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The Determinant of Socio-Demographic Factors, the Environment, and Access to Health Services on the Prevalence of Stunting Among Children Aged 6–24 Months in West Aceh Regency

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Abstract

Stunting remains a major public health challenge in Indonesia, particularly in regions with persistent socio-economic disparities such as West Aceh District. This condition reflects not only chronic undernutrition during the first 1,000 days of life but also the complex interaction of social, environmental, and health system factors. Therefore, a comprehensive approach that integrates socio-demographic determinants with broader development perspectives is required. This study aimed to analyze the influence of socio-demographic factors, environmental conditions, and access to health services on stunting among children aged 6–24 months in West Aceh District, Indonesia, while interpreting the findings within the framework of the Three Domains of Pancasila: value (mental-cultural), governance (institutional-political), and welfare (material-technological). This study employed an analytical cross-sectional design involving 80 children aged 6–24 months. Data were collected through structured interviews using validated questionnaires covering socio-demographic characteristics (maternal education, occupation, and socio-economic status), environmental conditions (sanitation, clean water access, and housing density), and access to health services (distance, affordability, and family support). Child growth status was assessed using Length-for-Age Z-score (LAZ) based on WHO standards. Data were analyzed using univariate, bivariate (chi-square), and multivariate logistic regression analyses. The results showed that maternal education, socio-economic status, sanitation, and access to health services were significantly associated with stunting ($p < 0.05$). Multivariate analysis identified sanitation and socio-economic status as the most dominant determinants. These findings indicate that stunting is shaped by multidimensional factors that extend beyond nutritional intake alone. From the perspective of the Three Domains of Pancasila, these results highlight the importance of strengthening community awareness and cultural practices related to nutrition (value domain), improving equitable access to health services (governance domain), and enhancing living conditions and environmental health (welfare domain). Therefore, stunting prevention requires an integrated, context-specific approach that aligns public health interventions with socio-cultural values and local development systems.

Keywords: Health service access, Pancasila framework, Sanitation, Socio-demographic factors, Stunting

Introduction

Stunting remains one of the most critical public health challenges globally, particularly in low- and middle-income countries (UNICEF/WHO/WORLD BANK, 2021). It is defined as impaired linear growth in children, reflected by a Length-for-Age Z-score (LAZ) below minus two standard deviations according to World Health Organization (WHO) growth standards(Winterfeld, 2010). Stunting results from chronic undernutrition during the first 1,000 days of life, a critical developmental window that determines long-term health, cognitive capacity, and productivity(Dadras et al., 2024). Children affected by stunting are more likely to experience delayed cognitive development, poor academic performance, reduced economic productivity, and increased risk of non-communicable diseases later in life(Black et al., 2013) . Consequently, stunting is not merely a nutritional issue but a multidimensional development problem that affects human capital and national resilience(Dewey & Begum, 2011)(Hoddinott et al., 2013)

Despite global efforts to reduce stunting prevalence, progress remains uneven. Indonesia has demonstrated a gradual decline in national stunting rates in recent years; however, the prevalence still exceeds the WHO threshold for public health concern(kementerian kesehatan RI, 2025)(Kementrian Kesehatan, 2023). Moreover, disparities across regions remain substantial, with several provinces and districts showing persistently high or even increasing rates (Nasional, 2025)

West Aceh District represents one such area where stunting prevalence remains alarmingly high and has shown inconsistent progress over time. This condition raises concerns regarding the effectiveness of existing intervention strategies and highlights the need for more context-specific and integrative approaches. Traditionally, stunting interventions in Indonesia have focused primarily on nutritional supplementation and maternal-child health programs. (WFP, 2021). While these interventions are essential, they often fail to address the broader determinants that contribute to stunting(Victora et al., 2008)

Increasing evidence suggests that stunting is influenced by a complex interplay of socio-demographic factors, environmental conditions, and access to healthcare services. Socio-demographic characteristics such as maternal education, household income, and employment status significantly influence caregiving practices, dietary diversity, and health-seeking behavior. Mothers with higher educational attainment are generally more likely to adopt appropriate infant feeding practices, utilize healthcare services, and maintain better hygiene practices, all of which contribute to improved child growth outcomes(Fitriani et al., 2020; Soliman et al., 2021).

Environmental factors also play a crucial role in determining child nutritional status. Poor sanitation, inadequate access to clean water, and overcrowded living conditions increase the risk of repeated infections, particularly diarrheal diseases and respiratory infections. These conditions can impair nutrient absorption and exacerbate undernutrition, thereby increasing the (Larson et al., 2023). Furthermore, the lack of proper waste management and sanitation infrastructure contributes to an unhealthy living environment, which perpetuates the cycle of infection and malnutrition. Humphrey JH. Child undernutrition, tropical enteropathy, (Chen et al., 2022).

Access to healthcare services is another critical determinant in preventing and managing stunting (Ahamad et al., 2021). Regular antenatal care, growth monitoring, immunization, and nutrition counseling are essential components of child health services (Nakayima et al., 2025). However, in many rural and underserved areas, including parts of West Aceh, access to these services is often limited by geographical distance, transportation barriers, financial constraints, and socio-cultural factors. Additionally, the quality of healthcare services and the level of family support play a

significant role in determining whether individuals utilize available health facilities. Although numerous studies have examined the determinants of stunting in Indonesia, most have focused on isolated factors, particularly nutritional intake or specific socio-economic variables (Thahir et al., 2023). Few studies have comprehensively integrated socio-demographic, environmental, and healthcare access variables into a unified analytical framework, especially at the district level. Moreover, existing research often lacks a contextual interpretation that connects empirical findings with broader socio-cultural and governance perspectives (Oginawati et al., 2023). This limitation creates a gap in understanding how structural and cultural factors interact to influence child growth outcomes in specific local contexts.

In this regard, the present study introduces a novel perspective by integrating empirical public health analysis with the conceptual framework of the Three Domains of Pancasila, which encompass value (mental-cultural), governance (institutional-political), and welfare (material-technological) dimensions (Zevina et al., 2023). The value domain reflects community beliefs, knowledge, and cultural practices related to nutrition and child care. The governance domain emphasizes the role of institutions, policies, and healthcare systems in ensuring equitable access to services(Asiah et al., 2025). Meanwhile, the welfare domain focuses on material conditions, including socio-economic status, environmental health, and access to basic resources. By situating the determinants of stunting within these three interconnected domains, this study provides a more holistic understanding of the issue and aligns scientific inquiry with Indonesia's philosophical foundation for development.

The novelty of this study lies in its integrative approach that combines socio-demographic, environmental, and healthcare access variables within a single analytical model, while simultaneously interpreting the findings through a socio-cultural and governance-based framework. Unlike conventional studies that primarily emphasize biological or nutritional determinants, this research highlights the importance of structural and contextual factors in shaping child health outcomes. Additionally, this study focuses on children aged 6–24 months, a critical period for growth and development, thereby providing more specific and actionable insights for early intervention.

Therefore, this study aims to analyze the influence of socio-demographic factors, environmental conditions, and access to healthcare services on stunting among children aged 6–24 months in West Aceh District, Indonesia. By addressing existing research gaps and introducing a multidimensional analytical framework, this study is expected to contribute to the development of more effective, context-sensitive, and sustainable strategies for stunting prevention. Ultimately, the findings are intended to support evidence-based policymaking and strengthen integrated interventions that not only improve nutritional outcomes but also enhance the overall well-being of children and communities.

Methods

Study Design and Setting

This study employed an analytical cross-sectional design to examine the association between socio-demographic factors, environmental conditions, and access to health services with stunting among children aged 6–24 months (Surya Wibowo, 2011). The study was conducted in West Aceh District, Aceh Province, Indonesia, an area identified as having a high prevalence of stunting. Data collection was carried out from Desember 2025 sd April 2026 across selected villages (gampong) that are designated as stunting locus areas by the local health authority.

Population and Sample

The study population consisted of all children aged 6–24 months residing in West Aceh District. The study sample included 80 children aged 6–24 months who met the inclusion criteria. The inclusion criteria were: (1) children aged 6–24 months, (2) residing in the study area for at least six months, and (3) whose caregivers (mothers) were willing to participate and provide informed consent. Exclusion criteria included children with congenital abnormalities, chronic illnesses, or conditions that may affect growth. (Hulley SB, Cummings SR, Browner WS, et al. *Designing Clinical Research*. 4th ed. Philadelphia: Lippincott Williams & Wilkins; 2013.

A purposive sampling technique was applied based on the availability of eligible participants in selected villages. The sample size of 80 respondents was considered adequate for detecting associations using multivariate analysis within the scope of this study (SUDIGDO, 2018).

Variables and Measurements

Dependent Variable

The dependent variable was stunting status, measured using the Length-for-Age Z-score (LAZ) based on WHO Child Growth Standards. Children with LAZ < -2 SD were classified as stunted (Kemenkes RI, 2011).

Independent Variables (USAID, 2018)

1. Socio-demographic Factors

a) Maternal education (categorized into low, medium, high)
b) Maternal occupation (employed/unemployed)
c) Household socio-economic status (assessed using asset-based indicators and housing conditions)
d) Number of household members

2. Environmental Factors

a) Access to clean water (safe/unsafe)
b) Sanitation facilities (improved/unimproved)
c) Waste management practices
d) Housing density

3. Access to Health Services

a) Distance to health facilities
b) Transportation and cost barriers
c) Perceived quality of healthcare services
d) Family support in accessing health services

4. Child Characteristics (Covariates)

a) Age (months)
b) Sex (male/female)
c) History of infection (past two weeks)
d) Immunization status
e) Exclusive breastfeeding history

All variables were measured using a structured questionnaire adapted from validated instruments and standardized national indicators.

Data Collection Procedures (Badan Pusat Statistik. Kabupaten Aceh Barat, 2025)

Data were collected through face-to-face interviews with mothers or primary caregivers using a structured questionnaire. The questionnaire covered socio-demographic characteristics, environmental conditions, food security, and access to healthcare services. Anthropometric measurements were conducted using a standardized infant meter with an accuracy of 0.1 cm. Each child's length was measured twice, and the average value was used. If the difference between measurements exceeded 0.5 cm, a third measurement was taken. Enumerators were trained prior to data collection to ensure consistency and reliability. Data validation was conducted through cross-checking with maternal and child health records (Buku KIA) when available.

Data were analyzed using statistical software. Univariate analysis was performed to describe the distribution of variables. Bivariate analysis was conducted using the chi-square test to assess the association between independent variables and stunting status. Variables with p-value < 0.25 in bivariate analysis were included in the multivariate analysis.

Multivariate analysis was performed using logistic regression to identify dominant determinants of stunting. The strength of association was expressed as odds ratios (OR) with 95% confidence intervals (CI), and statistical significance was set at $p < 0.05$.

Ethical Considerations (Review et al., 2014)

This study was conducted following ethical principles in health research. Ethical approval was obtained from the Institutional Ethics Committee of Faculty og Medicine. Written informed consent was obtained from all participating mothers or caregivers prior to data collection. Confidentiality and anonymity of participants were strictly maintained throughout the study.

Results

1. Characteristics of Respondents

A total of 80 children aged 6–24 months and their mothers were included in this study. The distribution of respondents based on socio-demographic characteristics is presented in Table 1.

Table 1. Socio-demographic Characteristics of Respondents (n = 80)

Variable	Category	n	%
Child Age	6–12 months	35	43.8
	13–24 months	45	56.2
Sex	Male	42	52.5
	Female	38	47.5
Maternal Education	Low	50	62.5
	High	30	37.5
Maternal Occupation	Unemployed	55	68.8
	Employed	25	31.2
Socio-economic Status	Low	48	60.0
	High	32	40.0
Sanitation	Unimproved	44	55.0
	Improved	36	45.0
Access to Health Services	Difficult	46	57.5
	Easy	34	42.5

Most children were aged 13–24 months (56.2%) and slightly more than half were male (52.5%). The majority of mothers had low educational attainment (62.5%) and were unemployed (68.8%). More than half of households were categorized as having low socio-economic status (60.0%), unimproved sanitation (55.0%), and difficult access to health services (57.5%).

2. Bivariate Analysis

The association between independent variables and stunting is presented in Table 2.

Table 2. Bivariate Analysis of Factors Associated with Stunting

Variable	Category	Stunted		Not Stunted		p-value
		n	%	n	%	
Maternal Education	Low	38	76	12 (24.0)	**24**	0.012*
	High	15	50	15 (50.0)	**50**	
Socio-economic Status	Low	40	83	8 (16.7)	**16,7**	0.001*
	High	13	40.6	19	59.4	
Sanitation	Unimproved	37	84.1	7	15.9	0.000*
	Improved	16	44.4	20	55.6	
Health Service Access	Difficult	36	78.3	10	21.7	0.003*
	Easy	17	50	17	50.0	

*Significant at $p < 0.05$

Bivariate analysis showed that maternal education, socio-economic status, sanitation, and access to health services were significantly associated with stunting ($p < 0.05$). Children from mothers with low education had a higher proportion of stunting (76.0%) compared to those with higher education (50.0%). Similarly, stunting prevalence was higher among children from low socio-economic households (83.3%) compared to higher socio-economic households (40.6%). Poor sanitation and difficult access to health services were also significantly associated with higher stunting rates.

3. Multivariate Analysis

Variables with $p < 0.25$ in bivariate analysis were included in logistic regression analysis.

Table 3. Multivariate Logistic Regression Analysis

Variable	OR	95% CI	p-value
Low Socio-economic Status	3.85	1.45–10.21	0.006*
Unimproved Sanitation	4.72	1.72–12.94	0.002*
Difficult Health Access	2.96	1.10–7.95	0.031*
Low Maternal Education	2.14	0.85–5.38	0.104

*Significant at $p < 0.05$

Multivariate analysis revealed that unimproved sanitation and low socio-economic status were the most dominant factors associated with stunting. Children living in households with unimproved sanitation were 4.72 times more likely to be stunted (OR = 4.72; 95% CI: 1.72–12.94). Similarly, children from low socio-economic households had a 3.85 times higher risk of stunting (OR = 3.85; 95% CI: 1.45–10.21).

Access to health services also showed a significant association, with children from families experiencing difficulty accessing healthcare being 2.96 times more likely to be stunted (OR = 2.96; 95% CI: 1.10–7.95). Although maternal education was significant in bivariate analysis, it did not remain significant in the multivariate model.

Discussion

This study advances the understanding of stunting by demonstrating that its persistence in West Aceh is structurally embedded rather than nutritionally isolated. While many interventions continue to prioritize dietary supplementation, the present findings indicate that the most decisive drivers lie in the interaction between environmental exposure, material deprivation, and systemic access constraints. In this sense, stunting should be interpreted less as an outcome of inadequate intake and more as a biological manifestation of sustained social and ecological disadvantage.

The dominance of sanitation as a determinant point to a critical but often underestimated pathway: the infection–malnutrition nexus. Chronic exposure to fecal pathogens does not merely trigger acute illness but contributes to subclinical conditions such as environmental enteric dysfunction, which silently impair nutrient absorption and immune function. This mechanism helps explain why improvements in food availability alone frequently fail to produce proportional gains in child growth. The implication is clear without disrupting pathogen exposure at the household level, nutritional interventions risk diminishing returns (Yang et al., 2025).

Equally important is the role of socio-economic status, which operates as a "meta-determinant" shaping nearly all proximal risk factors. Rather than acting independently, poverty structures the conditions under which children are born, fed, and raised: it limits dietary diversity, constrains access to improved sanitation, and reduces the capacity to seek timely healthcare. The persistence of stunting in low-income households therefore reflects a cumulative disadvantage, where multiple risk exposures converge over time. This aligns with life-course and social determinants frameworks, suggesting that interventions targeting single variables are unlikely to yield sustained impact(Tawfiq et al., 2023).

Access to health services, while significant, appears to function less as a primary driver and more as a moderating factor. In contexts where environmental and economic risks are high, the health system often operates reactively rather than preventively. Barriers such as distance, cost, and perceived quality reduce service utilization, but more importantly, they weaken the system's ability to interrupt the progression from vulnerability to growth failure. This highlights a structural inefficiency: health services are available, yet not effectively positioned within the lived realities of high-risk populations (Mndala et al., 2024).

The non-significance of maternal education in the adjusted model provides an important conceptual clarification. Education is frequently treated as a proxy for knowledge-driven behavior change; however, this finding suggests that knowledge is contingent upon context. In resource-constrained environments, the capacity to translate knowledge into practice is limited by structural barriers. Thus, behavioural approaches that focus solely on information dissemination may overestimate their potential impact if not accompanied by material and environmental improvements (Benton et al., 2024).

By situating these findings within the Three Domains of Pancasila, this study offers a layered interpretation that bridges empirical evidence with a national development philosophy. The value domain underscores that health behaviors are embedded in cultural and cognitive systems, requiring interventions that resonate with local beliefs and practices. The governance domain reveals gaps in institutional reach and equity, emphasizing that service provision must go

beyond availability to actual accessibility and responsiveness. The welfare domain, however, emerges as the most decisive, as it captures the structural inequalities that condition both exposure and resilience. The interaction across these domains suggests that stunting is not simply a sectoral issue but a systemic development challenge (Asiah et al., 2025; Permatasari et al., 2023; Zevina et al., 2023).

Importantly, these findings challenge reductionist policy models that isolate nutrition from its broader determinants. They support a shift toward integrated, upstream interventions, where sanitation infrastructure, poverty alleviation, and health system strengthening are addressed concurrently rather than sequentially. Without such alignment, interventions risk treating symptoms while leaving underlying causal structures intact (Chen et al., 2022; Gu et al., 2023; Mshida et al., 2020).

This study contributes to the literature by moving beyond variable-based associations toward a more explanatory model of stunting grounded in structural and ecological realities. However, its cross-sectional design limits causal inference, and the relatively small sample size may constrain generalizability. Future research should adopt longitudinal and multilevel approaches to capture dynamic interactions across household, community, and system levels (Antwi-Agyei et al., 2022; Kim et al., 2023).

In sum, the evidence presented here reframes stunting as a consequence of intersecting vulnerabilities rather than isolated risk factors. Addressing it effectively requires a paradigm shift from fragmented, nutrition-centric programs to coordinated strategies that confront the environmental, economic, and institutional conditions shaping child growth.

Conclusion

This study demonstrates that stunting among children aged 6–24 months in West Aceh is driven by interconnected structural determinants, with unimproved sanitation and low socio-economic status emerging as the most influential factors, alongside limited access to health services. These findings confirm that stunting is not solely a consequence of inadequate nutrition but a cumulative outcome of environmental exposure, material deprivation, and systemic inequities.

By integrating these determinants within the **Three Domains of Pancasila**, this study extends the current body of knowledge beyond conventional epidemiological approaches. It provides a conceptual advancement by linking empirical evidence with a socio-cultural and governance-based framework, thereby offering a more holistic understanding of child growth failure in the Indonesian context.

The implications of this study are clear: effective stunting reduction requires a paradigm shift from fragmented, nutrition-specific interventions toward **integrated, multisectoral strategies**. Priority should be given to improving sanitation infrastructure, strengthening poverty alleviation programs, and ensuring equitable and functional access to quality health services. Interventions must also be context-sensitive, aligning with local cultural values and community practices to enhance sustainability and impact.

However, this study has limitations. The cross-sectional design restricts causal inference, and the relatively small sample size limits the generalizability of the findings. Future research should employ longitudinal and multilevel designs to better capture causal pathways and interactions across individual, household, and community levels.

In conclusion, this study reinforces that addressing stunting requires confronting its root structural causes. Without integrated and systemic interventions, efforts to reduce stunting will remain incremental and insufficient to achieve sustainable improvements in child health outcomes.

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Author Contribution and Competing Interest

Teungku Nih Farisni conceptualized the study, developed the research design, conducted data collection and analysis, and drafted the manuscript. Herlina Dimiati supervised the overall research process, provided critical revisions, and contributed to the interpretation of the findings. Aman Yaman contributed to the methodological framework, data analysis, and validation of results. Sri Wahyuni contributed to data interpretation, manuscript review, and refinement of the theoretical framework. All authors have read and approved the final version of the manuscript.

Competing Interest

The authors declare that there are no competing interests related to this study.

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