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Original Research

Appropriate Complementary Feeding and Parenting Practices to Prevent Stunting in Children

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ABSTRACT

Background: *Stunting is a major public health problem caused by chronic malnutrition and recurrent infections, especially during the First 1000 Days of Life. Banjar Regency recorded the highest stunting prevalence in South Kalimantan, reaching 44.4% in 2022. Parenting practices such as early initiation of breastfeeding (IMD), exclusive breastfeeding, appropriate complementary feeding (MP-ASI), vitamin A supplementation, and handwashing with soap (CTPS) play an essential role in stunting prevention. This study aimed to analyze the association between parenting practices and stunting incidence in Banjar Regency.*

Methods: *An observational study with a cross-sectional design was conducted among mothers with children aged 12–24 months. Samples were selected using multistage random sampling. Data were collected through anthropometric measurements and structured questionnaires assessing parenting practices. Data were analyzed using the chi-square test with a significance level of $p<0.05$ and odds ratio (OR) estimation.*

Results: *Most mothers practiced IMD (90%), provided MP-ASI (80%), and administered vitamin A supplementation (80%), but more than half did not exclusively breastfeed (43.3%). The prevalence of stunting was 40%. Statistical analysis showed a significant association between MP-ASI practices and stunting incidence (p-value = 0.026; OR = 0.082). However, IMD, exclusive breastfeeding, vitamin A supplementation, and CTPS were not significantly associated with stunting.*

Conclusion: *Complementary feeding practices have a strong protective effect against stunting. Therefore, strengthening maternal knowledge and community-based education on optimal complementary feeding practices should be prioritized in stunting prevention strategies.*

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INTRODUCTION

Stunting is a chronic growth disorder defined as a height-for-age Z-score below −2 standard deviations (SD) from the WHO Child Growth Standards median. It results primarily from prolonged insufficient nutrient intake and recurrent infections during the First 1.000 Days of Life (Fetal life to 2 years), a critical window for child growth and development (Arima & Fukuoka, 2020). Stunting has serious long-term consequences, including impaired cognitive development, reduced physical capacity, lower educational attainment, and increased risk of chronic diseases in adulthood. Globally, stunting remains a major public health concern, particularly in low- and middle-income countries, where poor nutrition, inadequate healthcare access, and socio-economic inequalities persist as underlying determinants (Khasanah et al., 2021).

In Indonesia, stunting prevalence remains higher than the WHO public health threshold. South Kalimantan Province recorded a prevalence of 24.6% in 2021, which exceeded the national target of 21.6%. Banjar Regency contributes significantly to this burden, being the district with the highest prevalence in the province, reaching 40.2% in 2021 and increasing to 44.4% in 2022 (Banjar, 2022). These data indicate that almost one in two children in Banjar Regency experiences stunting, underscoring an urgent need for effective and context-specific preventive strategies.

The etiology of stunting is multifactorial, involving inadequate dietary intake, repeated infections, poor sanitation, and suboptimal caregiving and feeding practices. Among these determinants, parenting practices play a critical role during early childhood, particularly early initiation of breastfeeding (IMD), exclusive breastfeeding, timely and appropriate complementary feeding (MP-ASI), micronutrient supplementation such as vitamin A, and hygiene behaviors including handwashing with soap (CTPS) (Amalia, Ramadani, & Muniroh, 2022; Babys, Dewi, & Rahardjo, 2022). Evidence suggests that inappropriate complementary feeding practices, especially in terms of timing, dietary diversity, and food quality, are strongly associated with higher risk of stunting among infants and young children.

However, findings regarding other parenting practices, such as exclusive breastfeeding, vitamin A supplementation, IMD, and hygiene practices, remain inconsistent across different contexts and populations (Andra, Resmiati, Symond, & Puri, 2025; Herawati, Anwar, & Setyowati, 2020; Novianti, Huriyati, & Padmawati, 2023; Rai, 2022; Silva-Neto, dos Santos Neto, & de Menezes Toledo Florêncio, 2024). Several studies have reported that exclusive breastfeeding significantly reduces the risk of stunting by providing optimal nutrition and protecting infants from infectious diseases during the first six months of life (Hadi et al., 2021; Iffah Zahrotin Nisa, Benya Adriani, & Murti, 2022; Permatasari, Simbolon, & Yunita, 2024).

However, other studies found no significant association between exclusive breastfeeding and stunting, highlighting the influence of post-breastfeeding practices, maternal nutrition, and environmental factors (Andra et al., 2025). Similarly, vitamin A supplementation has been reported to have mixed effects on child growth outcomes, with some studies demonstrating protective effects against stunting (Silva-Neto et al.,

2024; Ssentongo et al., 2020), while others found no significant impact on linear growth (Rai, 2022).

Hygiene behavior, particularly maternal handwashing with soap (CTPS), has been recognized as an important factor in reducing infection-related growth faltering. Poor water, sanitation, and hygiene (WASH) practices are associated with higher stunting risk due to repeated exposure to diarrheal and respiratory infections (Batool et al., 2023; Herawati et al., 2020; Najib, Giyarsih, Listyaningsih, & Nawawi, 2024). Nevertheless, some intervention studies have reported limited effects of hygiene improvements alone on reducing stunting, suggesting that nutrition- and sanitation-based approaches need to be integrated (Piper et al., 2024).

MATERIALS AND METHOD

This study employed an observational analytical design with a cross-sectional approach to examine the association between parenting practices and stunting incidence among children aged 12–24 months. The cross-sectional design was selected because it allows the assessment of exposure (parenting practices) and outcome (stunting status) simultaneously within a defined population at a single point in time, which is appropriate for identifying associations in public health studies.

The study population consisted of all mothers who had children aged 12–24 months residing in Banjar Regency. The sample size was determined using a cross-sectional sample size calculation formula based on estimated stunting prevalence, a 95% confidence level, and 5% margin of error. The target minimum sample size was achieved, resulting in a total of 30 mother–child pairs included in the final analysis.

Participants were selected using a multistage random sampling technique. Initially, several sub-districts and villages were randomly selected. Subsequently, eligible respondents within the selected areas were recruited based on predefined criteria. Inclusion criteria:(1) mothers with children aged 12–24 months; and (2) residing permanently in the selected study area and willing to participate in the study by signing written informed consent. Exclusion criteria: (1) children with congenital anomalies or chronic diseases that could affect growth status; and (2) incomplete or missing data during the data collection process.

The dependent variable in this study was stunting status, defined as a height-for-age Z-score (HAZ) < −2 SD based on the WHO Child Growth Standards. The independent variables were parenting practices, consisting of: (1) early initiation of breastfeeding; (2) exclusive breastfeeding for the first 6 months; (3) complementary feeding practices; (4) Vitamin A supplementation; and (5) Maternal handwashing with soap behavior.

Each variable was measured using operational definitions: (1) IMD: Initiation of breastfeeding within the first hour after birth; (2) exclusive breastfeeding: feeding infants only breast milk for the first six months without additional food or drink; (3) MP-ASI practice: appropriateness of complementary feeding based on timing, frequency, and dietary diversity; (4) vitamin A supplementation: Administration of

vitamin A capsule according to national health guidelines; (5) CTPS behavior: Regular handwashing with soap before feeding and after defecation.

Data were collected through structured interviews and anthropometric measurements, conducted by trained research assistants. Child height or length was measured using standardized anthropometric equipment following WHO measurement procedures. The measurement results were converted into height-for-age Z-scores (HAZ) using WHO Anthro software. Parenting practices data were obtained using a structured questionnaire administered through face-to-face interviews with mothers. The questionnaire covered information related to breastfeeding practices, complementary feeding, vitamin A supplementation, and hygiene behavior.

Prior to data collection, the questionnaire was tested for validity and reliability in a pilot study involving a similar population. Content validity was assessed by public health and nutrition experts, while reliability was tested using Cronbach's alpha coefficient, which demonstrated acceptable internal consistency (>0.70). All collected data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS).

Univariate analysis was used to describe the frequency and distribution of each variable. Bivariate analysis using the Chi-square test was performed to examine the association between parenting practices and stunting incidence, with a significance level set at $p < 0.05$. Odds ratios (OR) with 95% confidence intervals (CI) were calculated to determine the strength of associations.

This study was approved by the Health Research Ethics Committee of Poltekkes Kemenkes Banjarmasin, Indonesia, with ethical approval number No. 134/KEPK-PKB/2025. Written informed consent was obtained from all participants before data collection. The study followed ethical principles including respect for autonomy, beneficence, non-maleficence, and justice, in accordance with the Declaration of Helsinki.

RESULTS

Table 1. Sociodemographic Characteristics of Respondents (n = 30)

Characteristic	Frequency (n)	Percentage (%)
Mother's Age		
<25 years old	7	23.3
≥25 years old	23	76.7
Total	**30**	**100**
Education		
Elementary School	6	20.0
Junior High School	11	36.7
High School	12	40.0
Vocational	1	3.3
Total	**30**	**100**
Occupation		

Characteristic	Frequency (n)	Percentage (%)
Housewife	30	100
Total	**30**	**100**
Child Gender		
Male	16	53.3
Female	14	46.7
Total	**30**	**100**

Table 1 shows the demographic and basic characteristics of the 30 respondents. Most mothers are in the productive age group (≥25 years, 76.7%), have completed junior or senior secondary school (77%), with slightly more boys (53.3%) than girls. Overall, most respondents were mothers in the productive age group (≥25 years) with a relatively moderate level of education, although the majority had only junior or senior high school education. All mothers were housewives, indicating limited socioeconomic variation.

Table 1. Characteristics of Children (n = 30)

Variable	Mean ± Standard Deviation
Number of children	2.2 ± 1.0
Child's age (months)	18.8 ± 4.1

Table 2 presents the meaning and standard deviation of family and child characteristics. The mean number of children is 2.2, indicating that most families have two to three children. The mean age of children is 18.8 months, suggesting that most children in the sample are in the early toddler age range.

Table 3. Child Feeding Practices, Hygiene Behavior, and Nutritional Status (n = 30)

Variable	Category	Frequency (n)	Percentage (%)
Early Initiation of Breastfeeding (IMD)	Yes	27	90.0
	No	3	10.0
	Total	**30**	**100**
Exclusive Breastfeeding	Yes	13	43.3
	No	17	56.7
	Total	**30**	**100**
Vitamin A Supplementation	Yes	24	80.0
	No	6	20.0
	Total	**30**	**100**
Complementary Feeding (MP-ASI)	Appropriate	24	80.0
	Not appropriate	6	20.0

Variable	Category	Frequency (n)	Percentage (%)
	Total	**30**	**100**
Handwashing with Soap (CTPS) Behavior	Good	17	56.7
	Poor	13	43.3
	Total	**30**	**100**
Stunting Status	Stunted	12	40.0
	Not stunted	18	60.0
	Total	**30**	**100**

Table 3 presents the distribution of parenting practices and stunting status among children aged 12–24 months. The prevalence of stunting in this study was 40%, indicating that two out of five children experienced chronic linear growth failure. This prevalence is substantially higher than the provincial prevalence of 10.3% and the national prevalence of 21.5% (2023) and 19.8% (2024), indicating a disproportionate burden of stunting in Banjar Regency.

In terms of parenting practices, most mothers reported practicing IMD (90.0%) and providing complementary feeding (80.0%). Vitamin A supplementation coverage was also relatively high (80.0%). However, exclusive breastfeeding was practiced by less than half of respondents (43.3%), and only 56.7% demonstrated good handwashing behavior with soap (CTPS). Despite the high coverage of MP-ASI, 20% of mothers still practiced inappropriate complementary feeding, which is critical given its significant association with stunting in this study.

These findings indicate that although some parenting practices such as IMD and vitamin A supplementation have been widely implemented, gaps remain in exclusive breastfeeding and hygiene practices. In addition, despite relatively high reported coverage of complementary feeding, a proportion of mothers (20.0%) still provided inappropriate MP-ASI, which is critical considering its significant association with stunting demonstrated in this study.

Table 3. Association Between Parenting Practices and Stunting Incidence (n = 30)

Variable	Category	Stunting Incidence Yes (n, %)	Stunting Incidence No (n, %)	Total (n)	p-value*	OR (95% CI)
Early Initiation of Breastfeeding (IMD)	Yes	10 (37.0)	17 (63.0)	27	0.548	–
	No	2 (66.7)	1 (33.3)	3		
Exclusive Breastfeeding	Yes	3 (23.1)	10 (76.9)	13	0.201	–
	No	9 (52.9)	8 (47.1)	17		
Vitamin A Supplementation	Yes	10 (41.7)	14 (58.3)	24	1.000	–
	No	2 (33.3)	4 (66.7)	6		
Complementary	Appropriate	7 (29.2)	17 (70.8)	24	**0.026***	0.082

Variable	Category	Stunting Incidence Yes (n, %)	Stunting Incidence No (n, %)	Total (n)	p-value*	OR (95% CI)
Feeding (MP-ASI)	Not appropriate	5 (83.3)	1 (16.7)	6		(0.008–0.838)
Handwashing with Soap (CTPS)	Good	7 (41.2)	10 (58.8)	17	0.708	–
	Poor	4 (30.8)	9 (69.2)	13		

Note: *Chi-square test

Bivariate analysis demonstrated that only complementary feeding (MP-ASI) was significantly associated with stunting incidence (p-value = 0.026). Children who received appropriate MP-ASI showed significantly lower odds of stunting compared to those who received inappropriate complementary feeding (OR = 0.082; 95% CI: 0.008–0.838), indicating a strong protective effect of adequate complementary feeding practices.

In contrast, early initiation of breastfeeding (IMD) (p-value = 0.548), exclusive breastfeeding (p-value = 0.201), vitamin A supplementation (p-value = 1.000), and handwashing with soap (CTPS) behavior (p-value = 0.708) were not significantly associated with stunting incidence. These findings suggest that among the parenting practices examined, complementary feeding plays the most critical role in preventing stunting in this study population.

DISCUSSION

The present study demonstrated that complementary feeding (MP-ASI) practices were significantly associated with stunting among children aged 12–24 months in Banjar Regency. Children who received inappropriate MP-ASI had approximately 12 times higher odds of stunting compared to those receiving appropriate MP-ASI. This confirms the critical role of complementary feeding during the post-infancy period when breast milk alone can no longer meet nutritional requirements (Arima & Fukuoka, 2020).

The role of MP-ASI is crucial because complementary foods serve as the primary source of nutrients after six months of age. Inadequate complementary feeding in terms of timing, frequency, food quality, and dietary diversity increases the risk of chronic growth failure. Previous studies have emphasized that poor dietary diversity, particularly the lack of animal-source foods, contributes significantly to impaired linear growth. Similar evidence from China also suggests that insufficient dietary variety in complementary feeding negatively affects infant and toddler growth patterns (Arima & Fukuoka, 2020).

Our findings are consistent with several previous studies showing the importance of appropriate complementary feeding. A meta-analysis by Babys et al., (2022) reported that low dietary diversity and inappropriate feeding frequency significantly increase the risk of stunting among children (Babys et al., 2022). Likewise, Yunitasari et al., (2022)

found that improper MP-ASI practices increased the odds of stunting by more than eight times in rural Indonesia (Yunitasari et al., 2022). Behavioral change communication (BCC) interventions focusing on complementary feeding have also been proven effective in improving feeding practices and reducing stunting prevalence (Darajat et al., 2022).

International studies further support these results. Research from India demonstrated that delayed or inappropriate introduction of complementary foods increases the risk of both stunting and severe stunting among infants aged 6–8 months (Dhami, Ogbo, Osuagwu, Ugboma, & Agho, 2019). Similarly, a case–control study in Ethiopia indicated that incorrect timing of complementary feeding was a significant risk factor for childhood stunting and wasting (Berhanu Mamo, Wudneh, & Molla, 2022).

However, not all studies report similar results. For instance, Anisa and Yuliana, (2023) found no association between MP-ASI and stunting in Sukarami Village, which may be explained by differences in sample size, study design, or confounding factors not controlled in their analysis (Anisa & Yuliana, 2023). Beyond complementary feeding, no significant association was found between early IMD and stunting in this study. This result aligns with multilevel studies suggesting that IMD alone may not directly influence linear growth when broader environmental and socioeconomic determinants, such as sanitation, maternal education, and subsequent feeding practices, are not optimal (Mulyaningsih et al., 2021).

Nevertheless, other studies have reported significant protective effects of IMD against stunting. For example, Prabandari and Rosmawati, (2024) found lower stunting prevalence among children who received IMD, and Lintang and Azkiya, (2022) reported that the absence of IMD increased stunting risk more than elevenfold. A meta-analysis by Iffah Zahrotin Nisa et al., (2022) also demonstrated that IMD indirectly reduces stunting risk by improving exclusive breastfeeding rates (Iffah Zahrotin Nisa et al., 2022; Lintang & Azkiya, 2022; Prabandari & Rosmawati, 2024).

In this study, exclusive breastfeeding was also not significantly associated with stunting. This finding is consistent with research conducted in Sawahlunto City, Indonesia, which reported no significant relationship between exclusive breastfeeding and stunting (Andra et al., 2025; Dewi, Kusumasari, Andarini, & Indrawan, 2023), as well as studies showing no difference in growth outcomes between children breastfed for longer or shorter durations. However, numerous studies have emphasized the protective role of exclusive breastfeeding against stunting.

For instance, Permatasari et al., (2024) found that children who were not exclusively breastfed were nearly three times more likely to be stunted (Permatasari et al., 2024). Similarly, Hadi et al., (2021) showed that exclusive breastfeeding significantly protected infants from stunting in low-income populations in eastern Indonesia (Hadi et al., 2021). The inconsistency in findings may be influenced by recall bias, variations in defining exclusive breastfeeding, maternal nutritional status, or post-breastfeeding feeding practice and diet quality.

Vitamin A supplementation was not significantly associated with stunting in this study, which is in line with findings from India indicating no direct impact of vitamin A supplementation on anthropometric outcomes (Rai, 2022). Although vitamin A plays an important role in immune function and epithelial integrity, its impact on linear growth is often indirect and influenced by multiple interacting factors.

Some studies have reported protective effects, such as reduced stunting risk in Brazilian children receiving supplementation (Silva-Neto et al., 2024) and increased stunting risk among children with vitamin A deficiency in Uganda (Ssentongo et al., 2020). However, other studies suggest that the impact of vitamin A supplementation may depend on baseline nutritional status and infection burden. Thus, its isolated contribution to preventing stunting may be limited in settings where other dominant risk factors persist.

The present study also found no significant association between maternal handwashing with soap and stunting. Theoretically, proper hygiene reduces recurrent infections, especially diarrhea, which can impair nutrient absorption and contribute to growth faltering. Several studies support this link, reporting higher stunting risk among children living in households with poor hygiene and sanitation practices (Batool et al., 2023; Najib et al., 2024; Novianti et al., 2023). This may be due to persistent environmental contamination, limited access to clean water, or simultaneous exposure to multiple risk factors that overshadow the effects of handwashing.

Although CTPS was not statistically significant in this study, it remains an essential component of integrated stunting prevention strategies. Hygiene promotion should be combined with nutrition education, improved sanitation infrastructure, and behavioral change interventions to maximize its impact on child growth and overall health.

Overall, the findings of this study highlight that inappropriate complementary feeding practices constitute the most prominent modifiable risk factor for stunting among children aged 12–24 months in Banjar Regency. This finding reinforces the importance of targeted, community-based nutrition education and capacity building among mothers and caregivers, especially through posyandu cadres and primary health workers (Amalia et al., 2022; Filiya, Ultasari, Putri, & Afifah, 2024; Masuke et al., 2021).

This study has several limitations, including a cross-sectional design that does not allow for the establishment of causal relationships and the potential for recall bias because parenting practice data were obtained through interviews. The limited sample size may also affect the strength of the analysis. For future studies, it is recommended to use a longitudinal or cohort design with a larger sample and more objective measurement of variables to improve the validity and generalisation of the findings.

CONCLUSION

This study demonstrates that inappropriate complementary feeding is significantly associated with stunting among children aged 12–24 months in Banjar

Regency. Children who did not receive appropriate MP-ASI had approximately 12 times higher odds of being stunted compared to those who received complementary feeding according to recommended standards. In contrast, IMD, exclusive breastfeeding, vitamin A supplementation, and maternal CTPS were not statistically associated with stunting in this study. These findings highlight that, within the context of Banjar Regency, inappropriate complementary feeding practices represent the most prominent modifiable risk factor for stunting. This study therefore fills an important local evidence gap, as previous research in this area has been limited despite the high prevalence of stunting in the region.

It is recommended that stunting prevention programs in Banjar Regency prioritize interventions aimed at improving maternal knowledge and practical skills related to appropriate MP-ASI, including correct timing, adequate quantity, and sufficient dietary diversity. Strengthening community-based education through health workers and posyandu cadres is essential to support sustainable improvements in feeding practices and child growth outcomes.

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