This study aimed to examine the association between household food security, consumption habits of galactagogue foods, and perceived breast milk sufficiency among breastfeeding mothers of the Kaili tribe in Sigi Regency, Central Sulawesi. A mixed-methods cross-sectional design was employed from February to May 2024. Qualitative data were collected through observation (n = 5), in-depth interviews (n = 10, including the observed mothers), and focus group discussions (FGDs) with 36 additional informants, including village leaders, midwives, health cadres, religious/community leaders, traditional leaders, and traditional birth attendants—yielding a total of 46 qualitative participants selected via purposive sampling. Quantitative data were gathered from 337 breastfeeding mothers using multistage random sampling. Findings revealed that most Kaili breastfeeding mothers frequently consumed galactagogue foods such as bavoa (*Cleome gynandra* L.), pumpkin leaves, sweet potato leaves, and banana blossom in sufficient amounts. Chi-square tests indicated a significant association ($p<0.001$) between household food security, as measured by the Household Food Insecurity Access Scale (HFIAS), and perceived breast milk sufficiency. Additionally, the quantity of galactagogue food consumption was significantly associated with perceived breastmilk sufficiency ($p<0.001$). The consumption of galactagogue foods among Kaili breastfeeding mothers appears to support their perceived adequacy of breast milk and should be promoted as part of strategies to enhance exclusive breastfeeding practices.

KEYWORDS

Breastfeeding mothers, *Cleome gynandra*, galactagogue foods, household food security.

ABBREVIATIONS

FGD: Focus Group Discussion.

HFIAS: Household Food Insecurity Access Scale.

SQ-FFQ: Semi Quantitative Food Frequency Questionnaire.

INTRODUCTION

Breastfeeding is one of the most effective strategies to improve infant and child health, development, and survival. Beyond its immediate nutritional benefits, breastfeeding is associated with enhanced cognitive development, improved educational attainment, greater productivity, and higher income

Correspondencia:
Katrin Roosita
kroosita2@apps.ipb.ac.id

in adulthood[1,2]. Despite its well-documented advantages, only 48% of infants aged 0–5 months worldwide are exclusively breastfed. Regional disparities exist, with South Asia reporting the highest prevalence (over 60%), while in North America, exclusive breastfeeding rates are as low as 26%[3]. Meanwhile, in Indonesia, 68.6% of infants under six months were exclusively breastfed in 2023, while in Central Sulawesi, the rate was slightly lower at 62.1%[4].

Several factors contribute to suboptimal breastfeeding practices, including low maternal education, parity, perceived insufficient milk, infant–mother separation, maternal discomfort, returning to work, and personal choice[5]. Additionally, household food insecurity is increasingly recognized as a significant barrier to exclusive breastfeeding. Mothers facing food insecurity may discontinue breastfeeding early due to perceived insufficient milk supply or concerns about their nutritional status[6,7].

The consumption of certain foods, known as galactagogues, in many Asian cultures, is traditionally believed to support lactation. For instance, mothers in Hong Kong consume papaya, eggs, chicken, ginger, and fish soup; in Thailand, banana blossom soup and spicy vegetable soup (kaeng liang); in the Philippines, moringa soup (Moringa oleifera); in China, crucian carp soup; and in Indonesia, Bataknese mothers consume torbangun (Coleus ambonicus Lour.), while Sundanese mothers use galohgor, a traditional formulation made from 56 plant species[8-12].

Despite these widespread traditional practices, no previous study has explored the relationship between household food security, galactagogue food consumption, and perceptions of breast milk sufficiency among mothers of the Kaili tribe, an indigenous ethnic group from Central Sulawesi, primarily residing in the Palu Valley. Therefore, this study aimed to assess the association between household food security and galactagogue consumption habits with perceived breast milk sufficiency among breastfeeding mothers of the Kaili tribe in Sigi Regency, Central Sulawesi.

METHODES

Design dan Participants

An exploratory sequential mixed-methods study design was employed to investigate traditional practices related to galactagogue consumption among breastfeeding mothers of the Kaili tribe. This approach was chosen to allow in-depth qualitative exploration, which informed the development of culturally relevant quantitative instruments. The study was conducted from February to May 2024 in Sigi Regency, Central Sulawesi.

Qualitative data were collected through observation of five breastfeeding mothers (25–30 minutes per session); In-depth interviews with ten breastfeeding mothers (including the five observed mothers; 30–45 minutes per interview); and focus group discussions (FGDs) with 36 additional informants (lasting approximately 45–60 minutes per session). The FGDs informants included village leaders, village midwives, health cadres, religious/community leaders, traditional leaders, and traditional birth attendants, providing a broad perspective on local breastfeeding practices. In total, 46 participants were involved in the qualitative phase. Informants were selected using purposive sampling, with attention to community knowledge and involvement in maternal and child health.

Quantitative data were collected from 337 households of breastfeeding mothers. The sample size was determined using the following formula[13]:

$$n \geq \frac{Z\alpha^2\ PQ}{d^2}$$

$$n \geq \frac{1{,}96^2 \times 0{,}677 \times 0{,}323}{0{,}05^2}$$

$$n \geq 336{,}02 \approx 337$$

where: n= minimum required sample size; Z = 1.96 (for 95% confidence interval); P = 67.7% (proportion of infants receiving exclusive breastfeeding in Sigi District, 2022); Q = 32.3% (proportion of infants not receiving exclusive breastfeeding in Sigi District, 2022); d = relative precision of 5%). A multistage random sampling approach was used for the quantitative phase of this study, involving a three-stage selection process. Stage 1 to select sub-districts: the stratified random sampling was conducted by categorizing all sub-districts in Sigi Regency into two strata based on topography: highland and lowland areas. A list of sub-districts was compiled for each stratum. From each stratum, four sub-districts were selected using simple random sampling, aided by a random number generator, resulting in a total of eight sub-districts. Stage 2 to select the villages: within each selected sub-district, villages were further stratified into rural and urban categories. Two villages from each stratum were randomly selected using simple random sampling assisted by a random number generator. This resulted in a total of 32 villages. Stage 3 to select respondents from each village: all eligible breastfeeding mothers residing in the selected villages were invited to participate. The inclusion criteria were mothers currently breastfeeding infants aged less than 6 months, Kaili tribe households, and residency in Sigi Regency confirmed by an official ID card or domicile certificate. The exclusion criteria included mothers who had delivered preterm or whose infants required neonatal intensive care, mothers with twins, mothers currently on an active weight-reduction diet, and mothers with clinically significant renal, hepatic, endocrine, cardiac, pulmonary, pancreatic, neurologic, hematologic, or biliary disorders, as identified through self-reported medical history.

Data Collection

Qualitative data were collected to explore galactagogues food consumption—including the types, amounts, and frequency of foods consumed—as well as perceptions of breast milk sufficiency. Quantitative data collection encompassed the following components: sociodemographic characteristics of breastfeeding mothers were collected using a structured questionnaire; energy and nutrient intake was assessed using a 2 × 24-hour food recall method to capture dietary variability and estimate average intake; and household food security was measured using two validated tools. The Household Food Insecurity Access Scale (HFIAS) to assess perceived physical access to food (availability dimension) whilst the Maxwell method to assess economic access, including household food expenditure levels and energy consumption per adult equivalent unit. Galactagogues food consumption were assessed using a Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ) tailored to include culturally relevant galactagogue foods identified during the qualitative phase. Perceived breast milk sufficiency was measured using a validated questionnaire, which demonstrated strong internal consistency with composite reliability values > 0.7 for all constructs. All quantitative data were collected through face-to-face interviews conducted by trained enumerators.

Qualitative data were analyzed through triangulation of information obtained from observations, in-depth interviews, and focus group discussions (FGDs). Data in the form of audio and video recordings were transcribed verbatim and then systematically coded and categorized thematically using NVivo 12 software.

The HFIAS consists of nine question items, each scored on a 0–3 scale i.e. 0 = Never; 1 = Rarely (1–2 times in the past 4 weeks); 2 = Sometimes (3–10 times in the past 4 weeks) and 3 = Often (>10 times in the past 4 weeks). Furthermore, it was categorized into four levels, namely food secure (total score 0-1), mildly food insecure (total score 2-7), moderately food insecure (total score 8-14), and severely food insecure (total score 15-27)[13,14]. Meanwhile, the Maxwell method was categorized into four groups, i.e. food secure (food expenditure ≤ 60% of household expenditure and energy consumption > 70% energy adequacy); food vulnerable (food expenditure > 60% of household expenditure and energy consumption > 70% energy adequacy), food less secure (food expenditure ≤ 60% of household expenditure and energy consumption ≤ 70% energy adequacy), and food insecure (food expenditure > 60% of household expenditure and energy consumption ≤ 70% energy adequacy)[14,15].

Consumption habits of galactagogue foods were assessed based on the average frequency score. The assigned scores for frequency categories were as follows: >1 time/day (score = 2.5), 1 time/day (score = 1.0), 3–6 times/week (score = 0.43), 1–2 times/week (score = 0.14), 2 times/month (score = 0.07), 1 time/month (score = 0.02), and never (score = 0)[16,17]. Based on the average frequency score, consumption was categorized into two groups: frequent (score ≥ 0.17) and rare (score < 0.17).The amount of galactagogue food consumption was also categorized into two groups: adequate (mean intake ≥ 12 g/day) and inadequate (mean intake < 12 g/day).

Perceived breast milk sufficiency was assessed using eleven[11] statements with two response options ("Yes" = 1, "No" = 0). The total score was then categorized into three levels: very low (<3), low (3–6), and adequate (>6)[18,19].

Statistical Analysis

Quantitative data were analyzed using IBM SPSS Statistics version 27. The Kolmogorov–Smirnov test was used to assess data normality. The Chi-square test was employed to examine associations between household food security and galactagogue food consumption habits with the perception of sufficient breast milk. Logistic regression analysis was conducted to confirm the association between galactagogue food consumption habits and perceived breast milk sufficiency, while controlling for potential confounders including maternal age, education level, employment status, infant's gender and age, protein adequacy level, and household food security. Collinearity diagnostics were performed, and the final, more parsimonious model was selected using the backward likelihood ratio method. A p-value of <0.05 was considered statistically significant.

Ethical Approval

This study was conducted in accordance with the principles of the Declaration of Helsinki (2013, last revised in Finland in 2024)[19], which governs research involving human subjects. Ethical approval was obtained from the Social Humanities Ethics Commission, National Research and Innovation Agency (BRIN) (Approval No: 084/KE.01/SK/02/2024). Informed consent was obtained from all participants prior to data collection.

RESULTS

Socio-Demographic Characteristics, Household Food Security, Energy and Nutrient Adequacy Levels of Breastfeeding Mothers

Table 1 presents the socio-demographic characteristics, household food security status, energy and nutrient adequacy levels among breastfeeding mothers of the Kaili tribe. The analysis revealed that the majority of mothers were of ideal reproductive age (69.4%), had a low level of education (90.2%), were unemployed (87.2%), had a household income above the poverty line (93.2%), and lived in households with five or more members (64.4%). Most mothers also had a history of multiparous pregnancies (65.3%), delivered at a

Table 1. Distribution of Kaili tribe breastfeeding mothers by socio-demographic characteristics

Variable	n = 337	%
Socio-demographic characteristics		
Age		
Non-ideal reproductive age (< 20 years dan > 35 years)	103	30.6
Ideal reproductive age (20-35 years)	234	69.4
Educational level		
Low	304	90.2
High	33	9.8
Employment status		
Working	43	12.8
Not working	294	87.2
Household Income		
Under the poverty line (£ Rp 382,579)	23	6.8
Above the poverty line (> Rp 382,579)	314	93.2
Number of family members		
Small family (£ 4 peoples)	120	35.6
Large family (³ 5 peoples)	217	64.4
Gestational age		
³ 37 weeks	97	28.8
< 37 weeks	240	71.2
Parity		
Primiparous	117	34.7
Multiparous	220	65.3
Mode of delivery		
Cesarean section	248	73.6
Spontaneous vaginal delivery	89	26.4
Infant's gender		
Boy	175	51.9
Girl	162	48.1
Infant's age (months)		
0-3	222	65.9
4-6	115	34.1

gestational age of less than 37 weeks (71.2%), and gave birth via spontaneous delivery (73.6%). Additionally, a slight majority had male infants (51.9%), with most infants aged between 0 and 3 months (65.9%).

In terms of nutrient adequacy, most breastfeeding mothers exhibited severe deficiencies in energy (76.0%), protein (71.8%), and carbohydrate (88.7%) intake, while fat intake was generally adequate (60.2%). Micronutrient adequacy levels were also predominantly low, with deficiencies observed in calcium (98.8%), iron (85.8%), zinc (97.3%), vitamin A (54.6%), and vitamin C (95.3%) (Table 2).

Table 2. Distribution of Kaili tribe breastfeeding mothers by household food security, energy and nutrient adequacy levels

Variable	n = 337	%
Household Food Security		
HFIAS Method		
Food secure	116	34.4
Mildly food insecure	105	31.2
Moderately food insecure	77	22.8
Severely food insecure	39	11.6
Maxwell Method		
Food secure	94	27.9
Food vulnerable	116	34.4
Food less secure	49	14.5
Food insecure	78	23.1
Energy and Nutrient Adequacy Levels		
Energy		
Severe deficit (<70%)	256	76.0
Moderate deficit (70-79%)	34	10.1
Mild deficit (80-89%)	22	6.5
Normal (90-119%)	21	6.2
Excess (³120%)	4	1.2
Protein		
Severe deficit (<70%)	242	71.8
Moderate deficit (70-79%)	26	7.7
Mild deficit (80-89%)	23	6.8
Normal (90-119%)	32	9.5
Excess (³120%)	14	4.2

Table 2 continuation. Distribution of Kaili tribe breastfeeding mothers by household food security, energy and nutrient adequacy levels

Variable	n = 337	%
Fat		
Adequate (20-30% KE)	203	60.2
Excess (>30% KE)	134	39.8
Carbohydrates		
Severe deficit (<70%)	299	88.7
Moderate deficit (70-79%)	19	5.6
Mild deficit (80-89%)	5	1.5
Normal (90-119%)	8	2.4
Calcium		
Deficient (<77% AKG)	333	98.8
Adequate (³77 AKG)	4	1.2
Iron		
Deficient (<77% AKG)	289	85.8
Adequate (³77 AKG)	48	14.2
Zinc		
Deficient (<77% AKG)	328	97.3
Adequate (³77 AKG)	9	2.7
Vitamin A		
Deficient (<77% AKG)	184	54.6
Adequate (³77 AKG)	153	45.4
Vitamin C		
Deficient (<77% AKG)	321	95.3
Adequate (³77 AKG)	16	4.7

Based on the Household Food Insecurity Access Scale (HFIAS) method, 34.4% of breastfeeding mothers from the Kaili tribe in Sigi Regency were classified as living in food-secure households. The remaining households were categorized as mildly food insecure (31.2%), moderately food insecure (22.8%), and severely food insecure (11.6%). In comparison, according to Maxwell's method, 27.9% of breastfeeding mothers were categorized as food secure, while 34.4% were considered food vulnerable, 14.5% as food less secure, and 23.1% as food insecure.

Lactagogue Food Consumption Habits

In-depth interviews and FGDs revealed that breastfeeding mothers of the Kaili tribe in Sigi Regency continue to consume several local foods traditionally believed to stimulate breast milk production (galactagogues). These include bavoa (*Cleome gynandra* L.), pumpkin leaves (*Cucurbita spp.*), sweet potato leaves (*Ipomoea batatas* L.), banana blossom (*Musa* spp.), moringa leaves (*Moringa oleifera*), and peanuts (*Arachis hypogaea*). This belief was confirmed by several informants, as illustrated in the following statements:

> "…. During breastfeeding, I was told to eat pumpkin leaves and moringa, *bavoa*...I also used to eat peanuts to encourage breast milk to come out...." (Breastfeeding mother, 31 years old)

> ".....I was told by my parents to eat a lot of moringa, *bavoa*, and sweet potato leaves when I first started breastfeeding so that I would get a lot of milk...." (Breastfeeding mother, 38 years old)

> "...bavoa boiled, moringa and banana blossom can also be used. We were also told to eat peanuts...that's what we, Kaili people used to eat when breastfeeding" (FGD with Paraji).

This finding is supported by survey results, which show that all breastfeeding mothers of the Kaili tribe (100%) reported consuming *bavoa*, pumpkin leaves, sweet potato leaves, and banana blossom as galactagogues foods (Figure 1).

Qualitative findings suggest that the frequency of galactagogue foods consumption among breastfeeding mothers of the Kaili tribe varies, ranging from 1-3 times a day to once a month. The following are quotes from some of the informants:

> "...I usually eat bavoa 1-3 times a day, Moringa 3-4 times every week....but sweet potato leaves at most once a month...." (Breastfeeding mother, 38 years old)

> "..every day I must eat vegetables so that there is a lot of breast milk...only the type changes, it can be spinach, bavoa.... " (Breastfeeding mother, 26 years old)

This finding is in line with the quantitative data, which indicates that lactagogue foods are frequently consumed by most breastfeeding mothers of the Kaili tribe (55%) (Figure 2).

Another key finding from the qualitative data was the variation in the amount of galactagogues foods consumption among breastfeeding mothers of the Kaili tribe in Sigi Regency. In general, mothers reported consuming approximately three tablespoons of vegetables per meal. However, some mothers indicated consuming larger portions, ranging

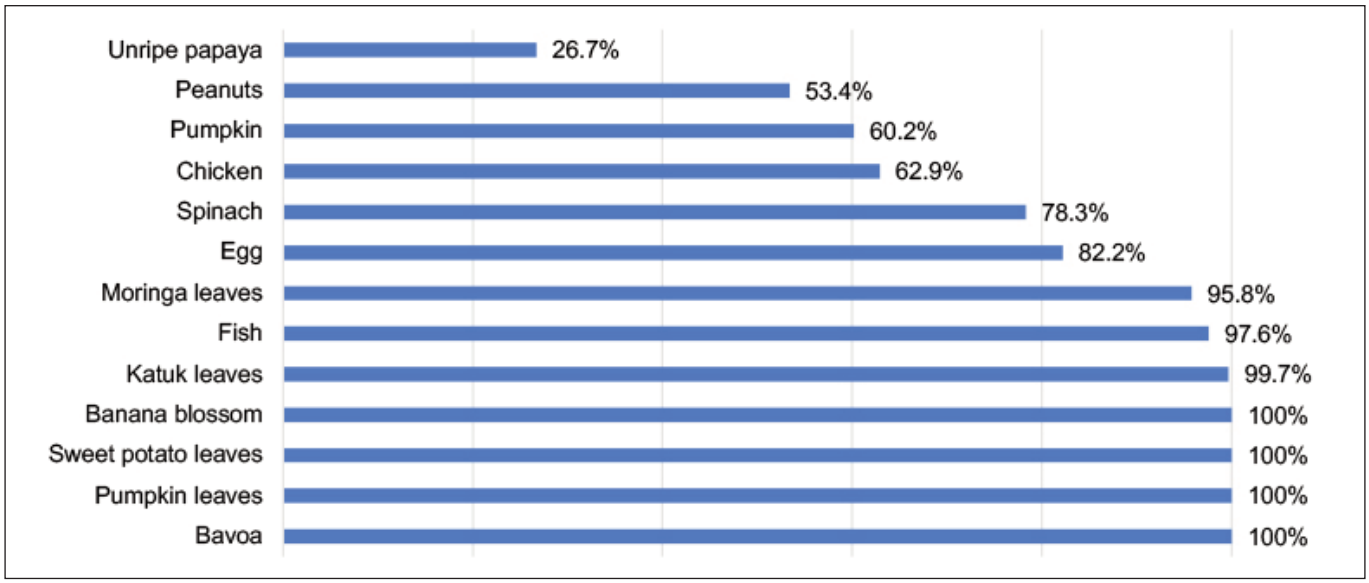

Figure 1. Distribution of breastfeeding mothers of the Kaili tribe according to type of galactagogues foods consumed

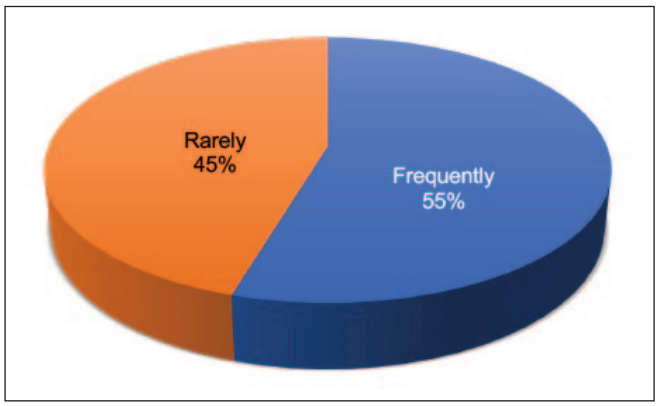

Figure 2. Distribution of breastfeeding mothers of the Kaili tribe according to frequency of galactagogue food consumption

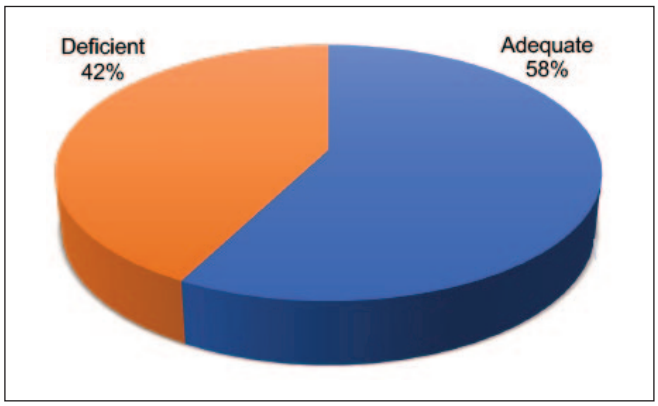

Figure 3. Distribution of breastfeeding mothers of the Kaili tribe by amount of galactagogue food consumption

from 3–4 tablespoons to a full bowl per meal. This variation is illustrated by the following informant comments:

> "....each meal time...I eat vegetable bavoa 3 tablespoons...other vegetables usually 5-6 tablespoons...." (Breastfeeding mother, 26 years old)

> "...oh I can eat up to one bowl of vegetables at every meal, but if it's bavoa, I always eat a full bowl for sure...." (Breastfeeding mom, 18 years old)

> ".... I usually eat about 3-4 tablespoons of vegetables on each meal time, especially bavoa... because I really like it....." (Breastfeeding mother, 38 years old)

A quantitative analysis of 337 breastfeeding mothers of the Kaili tribe in Sigi Regency showed that the majority (58%) had adequate galactagogue food consumption habits (Figure 3).

Perceived Breast Milk Sufficiency

Qualitative findings on Perceived breast milk sufficiency among breastfeeding mothers of the Kaili tribe revealed relatively consistent infant suckling patterns—typically 7–8 times per day, with each session lasting more than 10 minutes. Most informants identified signs of breast milk adequacy as breast tightness, milk leakage, and the infant sleeping soundly and not crying after feeding. These perceptions are illustrated in the following informant statements:

> "...When breastfeeding, the breasts are first cleaned with water, and then the baby is breastfed from the right breast and then moved to the left breast. The baby is held in the arms, and the baby's face is placed on the breast. Later, you can feel that the baby is breastfeeding, and you can hear the

sound of breast milk being swallowed...." (Breast-feeding mother, 26 years old)

"...Babies usually suckle for approximately 15 minutes each time. A day can be up to 7 or 8 times..." (Breast-feeding mother, 38 years)

"...the breast can feel firm, hard, the milk comes out by itself, the baby doesn't cry anymore..." (Breast-feeding mother, 38 years old)

Quantitative data indicate that the majority of breast-feeding mothers of the Kaili tribe in Sigi Regency have an adequate perception of sufficient breast milk (64.1%) (Figure 4).

Association of Household Food Security with Perceived Breast Milk Sufficiency

The Chi-square test revealed a significant association between household food security (measured using the HFIAS method) and perceived breast milk sufficiency ($p < 0.001$). However, no significant association was found when household food security was assessed using Maxwell's method ($p > 0.05$) (Table 3).

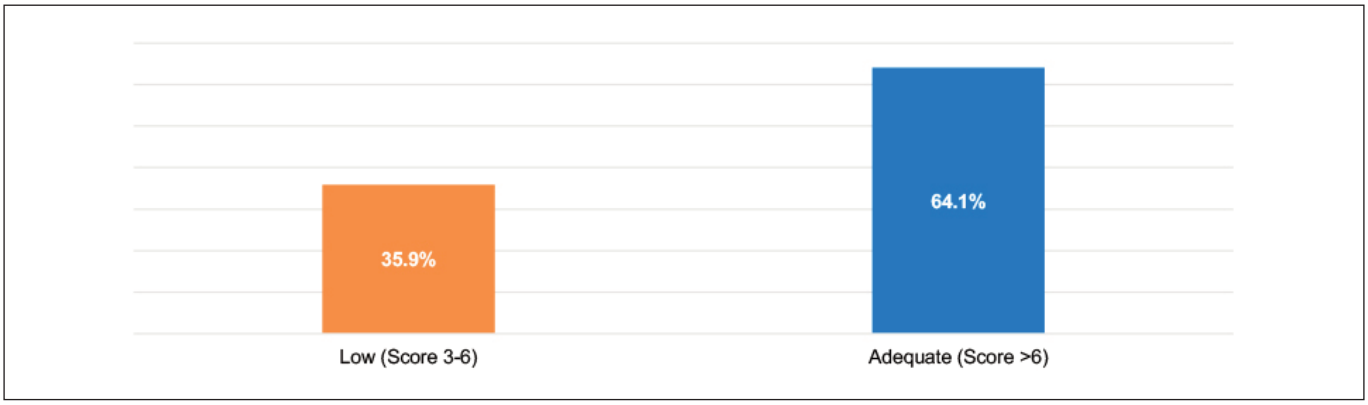

Figure 4. Distribution of Kaili tribe breastfeeding mothers by perceived breast milk sufficiency

Table 3. Association of household food security with perception of sufficient breast milk (n=337)

Household Food Security	Perceived Breast Milk Sufficiency				*p-value*[a)]
	Adequate		Low		
	n	%	n	%	
HFIAS Method					
Food secure	107	93.0	8	7.0	< 0.001*
Mildly food insecure	73	68.2	34	31.8	
Moderately food insecure	33	42.9	44	57.1	
Severely food insecure	3	7.9	35	92.1	
Maxwell Method					
Food secure	60	64.5	33	35.5	0.691
Food vulnerable	79	66.9	39	33.1	
Food less secure	28	57.1	21	42.9	
Food insecure	49	63.6	28	36.4	

a) Chi-Square Test; * significant.

Association of Consumption Habits of Galactagogue Foods Consumption with Perceived Breast Milk Sufficiency

Breastfeeding mothers of the Kaili tribe who frequently consumed galactagogue foods were more likely to perceive their breast milk as adequate (70.7%), similar to those who consumed an adequate amount of galactagogue foods (84.0%). The Chi-square test showed a significant association between both the frequency ($p < 0.05$) and the amount ($p < 0.01$) of galactagogue food consumption and perceived breast milk sufficiency (Table 4).

Logistic regression analysis revealed a highly significant association between the amount of galactagogues foods consumption and perceived breast milk sufficiency ($p<0.001$; OR = 11.327), after controlling for potential confounding variables (Table 4). The final, more parsimonious model is presented in Table 5, as other variables included in the initial analysis were not statistically significant.

The analysis yielded a Cox & Snell R Square value of 0.303 and a Nagelkerke R Square value of 0.415, indicating that the model has a moderate ability to predict the variation in the dependent variable. Additionally, the Hosmer–Lemeshow goodness-of-fit test produced a Chi-square value of 3.334 with a significance level of p=0.766, suggesting that the logistic regression model fits the data well.

DISCUSSION

The age range of 20–35 years is considered ideal for reproduction, as the reproductive organs are physiologically mature and ready for childbearing. This age group is also associated with greater psychological and emotional maturity, which contributes to the success of breastfeeding practices[20]. However, younger mothers may have limited experience, lower educational attainment, and reduced access to social support, all of which can negatively affect breastfeeding behaviors[21]. Maternal education plays a critical role in shaping health behaviors, including breastfeeding, and is therefore considered a key investment for improving maternal and child health outcomes[22]. Employment status can also present a significant barrier to successful breastfeeding[24,25]. In this study, 12.8% of breastfeeding mothers were employed. Working

Table 4. Association of consumption habits of lactagogue foods with perceived breast milk sufficiency

Consumption Habits of Lactagogue Foods	Perception of Sufficient Breast Milk				p-value [a)]
	Adequate		Low		
	n	%	n	%	
Frequency					
Frequnelty	130	70.7	54	29.3	0.008
Rarely	86	56.2	67	43.8	
Amount					
Adequate	163	84.0	31	16.0	< 0.001*
Deficient	53	37.1	90	62.9	

a) Chi-Square Test; * significant.

Table 5. Logistic regression results of the association between consumption habits of lactagogue foods and other variables with perceived breast milk sufficiency

Independent Variable	B	SE	*p-value*	OR (95% CI)
Food security	2.399	0.507	< 0.001	11.013 (4.073-29.777)
Protein adequacy level	0.955	0.487	0.050	2.598 (1.001-6.743)
Amount of lactagogue food consumption	2.427	0.328	< 0.001	11.327 (5.958-21.533)

B (regression coefficient); SE (standard error); OR (odds ratio); CI (confidence interval).

mothers often face time constraints and reduced opportunities to interact with their infants, including engaging in breastfeeding[25]. Furthermore, gestational age at birth is another influential factor. Preterm births (<37 weeks) may lead to the immaturity of vital organs, particularly the brain and the suckling reflex, which can interfere with effective breastfeeding[27,28]. In this study, 28.8% of breastfeeding mothers had delivered preterm infants.

Food security remains a global challenge, as it is closely linked to economic development and overall human well-being[29,30]. At the household level, food insecurity is recognized as a significant public health concern[30]. During lactation, physiological changes increase the energy and nutrient requirements of mothers. Therefore, adequate nutritional intake is essential—not only to maintain the health and nutritional status of the mother, but also to ensure the production of sufficient and high-quality breast milk[31].

The qualitative and quantitative findings of this study align with previous research[10,32,33] which reported that the consumption of galactagogue foods is deeply rooted in cultural beliefs regarding their benefits for enhancing breast milk production and improving lactation. These foods have become an integral part of the maternal diet in many communities. Another study[34] found that the frequency of galactagogue food consumption varies—ranging from one to three times per day—with differing portion sizes. The types and amounts of galactagogue foods consumed are often shaped by cultural practices. For example, Batak breastfeeding mothers commonly consume a bowl of *torbangun* soup (*Coleus ambonicus* Lour), based on the belief that it stimulates milk production[11].

Maternal perception of sufficient breast milk is a global concern, and the implications of this perception can differ across cultural contexts. A positive perception is essential for supporting exclusive breastfeeding and achieving optimal maternal and infant health outcomes[35].

Several studies have demonstrated that moderate to severe food insecurity is associated with an increased risk of early discontinuation of exclusive breastfeeding. This is often linked to maternal beliefs regarding the necessity of consuming nutritious foods to ensure adequate milk production[37,38] and it may also influence the timely initiation of breastfeeding[38]. Furthermore, household food insecurity has been associated with reduced breast milk intake among infants[39]. In contrast, breastfeeding mothers from food-secure households are more likely to successfully practice exclusive breastfeeding[40].

The findings of this study are consistent with previous research[9], which reported that the amount of galactagogue food consumed is positively associated with increased breast milk volume. Consuming galactagogue foods is a simple and culturally accepted strategy to help maintain breast milk production throughout the breastfeeding period, ultimately supporting optimal child growth and development. Therefore, the habit of consuming galactagogue foods among breastfeeding mothers of the Kaili tribe should be preserved and promoted to enhance the success of exclusive breastfeeding practices.

Limitations

The sample size and the geographic focus on breastfeeding mothers of the Kaili tribe in Sigi Regency limit the generalizability of the findings to other populations or cultural contexts. Additionally, perceived breast milk sufficiency was assessed subjectively through self-reported measures, which may be subject to reporting bias and personal interpretation.

CONCLUSION

Most breastfeeding mothers of the Kaili tribe habitually and frequently consume galactagogue foods in adequate amounts, particularly *bavoa* (*Cleome gynandra L.*), pumpkin leaves (*Cucurbita* spp.), sweet potato leaves (*Ipomoea batatas L.*), and banana blossom (*Musa* spp.). Based on the HFIAS method, 34.3% of these mothers were classified as living in food-secure households, and household food security was significantly associated with perceived breast milk sufficiency ($p<0.05$). Moreover, the amount of galactagogue food consumption showed a strong and significant association with perceived breast milk sufficiency ($p<0.001$).

Future research is recommended to analyze the nutritional composition and bioactive components of commonly consumed galactagogue foods among the Kaili tribe. Preclinical studies should also be conducted to evaluate their efficacy in supporting lactation.

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