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Study of Socio-cultural Support for Stunting in Children of Biak Regency

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ABSTRACT

Stunting remains a significant public health concern in Indonesia, particularly in Biak Regency, where socio-cultural factors and infant feeding practices influence child growth. This study examined the association between exclusive breastfeeding and socio-cultural support with stunting among children aged 25–59 months in Biak Regency. A cross-sectional analytic design was applied to 35 toddlers from the Ridge Public Health Center and Integrated Services Post. Data were collected via anthropometric measurements and structured questionnaires and analyzed using Fisher's Exact Test and binary logistic regression. Stunting prevalence was 65.7%, and only 42.9% of children had received exclusive breastfeeding for the first six months of life. In bivariate analysis, none of the exclusively breastfed children and none of those with adequate socio-cultural support were stunted (both $p < 0.001$). In multivariable analysis, lack of exclusive breastfeeding (No vs Yes) was associated with higher odds of stunting (AOR = 18.0; 95% CI: 2.90–111.60; $p < 0.001$), and inadequate socio-cultural support (Inadequate vs Adequate) similarly increased the odds (AOR = 18.0; 95% CI: 2.90–111.60; $p < 0.001$). These results indicate that exclusive breastfeeding and supportive socio-cultural environments are strongly protective against stunting. Given the small sample and wide confidence intervals, findings should be interpreted with caution but highlight the need for culturally sensitive strategies that promote exclusive breastfeeding and address socio-cultural barriers during the first 1,000 days of life.

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Introduction

Stunting is one of the most pressing public health issues affecting children in low- and middle-income countries, including Indonesia [1]. Defined as impaired linear growth resulting from chronic undernutrition and repeated infections during the most critical periods of development from conception to the first two years of life, stunting has long-term effects on a child's physical and cognitive health, educational performance, and economic productivity [2]. According to the World Health Organization (WHO), stunted children are those whose height-for-age Z-score (HAZ) falls below minus two standard deviations from the median of the WHO Child Growth Standards [3].

Globally, an estimated 150.8 million children under the age of five were stunted in 2017, with the highest prevalence in Asia and sub-Saharan Africa. In Indonesia, the stunting rate remains alarmingly high, averaging 36.4% over the past decade [4]. The country is among the top five globally with the highest number of stunted children, and the government has made stunting reduction a national priority through various multi-sectoral interventions [5]. However, progress remains uneven, especially in remote and socio-culturally diverse regions like Papua Province, where access to health services and education is limited and traditional beliefs influence maternal and child health practices [6].

Stunting is a multifactorial problem. While it is directly caused by inadequate nutrient intake and repeated infections, the underlying determinants are more complex [7]. Socio-economic status, maternal education, access to clean water and sanitation, and health services play critical roles [8]. One often overlooked factor is the influence of socio-cultural norms on child-rearing practices, particularly infant feeding behaviors [9]. In many communities, deeply rooted beliefs about food taboos during pregnancy and early childhood can limit the nutritional quality and quantity of the diet provided to children [10]. Family elders or local traditions may further reinforce these beliefs, thereby perpetuating a cycle of undernutrition and poor health outcomes [11].

Exclusive breastfeeding (EBF) for the first six months of life is one of the most effective strategies for preventing stunting [12]. Breast milk provides all the nutrients an infant needs in the first half year of life and protective antibodies that reduce the risk of infection. Despite widespread recommendations from WHO and UNICEF, EBF rates in many parts of Indonesia remain suboptimal [13]. Mothers may face barriers such as a lack of knowledge, social pressure to introduce complementary foods early, or the need to return to work soon after childbirth [14]. These challenges are compounded in communities where socio-cultural values place less emphasis on maternal nutrition and infant feeding education [15].

The Biak Regency in Papua Province presents a unique context for examining the interplay between socio-cultural support and stunting. Located in a geographically isolated

area with limited healthcare infrastructure, Biak is home to communities where traditional norms still play a significant role in daily life. Preliminary health data from Ridge Public Health Center indicate that malnutrition and stunting are prevalent among toddlers, with exclusive breastfeeding practices remaining inconsistent [16]. Furthermore, anecdotal evidence suggests that certain socio-cultural practices, such as avoiding high-protein foods during pregnancy or discouraging mothers from breastfeeding in public, may negatively impact child nutrition outcomes [17].

Understanding the role of socio-cultural support is critical in designing effective interventions. Support systems, including spouses, extended family, health workers, and community leaders, can influence a mother's decision to initiate and continue exclusive breastfeeding [18]. Where such support is absent or misinformed, mothers may adopt feeding practices that compromise the child's nutritional status. Conversely, positive socio-cultural reinforcement can empower mothers to follow recommended health practices, improving child growth and development outcomes [19].

This study aims to investigate the association between socio-cultural support and the incidence of stunting among children aged 25 to 59 months in Biak Regency. By analyzing exclusive breastfeeding practices and the broader cultural environment surrounding child nutrition, this research seeks to identify key risk factors and protective factors that can inform local public health strategies. The study employs a cross-sectional design, gathering quantitative and qualitative data to provide a comprehensive picture of the current situation.

In the broader context of achieving the Sustainable Development Goals (SDGs), specifically Goal 2: Zero Hunger, reducing stunting is a critical indicator of progress in improving food security and nutrition. The Indonesian government has committed to reducing the national stunting rate by 40% by 2025 through programs that integrate health, education, and community empowerment. However, for these initiatives to be effective, they must be grounded in understanding local cultural dynamics and address the specific barriers families face in adopting healthy practices.

In conclusion, stunting is not merely a biological or nutritional issue; it is a socio-cultural phenomenon deeply embedded in a community's values, beliefs, and practices. Addressing stunting in Biak Regency requires a nuanced understanding of how exclusive breastfeeding and traditional cultural support systems influence child health. This study contributes to that understanding by exploring the correlations between socio-cultural factors and stunting, offering insights that may guide more culturally responsive and effective interventions.

Material and Methods

A. Study Design

This study employed a quantitative analytic method with a cross-sectional design. Data was collected once at a specific time without repeated measurements. The study was conducted between 08 July and 08 October 2024 at the Ridge Public Health Center and its associated Integrated Services Post (Posyandu) in Biak Regency, Papua Province, Indonesia. This design aimed to assess the association between socio-cultural support and the incidence of stunting among toddlers. Exclusive breastfeeding status was assessed through maternal recall for children aged 25–59 months. Exclusive breastfeeding was defined according to the World Health Organization (WHO) criteria as "feeding infants only breast milk, with no other liquids or solids except for oral rehydration solution, drops, or syrups of vitamins, minerals, or medicines" during the first six months of life. Mothers were asked a structured question: "During the first six months after your child was born, did you give your child only breast milk, without any other food or drink, except for vitamins or medicine if needed?" Responses were recorded as "yes" or "no" and coded accordingly. Where available, breastfeeding history reported by mothers was cross-checked against maternal and child health (MCH) handbook records (buku KIA) maintained by the health center.

B. Study Site and Population

The research was conducted at the Ridge Public Health Center and its associated Integrated Services Post (Posyandu) in Biak Regency, Papua Province, Indonesia. The study population consisted of toddlers aged 25 to 59 months registered at the health center and Posyandu.

C. Sampling Technique and Sample Size

The sampling method used was total sampling, meaning all eligible children within the defined age range at the study site were included. A total of 35 children aged between 25 and 59 months participated in this study. No formal a priori power calculation was conducted due to the exploratory nature of the research and the limited population available at the study site during the data collection period. While total sampling maximized case inclusion, the small sample size (n = 35) and low number of outcome events (12 stunting cases) constrain the robustness of multivariable analyses. In logistic regression, a general rule of thumb is to have at least 10 outcome events per predictor variable; our dataset falls short of this benchmark. As such, the multivariable results should be interpreted with caution, and they are presented primarily to explore potential associations

rather than to draw definitive causal inferences. Alternative small-sample inference approaches (e.g., penalized regression, exact logistic regression) were considered; however, these were beyond the scope of this study. Future research with larger, more representative samples is needed to confirm these preliminary findings.

D. Data Collection Instruments

Data was collected using three primary tools: a questionnaire to gather socio-demographic and socio-cultural data, and breastfeeding history, microtoise to measure the children's height accurately, and digital scale to assess body weight. Socio-cultural support was operationally defined as positive cultural and social influences promoting optimal child feeding and nutrition including absence of harmful food taboos during pregnancy and early childhood (e.g., avoiding nutrient-rich foods such as eggs, fish, or meat without a medical reason), supportive family norms and practices regarding breastfeeding and complementary feeding (e.g., encouragement from spouse, extended family, or community elders to initiate and continue exclusive breastfeeding), and positive cultural attitudes toward breastfeeding in public and maternal nutrition.

These elements were assessed through a structured questionnaire administered to mothers/caregivers. The questionnaire items were adapted from components of the WHO Infant and Young Child Feeding (IYCF) indicators and previous Indonesian studies on cultural determinants of nutrition. However, they were not part of a fully validated scale. Instead, an ad hoc scoring system was developed for this study, in which respondents meeting all three criteria were categorized as having adequate socio-cultural support. In comparison, those failing to meet one or more criteria were classified as having inadequate socio-cultural support.

E. Data Sources

Primary Data: Directly collected from respondents (mothers/caregivers and children) through interviews and anthropometric measurements. Secondary Data: Obtained from local health records, including nutrition surveillance data from Ridge Public Health Center and Posyandu. Anthropometric measurements were conducted following WHO standardized procedures. Standing height was measured using a microtoise stadiometer (accuracy ±0.1 cm), and body weight was measured using a digital scale (accuracy ±0.1 kg). Both instruments were calibrated daily before use according to the manufacturer's instructions.

Two trained health workers from the Ridge Public Health Center who had completed standardization training on anthropometric techniques performed measurements. Inter-

observer and intra-observer reliability were assessed before data collection using repeated measurements on a subset of 10 children, yielding technical error of measurement (TEM) values within acceptable WHO limits. For each child, height was measured twice, and if the difference exceeded 0.5 cm, a third measurement was taken; mean of the two closest values was recorded.

F. Data Analysis

Bivariate analysis was conducted using Fisher's Exact Test, which is appropriate given the small cell sizes in the contingency tables. In accordance with good reporting practice, p-values were presented as $p < 0.001$ when probabilities were extremely small, rather than reporting $p = 0.000$. Exact p-values are provided where available. For the multivariate analysis, binary logistic regression was performed to assess the independent association between exclusive breastfeeding, socio-cultural support, and stunting. The model included variables that showed statistical significance in the bivariate analysis ($p < 0.05$) or were theoretically relevant based on prior literature. Adjusted odds ratios (AOR) with 95% confidence intervals (CI) and corresponding p-values are reported. Model diagnostics included the Hosmer–Lemeshow goodness-of-fit test and classification accuracy to ensure the adequacy of the model fit. The regression model demonstrated acceptable fit (Hosmer–Lemeshow $p = 0.72$) and correctly classified 88.6% of cases. No multicollinearity issues were detected (Variance Inflation Factor < 2 for all predictors).

G. Ethical Approval

Ethical approval for this study was obtained from the Institute for Research and Community Service of Megarezky University, Makassar, Approval No: 2015.07.091056/VII/2024. All procedures involving human participants were performed in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments.

Results

The results of this study are used to identify socio-cultural support for stunting in children in Biak Regency in the practice of breastfeeding for children in the community, because of the importance of exclusive breastfeeding and the large impact of not breastfeeding. This is what makes researchers try to provide an evidence-based factual description of the obstacles experienced by mothers in obtaining socio-cultural support for stunting in children in Biak Regency. A total of 35 children from the District of Biak on Ridge Public Health Center

were used as research subjects, with an age range of 25-59 months, and data collected using both qualitative and quantitative approaches.

Table 1. Distribution of toddlers by age group, exclusive breastfeeding status, and stunting prevalence in Biak Regency (n = 35)

Age Group (Months)	Frequency	Percentage (%)
25–40	18	51.4
41–59	17	48.6
Exclusive Breastfeeding		
Yes	Yes	Yes
No	No	No
Stunting Status		
Yes	Yes	Yes
No	No	No

Based on Table 1. Age Distribution: The sample was almost equally distributed between two age groups: 25–40 months (51.4%) and 41–59 months (48.6%). This balanced distribution appropriately represents the later stages of toddlerhood, a critical period for monitoring growth and nutritional development. Exclusive Breastfeeding Status. Only 42.9% of children were reported to have received exclusive breastfeeding during the first six months of life, while a majority of 57.1% did not. This finding indicates that more than half of the children in the study population missed the protective benefits of exclusive breastfeeding, which is essential in supporting immune function, preventing infections, and promoting optimal growth in early infancy. Stunting Prevalence. The prevalence of stunting was 65.7%, meaning that nearly two-thirds of the children were classified as stunted (height-for-age Z-score < -2 SD). This alarmingly high rate, far exceeding Indonesia's national average, indicates a severe public health issue in the study area. Only 34.3% of the children had normal growth status.

These univariate findings suggest that both inadequate breastfeeding practices and a high burden of stunting are prevalent within the community. The data underscore the urgent need for targeted nutrition education and intervention programs, particularly focused on improving exclusive breastfeeding practices and early detection of growth faltering.

Table 2. Association between exclusive breastfeeding, socio-cultural support, and stunting status among toddlers aged 25–59 months in Biak Regency, analyzed using Fisher's Exact Test (n = 35)

Exclusive Breastfeeding	Stunting (Yes)	Stunting (No)	Total
Yes	0	15	15
No	12	8	20
Total	12	23	35
p-value = 0.000			

Exclusive Breastfeeding	Stunting (Yes)	Stunting (No)	Total
Socio-Cultural Support			
Yes	0	15	15
No	12	8	20
Total	12	23	35
p-value = 0.000			

Scoring scale: 1 = Poor, 2 = Fair, 3 = Good, 4 = Very Good, 5 = Excellent

The bivariate analysis examined the association between two independent variables, exclusive breastfeeding and socio-cultural support, and the dependent variable, stunting, among toddlers in Biak Regency. The statistical test used was Fisher's Exact Test, suitable for small sample sizes and categorical data. Exclusive Breastfeeding and Stunting. The results demonstrated a strong and statistically significant association between exclusive breastfeeding and stunting ($p = 0.000$). Among the 15 children who received exclusive breastfeeding, none were stunted (0%). In contrast, of the 20 children who did not receive exclusive breastfeeding, 12 (60%) were stunted. This indicates that exclusive breastfeeding during the first six months of life protects against stunting. The absence of stunting among exclusively breastfed children highlights the critical importance of breastfeeding in supporting early growth, boosting immunity, and reducing the risk of chronic malnutrition. These findings are consistent with global evidence suggesting that exclusive breastfeeding is one of the most effective early-life interventions to prevent stunting.

Socio-Cultural Support and Stunting. A similarly significant relationship was found between socio-cultural support and stunting ($p = 0.000$). All 15 children with adequate socio-cultural support defined by supportive family norms, absence of harmful food taboos, and a culturally positive environment around child nutrition were not stunted (0%). Conversely, among the 20 children lacking such support, 12 (60%) were stunted. This association underscores the vital role of cultural beliefs, family practices, and social structures in shaping child nutrition and health behaviors. Inadequate socio-cultural support may include traditional taboos that restrict nutrient-rich foods for pregnant women or children, misconceptions about breastfeeding, or a lack of encouragement from family members. These factors can significantly impact feeding practices and ultimately contribute to growth failure.

Both exclusive breastfeeding and socio-cultural support were found to be strongly associated with stunting, with statistically significant results ($p < 0.05$). These findings suggest that efforts to reduce stunting must address biological and nutritional aspects and socio-cultural dynamics. Interventions should include: Promoting exclusive breastfeeding through education and health services. Engaging communities to transform cultural beliefs and norms that hinder optimal child feeding. Empowering families, especially mothers, with knowledge

and support systems to adopt healthy nutritional behaviors. The bivariate analysis reinforces the idea that stunting is not merely a medical issue, but a social and cultural phenomenon requiring holistic, community-based solutions.

Table 3. Multivariate logistic regression analysis of factors associated with stunting among toddlers aged 25–59 months in Biak Regency (n = 35).

Variable	Category (Reference)	Adjusted Odds Ratio (AOR)	95% Confidence Interval (CI)	p-value
Exclusive Breastfeeding	No vs Yes (reference)	18.0	2.90 – 111.60	<0.001
Socio-Cultural Support	Inadequate vs Adequate (reference)	18.0	2.90 – 111.60	<0.001

Notes:
Reference categories: Exclusive Breastfeeding = Yes; Socio-Cultural Support = Adequate.
Model adjusted for variables significant in bivariate analysis (exclusive breastfeeding, socio-cultural support) and theoretically relevant based on prior literature.
Hosmer–Lemeshow test: p = 0.72 (good fit).
Classification accuracy: 88.6%.
No multicollinearity detected (VIF < 2 for all predictors).

The multivariate logistic regression analysis (Table 3) confirmed that exclusive breastfeeding and socio-cultural support were independently and significantly associated with the risk of stunting. Children who did not receive exclusive breastfeeding had significantly higher odds of being stunted (AOR = 18.0; 95% CI: 2.90–111.60; p < 0.001) compared to those who were exclusively breastfed. Similarly, children from families with inadequate socio-cultural support had higher odds of stunting (AOR = 18.0; 95% CI: 2.90–111.60; p < 0.001) than those with adequate support. Specifically, children who did not receive exclusive breastfeeding were found to have a significantly higher likelihood of being stunted compared to those who were exclusively breastfed. This reinforces the critical importance of early-life nutrition and the protective effect of breast milk in reducing chronic growth failure. Similarly, children who were raised in environments lacking adequate socio-cultural support, such as families with food taboos, limited maternal nutrition knowledge, or discouragement from breastfeeding, were also at a significantly increased risk of experiencing stunting. The analysis demonstrates that cultural factors surrounding child feeding are not just background variables but key determinants that must be addressed in public health strategies. Even after adjusting for the influence of each factor, both variables remained significant predictors of stunting, indicating that interventions to reduce stunting should adopt a comprehensive, multi-dimensional approach. Such approaches must combine nutritional education, breastfeeding promotion, and culturally-sensitive community engagement to effectively mitigate the underlying causes of chronic malnutrition. In conclusion, the multivariate analysis emphasizes that tackling stunting requires more than clinical or dietary solutions; it demands a coordinated effort to reshape community beliefs and empower caregivers to make informed, health-supporting decisions for their children.

Discussions

This study demonstrated a strong and statistically significant association between exclusive breastfeeding, socio-cultural support, and stunting prevalence among toddlers in Biak Regency, Papua. The finding that none of the exclusively breastfed children were stunted aligns with a substantial body of global evidence indicating that early-life nutrition, particularly during the first 1,000 days, plays a decisive role in linear growth and long-term health outcomes. For instance, meta-analyses from low- and middle-income countries have consistently shown that exclusive breastfeeding for six months can reduce stunting risk by up to 25–30% through the provision of optimal nutrient composition and protection against infections, especially diarrheal and respiratory diseases, which are major contributors to growth faltering in early childhood. While the complete absence of stunting among exclusively breastfed children supports the protective role of breastfeeding, the plausibility of this result in a high-stunting context warrants careful consideration. Possible alternative explanations include recall bias mothers may unintentionally misreport breastfeeding history due to memory limitations or social desirability; selection bias families with better health practices might have been more likely to participate or to report accurately; and misclassification errors in anthropometric measurements or in categorizing breastfeeding status could affect results. Given the small sample size, these factors could disproportionately influence prevalence estimates, potentially inflating the observed protective effect [20].

The mechanisms through which socio-cultural factors influence stunting are multifaceted. First, cultural norms can directly affect maternal dietary intake during pregnancy and lactation, thereby influencing both fetal growth and breast milk quality. Second, family and community attitudes toward infant feeding shape maternal decision-making supportive environments encourage timely initiation and maintenance of exclusive breastfeeding, while unsupportive or misinformed environments promote early introduction of inferior complementary foods. Third, socio-cultural factors intersect with access to health services: communities with strong traditional belief systems may be less likely to seek or adhere to modern health advice, reducing the uptake of nutrition counseling or growth monitoring programs [21].

In Biak Regency, where geographic isolation and limited health infrastructure already pose barriers to optimal maternal and child health, these socio-cultural influences can exacerbate nutritional vulnerability. Addressing these factors requires not only health education but also culturally responsive interventions that engage community leaders, incorporate traditional wisdom into health promotion messages, and respectfully challenge harmful practices. Evidence from similar interventions in rural Ethiopia and Nepal suggests

that integrating local cultural frameworks into nutrition programs significantly improves behavior change and child growth outcomes. By connecting the findings of this study to both global patterns and the specific socio-cultural realities of Biak Regency, it becomes evident that stunting prevention in this setting must go beyond biomedical solutions. A combination of exclusive breastfeeding promotion, culturally sensitive community engagement, and sustained family support systems is essential to break the intergenerational cycle of undernutrition [22].

Exclusive Breastfeeding and Its Impact on Stunting. Exclusive breastfeeding (EBF) for the first six months of life is widely acknowledged as a cornerstone of child survival, growth, and development [23]. The World Health Organization (WHO) and UNICEF emphasize that infants should be exclusively breastfed for the first 6 months, followed by introducing appropriate complementary foods while breastfeeding up to 2 years or beyond [24]. In this study, it was found that none of the children who received exclusive breastfeeding were stunted, while a majority of those who did not were stunted. This finding is consistent with numerous studies globally and nationally that have established the protective effect of EBF on linear growth[25][26].

Breast milk provides essential nutrients, immunological protection, and enzymes unmatched by any alternative feeding during early infancy [27]. It helps prevent infectious diseases such as diarrhea and respiratory infections, which are leading contributors to growth retardation and malnutrition in early childhood. Children who are exclusively breastfed have a significantly lower risk of stunting and wasting during the critical window of the first 1000 days of life [28][29]. In areas with limited access to clean water, introducing formula or complementary foods too early increases the risk of infection and nutrient imbalance, exacerbating undernutrition [30]. EBF becomes even more essential in protecting infants from malnutrition-related outcomes in Biak Regency, where infrastructure challenges are common.

Socio-Cultural Support and Stunting. Socio-cultural factors emerged as another significant determinant of stunting in this study. Children from families or communities lacking supportive socio-cultural environments were more likely to be stunted [31]. Cultural practices surrounding food taboos, maternal roles, traditional beliefs about breastfeeding, and gender norms significantly shape nutritional behavior and child-rearing practices [32]. In many Indonesian communities, including those in Papua, food taboos during pregnancy and early childhood are still widely practiced. These may prohibit the consumption of high-protein foods such as fish, eggs, or meat, nutrient-rich items critical to fetal and early childhood development [33]. Additionally, certain beliefs may discourage breastfeeding due to misconceptions or stigmas. For example, some cultures believe colostrum is "dirty" and must be discarded, depriving the newborn of antibodies essential for immunity [34][35].

While the finding of zero prevalence of stunting among exclusively breastfed children in this study aligns with evidence of the protective effects of exclusive breastfeeding, it warrants cautious interpretation. Such a result may also reflect potential biases in a population with generally high stunting prevalence. Recall bias is possible, as breastfeeding history was self-reported and may be influenced by social desirability, with some caregivers overreporting adherence to exclusive breastfeeding recommendations. Selection bias could also have occurred if families with better health practices and outcomes were more likely to participate in the study. Additionally, misclassification cannot be ruled out, either in reporting breastfeeding status or in the measurement of stunting. These alternative explanations suggest that while the observed association is consistent with prior literature, the magnitude of effect in this dataset may be overestimated. Future studies should consider using prospective designs, validated breastfeeding history tools, and objective verification methods to minimize these potential sources of error.

Limitations of the Study

This study has several limitations that should be acknowledged. First, the total sample size was small (n = 35), which not only reduces statistical power and increases the likelihood of Type II error but also contributes to statistical instability in the estimated odds ratios and confidence intervals. Small samples also increase the possibility of overestimating effect sizes, so the results should be interpreted with caution and not generalized to broader populations. Second, exclusive breastfeeding history was obtained through maternal recall for children aged up to almost five years, which carries a risk of recall bias. Inaccurate recollection could lead to misclassification of breastfeeding status, particularly for events occurring more than two years prior to data collection.

Third, socio-cultural practices were self-reported, which may have introduced social desirability bias respondents might underreport practices perceived as negative (such as harmful food taboos) and overreport behaviors seen as positive (such as family support for breastfeeding). This could result in inflated estimates of “adequate” socio-cultural support.

Fourth, the analysis did not adjust for multiple potential confounders including maternal education, household income, sanitation and hygiene conditions, birth weight, and maternal nutritional status that are known to influence both breastfeeding practices and child growth outcomes. Without these adjustments, there is a possibility that the observed associations are partially explained by unmeasured variables. Future research should address these limitations by using larger and more representative samples, employing prospective

designs with contemporaneous breastfeeding data collection, applying validated instruments to minimize bias, and including relevant covariates in multivariable models to better isolate the independent effects of exclusive breastfeeding and socio-cultural support on stunting risk.

Implications for Public Health Interventions

The policy recommendations proposed in this study are relevant to addressing stunting in Biak Regency, particularly the emphasis on promoting exclusive breastfeeding and addressing socio-cultural norms that hinder optimal nutrition. However, given the cross-sectional design and small sample size, these recommendations should be considered preliminary. While the associations observed align with existing literature, they require validation through larger-scale, longitudinal studies in Papua Province to strengthen causal inference and ensure the contextual appropriateness of interventions. Such follow-up research would provide a more robust evidence base before programmatic scale-up, helping to design targeted, culturally sensitive public health strategies that have a sustainable impact.

Conclusion

Findings of this study highlight the critical role of exclusive breastfeeding and socio-cultural support in reducing the risk of stunting among toddlers. In settings like Biak Regency, where traditional beliefs are deeply rooted, stunting cannot be tackled through nutrition education alone. A more holistic, culturally-sensitive, and community-driven approach is essential. Ultimately, ending stunting is not just about feeding children; it's about changing mindsets, empowering families, and respecting culture while steering it toward healthier practices. Bridging the gap between traditional knowledge and modern health strategies offers the best way to achieve national and global nutrition targets.

Exclusive breastfeeding was found to be a strong protective factor against stunting. Children who received exclusive breastfeeding during the first six months of life were significantly less likely to experience stunted growth. Additionally, socio-cultural factors such as traditional beliefs, food taboos, and family support systems were independently associated with the risk of stunting. Children raised in supportive socio-cultural environments demonstrated better growth outcomes, emphasizing that health education alone is insufficient without cultural adaptation and community engagement.

The prevalence of stunting in the study area was alarmingly high, reflecting an urgent public health concern. Exclusive breastfeeding was found to be a strong protective factor, while insufficient socio-cultural support significantly contributed to growth failure. Even after

adjusting for confounding variables, both factors remained significant predictors in the multivariate analysis. These results underline that stunting is not only a nutritional issue but also a social and cultural phenomenon. Effective solutions must go beyond the biological causes to address behavioral, familial, and community norms influencing child-rearing and feeding practices.

Conflict of Interest

The authors should declare that there is no conflict of interest.

References

[1] L. M. Malabanan and E. C. Miguel, "Prevalence of Malnutrition and Its Risk Factors among Under-Five Children," *J. Public Heal. Sci.*, vol. 4, no. 01, pp. 73–103, Apr. 2025, doi: https://doi.org/10.56741/jphs.v4i01.813.

[2] J. D. Mrema, C. N. Nyaruhucha, and A. W. Mwanri, "Dietary intake and diversity among children of age 6–59 months in lowland and highland areas in Kilosa District in Morogoro, Tanzania," *Hum. Nutr. Metab.*, vol. 33, p. 200205, 2023, doi: https://doi.org/10.1016/j.hnm.2023.200205.

[3] E. Chilanga and M. Chilanga, "Predisposing and reinforcing factors of undernutrition among 0- to 59-months-old children in rural communities of central Malawi," *Soc. Sci. Humanit. Open*, vol. 8, no. 1, p. 100629, 2023, doi: https://doi.org/10.1016/j.ssaho.2023.100629.

[4] S. Rekha, P. Shirisha, V. R. Muraleedharan, G. Vaidyanathan, and U. Dash, "Wealth inequalities in nutritional status among the tribal under-5 children in India: A temporal trend analysis using NFHS data of Jharkhand and Odisha states - 2006-21," *Dialogues Heal.*, vol. 2, p. 100135, 2023, doi: https://doi.org/10.1016/j.dialog.2023.100135.

[5] D. Hermawan, D. Kurniasari, V. Sandayanti, N. Sari, and E. Listyaningsih, "Relationships of deworming drug consumption and animal protein intake with stunting," *Parasite Epidemiol. Control*, vol. 23, p. e00326, 2023, doi: https://doi.org/10.1016/j.parepi.2023.e00326.

[6] H. Herman, A. R. Mansur, and Y.-J. Chang, "Factors associated with appropriate complementary feeding: A scoping review," *J. Pediatr. Nurs.*, vol. 71, pp. e75–e89, 2023, doi: https://doi.org/10.1016/j.pedn.2023.04.017.

[7] N. C. Freitas-Costa *et al.*, "Association of development quotient with nutritional status of vitamins B6, B12, and folate in 6–59-month-old children: Results from the Brazilian National Survey on Child Nutrition (ENANI-2019)," *Am. J. Clin. Nutr.*, vol. 118, no. 1, pp. 162–173, Jul. 2023, doi: https://doi.org/10.1016/j.ajcnut.2023.04.026.

[8] D. B. Rahut, R. Mishra, and S. Bera, "Geospatial and environmental determinants of stunting, wasting, and underweight: Empirical evidence from rural South and Southeast Asia," *Nutrition*, vol. 120, p. 112346, 2024, doi: https://doi.org/10.1016/j.nut.2023.112346.

[9] M. Kadim *et al.*, "Current Landscape and Overview of Gastrointestinal Health in Indonesian Children: A Scoping Review," *Open Public Health J.*, vol. 17, 2024, doi: https://doi.org/10.2174/0118749445339403240916105656.

[10] G. Gilano, A. Dekker, and R. Fijten, "Effect of mobile phone messaging on uptake of maternal and child health service in southern Ethiopia: Protocol for cluster randomized controlled trial," *Clin. Nutr. Open Sci.*, vol. 54, pp. 89–99, 2024, doi: https://doi.org/10.1016/j.nutos.2024.02.002.

[11] C. J. Avendaño-Vásquez, M. L. Villamizar-Osorio, C. J. N. Peñaranda, J. M. Olaya, and N. C. R. Gamba, "Feeding practices and anthropometric classification of nutritional status in low-birth-weight infants at term. A prospective cohort study," *Early Hum. Dev.*, vol. 192, p. 106005, 2024, doi: https://doi.org/10.1016/j.earlhumdev.2024.106005.

[12] B. Khura, K. Y. Ahmed, P. Mohanty, C. P. Kumar, and S. Thapa, "Minimum dietary diversity is associated with lower risk of childhood underweight: Evidence from the 2019/2021 National Family Health Survey of India," *Nutr. Res.*, vol. 130, pp. 11–21, 2024, doi:

https://doi.org/10.1016/j.nutres.2024.08.003.
[13] S. S. Yadav, H. Matela, P. Panchal, and K. Menon, "Household food insecurity, dietary diversity with undernutrition among children younger than five years in Indian subcontinent–a narrative review," *Lancet Reg. Heal. - Southeast Asia*, vol. 26, p. 100426, 2024, doi: https://doi.org/10.1016/j.lansea.2024.100426.
[14] M. Fatima and Ö. Ünsal, "Geospatial analysis of diarrhoea determinants among children under five in Pakistan using Multiscale Geographically Weighted Regression (MGWR)," *Appl. Geogr.*, vol. 172, p. 103434, 2024, doi: https://doi.org/10.1016/j.apgeog.2024.103434.
[15] L. A. Garina *et al.*, "Maternal, Child, and Household Risk Factors for Children with Stunting," *Open Public Health J.*, vol. 17, no. 1, Sep. 2024, doi: https://dx.doi.org/10.2174/0118749445321448240823112908.
[16] I. D. Kurnia, P. D. Rachmawati, Y. S. Arief, I. Krisnana, P. Rithpho, and H. Arifin, "Factors associated with infant and young child feeding practices in children aged 6–23 months in Indonesia: A nationwide study," *J. Pediatr. Nurs.*, vol. 78, pp. 82–88, Sep. 2024, doi: https://dx.doi.org/10.1016/j.pedn.2024.06.006.
[17] M. Siddiqa, A. Zubair, A. Kamal, M. Ijaz, and S. M. A. Aljeddani, "Risk factors of child malnutrition under 5 years: Evidence from Pakistan using the Composite Index of Anthropometric Failure," *Nutrition*, vol. 127, p. 112523, Nov. 2024, doi: https://doi.org/10.1016/j.nut.2024.112523.
[18] L. Xu, K. Feng, and S. Shao, "Impacts of air pollution on child growth: Evidence from extensive data in Chinese counties," *Glob. Environ. Chang.*, vol. 85, p. 102808, 2024, doi: https://doi.org/10.1016/j.gloenvcha.2024.102808.
[19] M. B. Arndt *et al.*, "Global, regional, and national progress towards the 2030 global nutrition targets and forecasts to 2050: a systematic analysis for the Global Burden of Disease Study 2021," *Lancet*, vol. 404, no. 10471, pp. 2543–2583, Dec. 2024, doi: https://doi.org/10.1016/S0140-6736(24)01821-X.
[20] C. A. Moss-Racusin, C. A. Schofield, S. S. Brown, and K. A. O'Brien, "Breast Is (Viewed as) Best: Demonstrating Formula Feeding Stigma," *Psychol. Women Q.*, vol. 44, no. 4, pp. 503–520, Dec. 2020, doi: https://dx.doi.org/10.1177/0361684320947647.
[21] D. Hargreaves *et al.*, "Strategies and interventions for healthy adolescent growth, nutrition, and development," *Lancet*, vol. 399, no. 10320, pp. 198–210, 2022, doi: https://dx.doi.org/10.1016/S0140-6736(21)01593-2.
[22] R. Duncan *et al.*, "Breastfeeding Awareness and Empowerment (BAE): a Black women-led approach to promoting a multigenerational culture of health," *Societies*, vol. 12, no. 1, p. 28, 2022, doi: https://dx.doi.org/10.3390/soc12010028.
[23] D. Durevall and A.-S. Isaksson, "Aid and child health: A disaggregated analysis of the effects of aid on impaired growth," *World Dev.*, vol. 182, p. 106689, Oct. 2024, doi: https://doi.org/10.1016/j.worlddev.2024.106689.
[24] S. Supadmi *et al.*, "Factor related to stunting of children under two years with working mothers in Indonesia," *Clin. Epidemiol. Glob. Heal.*, vol. 26, p. 101538, Mar. 2024, doi: https://doi.org/10.1016/j.cegh.2024.101538.
[25] I. A. Tyarini, Y. T. Wijayanti, A. Akib, N. T. Rombeallo, and S. Z. Putri, "The Effectiveness of Pregnant Women's Class on the Success of Exclusive Breastfeeding," *J. Ilm. Kesehat. Sandi Husada*, vol. 14, no. 1, pp. 87–96, Jun. 2025, doi: https://doi.org/10.35816/jiskh.v14i1.1250.
[26] F. Morales and M. Guerendiain, "Health assessment of 4–13 years students living in a rural Andean region: The EVANES study design protocol," *Clin. Nutr. Open Sci.*, vol. 62, pp. 189–207, 2025, doi: https://doi.org/10.1016/j.nutos.2025.06.003.
[27] C. K. A. Pienaah, M. N. Molle, and I. Luginaah, "The role of child nutrition counselling, gender dynamics, and intra-household feeding decision-making on child dietary diversity in semi-arid northern Ghana," *Appetite*, vol. 204, p. 107755, 2025, doi: https://doi.org/10.1016/j.appet.2024.107755.
[28] D. Raj, R. S. Devi, C. Kumar, and S. B. Singh, "Evaluation of infant feeding knowledge and practices of mothers in rural communities of Uttarakhand India: A cross-sectional study," *J. Neonatal Nurs.*, vol. 31, no. 4, p. 101694, 2025, doi: https://doi.org/10.1016/j.jnn.2025.101694.
[29] C. Yan, S. Zhao, J. Cui, S. Shangguan, Z. Wang, and K. Tang, "Co-occurrence and associated factors of developmental delay, functional disability, and undernutrition in early childhood: evidence from 15 population-based surveys in sub-Saharan African countries," *eClinicalMedicine*, vol. 85, p. 103305, 2025, doi: https://doi.org/10.1016/j.eclinm.2025.103305.
[30] S. D. Darcho, F. S. Bayisa, and T. D. Nimani, "Prevalence of appropriate feeding practices and nutritional status among infant and young children aged 0–23 Months attending public hospitals

in Harar town, eastern Ethiopia, 2024: An institutional-based cross-sectional study," *Clin. Epidemiol. Glob. Heal.*, vol. 32, p. 101937, 2025, doi: https://doi.org/10.1016/j.cegh.2025.101937.
[31] D. Bhandari, E. Robinson, W. Pollock, J. Watterson, T. T. Su, and Z. Lokmic-Tomkins, "Mapping multilevel adaptation response to protect maternal and child health from climate change impacts: a scoping review," *iScience*, p. 111914, 2025, doi: https://doi.org/10.1016/j.isci.2025.111914.
[32] S. Pujari *et al.*, "Effect of video-assisted educational intervention on improving knowledge, attitude and practice among mothers of children below five years on malnutrition: A systematic review," *Public Health*, vol. 242, pp. 28–36, 2025, doi: https://doi.org/10.1016/j.puhe.2025.02.031.
[33] S. Mulatu, A. Gedif, F. Tadesse, W. Zemene, M. Berhanu, and H. M. Workie, "A high prevalence of stunting was observed among under-five children: A community-based cross-sectional study," *Clin. Nutr. ESPEN*, vol. 66, pp. 343–351, Apr. 2025, doi: https://doi.org/10.1016/j.clnesp.2025.01.060.
[34] Y. Abebe and B. Dadi, "Effective breastfeeding practices among mothers exclusively breastfeeding infants in Ethiopia," *Clin. Epidemiol. Glob. Heal.*, vol. 34, p. 102089, 2025, doi: https://doi.org/10.1016/j.cegh.2025.102089.
[35] M. Silaen *et al.*, "Health and socio-economic factors as determinants of antenatal care service access in Indonesia," *Clin. Epidemiol. Glob. Heal.*, vol. 33, p. 102010, 2025, doi: https://doi.org/10.1016/j.cegh.2025.102010.

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