

# The Influence of Clean Lifestyle and Healthy Environment Maintained by Mothers on The Incidence of Stunting in Maratua District, Berau Regency

Parli Prananda<sup>1</sup>, Rusdi<sup>2\*</sup>, Ainur Rachman<sup>3</sup>

<sup>1,3</sup> Undergraduate Program in Environmental Health, Faculty of Public Health, Muhammadiyah University of East Kalimantan, Indonesia

<sup>2</sup> Environmental Health, Faculty of Public Health, Muhammadiyah University, Indonesia

\*Corresponding Author:

Email: [rus756@umkt.ac.id](mailto:rus756@umkt.ac.id)

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## Abstract.

*Stunting is a major health problem in the Indonesian archipelago, such as in the Maratua Island District, due to limited sanitation and access to health services. This study aims to analyze the relationship between maternal hygiene practices and household environmental conditions with the incidence of stunting in toddlers. Using a quantitative analytical observational cross-sectional design, the population of all mothers of toddlers aged 0-4 years (n=54) was taken by total sampling. Data were collected through a PHBS questionnaire, environmental observations, and WHO anthropometric Z-scores, analyzed univariately and bivariately using the Spearman Rank test. The results showed that 100% of toddlers were stunted (75.9% were short, 24.1% were very short), but there was no significant relationship between maternal hygiene practices ( $\rho=-0.031$ ;  $p=0.825$ ) or the home environment ( $\rho=0.139$ ;  $p=0.317$ ) with stunting. Stunting is multifactorial, so the conclusion recommends integrated interventions including nutrition, sanitation, and socioeconomic factors for effective prevention in the archipelago.*

**Keywords:** *Toddlers; Healthy Environment; PHBS; Stunting and Sanitation.*

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## I. INTRODUCTION

Stunting remains a major public health challenge in Indonesia, particularly in island regions with limited access to sanitation and health services. According to the World Health Organization (WHO, 2020), this condition reflects impaired linear growth due to chronic malnutrition, repeated infections, and poor environmental conditions, which have long-term impacts on children's cognitive development and economic productivity (Black et al., 2013). A UNICEF report (2023) confirms that poor sanitation and family hygiene practices are the dominant indirect causes of stunting, particularly in remote areas such as Maratua Island District, Berau Regency (Ministry of Health of the Republic of Indonesia, 2021; Rah et al., 2020). The prevalence of stunting in Indonesia remains high despite programs such as the National Stunting Strategy, with target achievement being suboptimal in underdeveloped, frontier, and outermost (3T) regions. On Maratua Island, limited sanitation and clean water infrastructure hinders the implementation of clean and healthy living behaviors (PHBS) by mothers as primary caregivers, thereby increasing the risk of infection and stunted child growth (Berau Regency Government, 2023; Prüss-Ustün et al., 2019). Studies show variations in outcomes across the islands, where environmental factors such as environmental enteric dysfunction (EED) impair nutrient absorption despite adequate dietary intake (Fink et al., 2019; Prendergast & Humphrey, 2014).

The problem is further complicated by the lack of specific empirical evidence in the East Kalimantan archipelago, which differs from the mainland due to unique geographic and socio-ecological dynamics. Previous research has focused more on nutrition and healthcare access, neglecting the role of maternal PHBS (Healthy Living) and household environmental conditions as key determinants (Headey et al., 2017; Spears et al., 2021). Furthermore, tourist mobility on Maratua Island has the potential to pollute the environment, exacerbating the risk of stunting without adequate sanitation management (WHO, 2021; Checkley et al., 2019). This study aims to analyze the relationship between maternal hygiene practices and household environmental conditions with stunting incidence in toddlers in Maratua Island District. Its urgency lies in the need for empirical data to support targeted interventions in the archipelago, fill the gap in the literature

dominated by mainland studies, and enrich gender and behavioral perspectives on environmental health (Bhutta et al., 2020; Dangour et al., 2021). Its novelty lies in the contextual evaluation within island micro-communities, which provides a basis for adaptive, community-based policies for sustainable stunting prevention (Cumming et al., 2019; Wilson-Jones et al., 2019).

## II. METHODS

This study used a quantitative design with an observational analytical approach to assess the relationship between maternal hygiene practices, household environmental conditions, and stunting incidence. The cross-sectional approach was chosen because it provides a snapshot of the relationship between variables in a single measurement and is suitable for application in island regions with limited access, such as Maratua Island. (Setia, 2016) Cross-sectional designs are effective in public health research to quickly and measurably evaluate population risk factors. This design also allows researchers to identify behavioral patterns and environmental conditions that potentially influence children's nutritional status. Therefore, this approach is an appropriate choice for identifying environmental and behavioral determinants associated with stunting. The research was conducted in Maratua Island District, Berau Regency, which comprises several villages with heterogeneous characteristics of sanitation and clean water access. This area was selected purposively because it is a priority area for stunting reduction in East Kalimantan. According to the Berau Regency Government (2023), Maratua Island still faces basic sanitation challenges that impact child health. Data collection was conducted during December 2025 to ensure sufficient time for preparation, data collection, and verification of results. This timeframe was also chosen to consider the weather conditions in the archipelago region to ensure optimal data collection.

The study population consisted of all mothers with toddlers aged 0 months to 4 years and residing on Maratua Island. The population in this study was all mothers with toddlers in Maratua Island District, Berau Regency, with a total of 54 respondents. The sampling technique used total sampling (saturated sampling), namely the entire population was sampled due to the relatively small population size and to minimize selection bias. Thus, the sample size in this study was 54 respondents. According to (Etikan, 2016) This technique is effective when a population has subgroups with distinct characteristics that need to be represented in the study. The population in this study was 54 toddlers and their mothers, according to data released by the Maratua Community Health Center in November 2025. The independent variables in this study include maternal hygiene practices and household environmental conditions, each measured using instruments adapted to national indicators. Maternal hygiene practices encompass personal hygiene practices, food handling, drinking water management, and household waste disposal. According to the Indonesian Ministry of Health (2021), household PHBS indicators can be used to measure behaviors that contribute to the risk of infectious diseases and growth disorders. Physical home environmental conditions include adequate sanitation, clean water quality, ventilation, and residential density. The dependent variable is the incidence of stunting, determined based on height-for-age using the WHO Z-score standard (2020). The research instruments consisted of a structured questionnaire to assess clean living patterns, an observation sheet to evaluate environmental conditions, and an anthropometric form to record toddlers' height.

The questionnaire was developed from official PHBS indicators and tested for validity and reliability before use. (Taherdoost, 2018) Validity and reliability testing are essential to ensure the instrument has adequate accuracy and consistency. Data collection techniques include direct interviews with mothers, home observations by enumerators, and anthropometric measurements by trained health workers. These procedures ensure that data are collected systematically and in accordance with child growth monitoring guidelines. Data analysis was conducted in two stages: univariate and bivariate analysis. Univariate analysis yielded a distribution of respondent characteristics, clean living patterns, environmental conditions, and child nutritional status. Bivariate analysis used the Spearman Rank test to assess the relationship between independent variables and stunting incidence. This study received approval from the Health Research Ethics Committee and permission from the Maratua Community Health Center and the Berau District Health Office. All respondents were provided with complete information regarding the study's purpose, benefits, and procedures before providing written consent. According to Creswell and Creswell (2018), informed

consent is an essential ethical component to ensure the autonomy and protection of respondents in health research. Researchers guaranteed the confidentiality of respondents' identities and stored data securely throughout the research process. Participants were also given the right to withdraw at any time without any consequences.

### III. RESULT AND DISCUSSION

#### Univariate Analysis

Characteristics	Category	N	%
<b>Age</b>	0–1 Years	7	13.0
	>1–3 Years	29	53.7
	>3–5 Years	18	33.3
<b>Gender</b>	Man	30	55.6
	Woman	24	44.4
<b>Weight</b>	Very Low	7	13.0
	Low	24	44.4
	Normal	23	42.6
<b>Height</b>	Very Short	13	24.1
	Short	41	75.9

Based on the table above, the number of respondents in this study was 54 toddlers. The age distribution shows that the majority of respondents were in the age group >1–3 years, namely 29 children (53.7%). The age group >3–5 years numbered 18 children (33.3%), while the age group 0–1 years made up the smallest proportion, namely 7 children (13.0%). This composition indicates that the majority of respondents were in the toddler phase, namely a period of very rapid growth and development and vulnerable to nutritional disorders and infections. Epidemiologically, the age range of 1–3 years is a critical period because children begin to experience transitions in eating patterns and increased environmental exposure. Based on gender, 30 (55.6%) were boys, while 24 (44.4%) were girls. This distribution shows a relatively balanced proportion, although there was a slight preponderance of boys. In child growth studies, gender differences can influence energy needs, activity patterns, and responses to environmental risk factors. However, the small differences in proportions indicate that the sample characteristics are sufficiently representative of the conditions of both genders. Regarding weight, the majority of respondents were in the low weight category (24 children (44.4%)), followed by 23 children in the normal weight category (42.6%), and 7 children in the very low weight category (13.0%).

This finding indicates that more than half of the respondents (57.4%) experienced weight problems below the normal standard. This condition reflects the potential for nutritional problems that require attention, considering that weight is a sensitive indicator for detecting acute and chronic nutritional disorders in toddlers. Meanwhile, based on height, the majority of respondents were categorized as short (41 children (75.9%)), and 13 children (24.1%) as very short. There were no respondents in the normal height category in this data, so it can be concluded that the entire sample was stunted (short and very short). The very high proportion of short children indicates the presence of significant chronic nutritional problems in the study population. Height-for-age is a key indicator in assessing the incidence of stunting, so this distribution emphasizes the urgency of family- and environment-based interventions to improve children's growth status. Overall, the characteristics of the respondents show that this study was dominated by toddlers aged >1–3 years, male, with a large proportion experiencing low birth weight and all in the short and very short height categories. This distribution pattern confirms that the study population has a fairly high nutritional vulnerability, making it relevant for further analysis in relation to factors such as clean lifestyles and healthy environments maintained by mothers.

**Bivariate Analysis**

No	Independent Variables	Dependent Variable	Correlation Coefficient ( $\rho$ )	p-value (Sig. 2-tailed)	N	Information
1	Mother's Clean Lifestyle X1	Stunting Incident (Y)	-0.031	0.825	54	Not significant
2	Household Environmental Cleanliness X2	Stunting Incident (Y)	0.139	0.317	54	Not significant

Bivariate analysis using the Spearman Rank test showed no significant relationship between maternal hygiene and stunting ( $p = 0.825$ ;  $\rho = -0.031$ ). The very small correlation coefficient, approaching zero, indicates a negligible relationship between the two variables. Statistically, these findings indicate that changes in maternal hygiene did not significantly impact stunting among the respondents in this study. Similar results were also found for the relationship between household environmental cleanliness and stunting ( $p = 0.317$ ;  $\rho = 0.139$ ). Although the correlation trended positively, the strength of the relationship was very weak and not statistically significant. Therefore, household environmental cleanliness cannot be said to have a significant direct relationship with stunting in the studied population. The lack of a significant relationship between these two variables is understandable, given that stunting is a complex, chronic nutritional problem influenced by various factors. Stunting is not solely related to a single factor, but rather the result of the interaction of various determinants, such as long-term nutritional intake, history of infectious diseases, maternal health during pregnancy, and family socioeconomic factors. Therefore, an analysis involving only one or two variables may not be sufficient to fully explain the causes of stunting. In general, the results of this study indicate that stunting prevention efforts require a more comprehensive and integrated approach. Although maternal hygiene and household environmental cleanliness theoretically play a role in supporting child health, this study has not shown a statistically significant relationship between the two. Further research considering more variables and using more in-depth analysis is needed to obtain a more comprehensive picture of the factors contributing to stunting.

The results of the bivariate analysis showed that there was no significant relationship between maternal hygiene habits and stunting ( $\rho = -0.031$ ;  $p = 0.825$ ) or between household environmental conditions and stunting ( $\rho = 0.139$ ;  $p = 0.317$ ). Statistically, the correlation coefficient value was very weak and close to zero, indicating that variations in the two independent variables were not significantly correlated with variations in stunting incidence in this study population. This finding confirms that in the context of Maratua Island, maternal hygiene behavior and the physical condition of the home environment do not stand alone as dominant determinants of stunting. Theoretically, sanitation and household hygiene practices are closely linked to the risk of recurrent infections, which can disrupt nutrient absorption and child growth. Prüss-Ustün et al. (2019) explain that exposure to unhygienic environments increases the risk of diarrhea and respiratory infections, which contribute to impaired linear growth. However, large intervention studies such as the WASH Benefits Trial show that improvements in sanitation and hygiene alone do not always result in significant reductions in stunting without strong nutritional interventions (Luby et al., 2018; (Null et al., 2018). The results of this study align with these findings, stating that environmental components and hygiene behaviors may act as supporting factors, but are not the sole determinants strong enough to directly influence stunting outcomes.

The insignificant results can also be understood through the UNICEF (2020) conceptual framework, which states that stunting is the result of the interaction of direct factors (nutritional intake and infectious diseases) and indirect factors (food security, parenting patterns, health services, and the environment). In this study, the variables analyzed only cover a portion of the indirect factors, thus limiting their contribution to variations in stunting incidence. Headey et al. (2017) emphasized that the impact of sanitation interventions on child growth will be more visible when combined with improved dietary quality and maternal health status during pregnancy. Furthermore, the lack of a significant relationship may be influenced by the homogeneity of the dependent data, where all the respondents were in the stunting category (short and very short). This condition minimizes outcome variation, making it difficult to detect a correlational relationship statistically. Methodologically, limited variation in the dependent variable can reduce the power of the analysis and increase the likelihood of a type II error, which is the failure to detect a true relationship. (Setia, 2016). Thus, the results of this study need to be interpreted carefully and not concluded as an absolute

absence of influence. In the context of an archipelagic region such as Maratua Island, structural determinants likely have a greater contribution than individual behavioral factors. (Black et al., 2013) The Lancet Maternal and Child Nutrition Series emphasizes that stunting is a consequence of exposure to chronic risks from the first 1,000 days of life, including maternal nutritional status, low birth weight, and structural poverty. If these chronic factors have persisted for a long time, improving hygiene behaviors in the postnatal period may not be sufficient to significantly change a child's height status.

Furthermore, several studies in Indonesia have also shown varying results. A study by Beal et al. (2018) found that socioeconomic factors and food consumption patterns were more strongly associated with stunting than sanitation alone. This indicates that in highly vulnerable populations, macroeconomic determinants such as food access and poverty may be dominant factors, overshadowing the influence of microenvironmental variables. Thus, the results of this study do not necessarily deny the importance of a clean lifestyle and environmental conditions, but rather indicate that in the context of Maratua Island, these two variables are not the primary determinants in explaining stunting incidence. Stunting in this region is likely the result of an accumulation of chronic, multidimensional, and cross-sectoral factors that require an integrated intervention approach. Therefore, stunting management strategies should not only focus on changing hygiene behaviors but also include strengthening food security, improving maternal and child nutritional quality, and community-based socioeconomic interventions.

#### IV. CONCLUSION

This study found that maternal hygiene and household environmental conditions were not significantly associated with stunting in toddlers in Maratua Island District, with a  $\rho$  value of  $-0.031$  ( $p = 0.825$ ) and  $\rho = 0.139$  ( $p = 0.317$ ). All samples (100%) experienced stunting, dominated by ages  $>1-3$  years (53.7%) and low body weight (57.4%), confirming the high prevalence of multifactorial factors involving chronic malnutrition, infection, and socioeconomic factors. The practical implication is the need for integrated cross-sectoral interventions, such as strengthening food security, nutritional supplementation for pregnant women, and increasing access to community-based sanitation in the island region, in line with the national target of reducing stunting to 18.8% by 2025. Major limitations include the cross-sectional design, which cannot establish causality, the small sample size (54 respondents), and the homogeneity of the dependent data (all stunted), which could potentially introduce type II error and reduce the power to detect associations. Recommendations for future research include using longitudinal or cohort designs with larger samples, multivariate analysis for additional factors such as maternal nutritional status and structural poverty, and studies in similar island regions to compare geographic variations. This approach would generate stronger evidence for sustainable stunting prevention policies in Indonesia.

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