Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 28s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Social Demography, Sanitation, and Nutrient Intake in Relation to Stunting Among Children Aged 6–23 Months in Gorontalo

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Cite this paper as: Rifai Ali, Ratna Djuwita, Umi Fahmida, Besral, (2025) Social Demography, Sanitation, and Nutrient Intake in Relation to Stunting Among Children Aged 6–23 Months in Gorontalo, *Journal of Neonatal Surgery*, 14 (28s), 455-461

ABSTRACT

Background: Stunting is a condition of growth failure in toddlers or being too short for their age, caused by chronic malnutrition. Stunted (short) and severely stunted children are those with height (or length) for age (HAZ) below the standard according to the WHO-MGRS (Multicentre Growth Reference Study) 2006.

Methods: This study used a cross-sectional design with the population of all toddlers in the Pohuwato region, with a sample size of 195 toddlers. The chi-square test was used for bivariate analysis, and multiple logistic regression analysis was used for multivariate analysis.

Results: There is a significant relationship between several factors and stunting in children. The results of multivariate analysis showed that maternal education (PR=2.84, p=0.012), access to a latrine (PR=8.95, p=0.000), and protein intake (PR=4.28, p=0.001) were the dominant factors significantly associated with an increase in the incidence of stunting. Additionally, zinc intake (PR=0.28, p=0.021) and a history of illness (PR=0.28, p=0.036) were significantly associated with a decrease in the incidence of stunting. All of these factors had a p-value < 0.05, indicating statistical significance.

Conclusion: The results of this analysis indicate that maternal education, access to a latrine, protein intake, zinc intake, and history of illness are significantly associated with the incidence of stunting.

Keywords: *Stunting, Social Demography, Sanitation, Nutrient Intake*

1. INTRODUCTION

Stunting is a condition of impaired growth in young children due to chronic malnutrition, particularly during the first 1,000 days of life, from pregnancy until the child reaches two years of age. Stunting not only affects physical growth but also impacts cognitive development and increases the risk of chronic diseases in adulthood. [1] Globally in 2022, 148.1 million or 22.3% of children under five will be stunted, 6.8% will be wasted, and 5.6% will be overweight. Stunting is most prevalent in Asia (52% of the global total) and Africa (43%) as well as wasting. Although the problem of stunting is declining, globally it still does not meet the 2030 target. More intensive efforts are needed to achieve the global target of reducing the number of stunted children to 89 million by 2030. [2]

These findings indicate that the availability of clean water alone is not sufficient to be a determining factor in reducing stunting rates. This is also supported by UNICEF's findings, which state that sanitation interventions must be accompanied by behavioral change and community empowerment in order to be effective in reducing stunting. [3] Stunting remains a major public health problem in Indonesia. One of the sanitationtal factors contributing to stunting is access to basic sanitation, including the ownership of proper latrines. Without adequate sanitation, children are at a higher risk of chronic diarrhea, which directly affects nutrient absorption and physical growth. [4]

Nutrient intake in toddlers is very important in supporting growth in accordance with the growth chart so that there is no growth faltering which can cause stunting. In 2017, 43.2% of children under five in Indonesia had energy deficiency and 28.5% had mild energy deficiency. For protein adequacy, 31.9% of toddlers experienced protein deficiency and 14.5%

experienced mild protein deficiency. [5] The intake of nutrients, including macronutrients (such as carbohydrates, proteins, and fats) and micronutrients (such as vitamins and minerals), plays a crucial role in ensuring optimal growth. Nutritional imbalances can lead to growth disorders, either in the form of undernutrition or overnutrition. [6]

In 2022, the prevalence of stunting in Gorontalo Province was 23.9%, wasting was 9.6%, and underweight was 20.8% (SSGI 2022). In 2023, the prevalence of stunted children aged 0–23 months was 15.8%, with 9.4% categorized as severely stunted, and the prevalence of wasting in the same age group was 8.8%. [7]

The objective of this study is to investigate the effects of parental socio-demographic characteristics, sanitationtal factors and nutritional intake on the risk of stunting among children aged 6 to 23 months in Gorontalo

2. METHODS

This research design is a cross-sectional study conducted in Pohuwato Regency, Gorontalo Province from July to September 2023. The population was all children under five years old in Randangan and Buntulia sub-districts which are the locus of stunting. Affordable population or source population is children who visit *posyandu* in the study area. The sample of this study was 195 toddlers aged 6-23 months who were taken based on inclusion and exclusion criteria. The sampling technique used systematic random sampling. Data analysis used chi-square test for bivariate analysis and logistic regression analysis was used for multivariate analysis.

Data collection was conducted at a single point in time to describe the relationship or pattern among socio-demographic variables within a population using a questionnaire. Children's height was measured using anthropometric indicators (length-for-age z-score / LAZ). Nutritional intake data were collected using a 24-hour food recall instrument and analyzed using the Nutrisurvey program.

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) to assess descriptive statistics such as frequencies and percentages, and bivariate analysis. The chi-square test was applied with a 95% confidence interval. For multivariate analysis, multiple logistic regression was used with a 95% confidence interval.

3. RESULTS

Table 1 provides information on the frequency and percentage distribution of socio-demographic characteristics of 195 respondents in a study. The age group of 12-23 months had a stunting prevalence (21.2%) and in the age group of 6-11 months the stunting prevalence was 16.3%, Girls had a slightly higher stunting prevalence of 19.4% compared to boys at 16.5%, Children with fathers working as farmers (21.8%), drivers (20.0%), and private (14. 9%), have a higher prevalence of stunting than other professions, working mothers tend to have children with a lower prevalence of stunting (6.9%), there is no significant difference between low (17.6%) and high (18.2) father's education on the prevalence of stunting, mothers with low education (27.5%) tend to have children with a higher prevalence of stunting, There are several types of clean water facilities used by the community. The most widely used facility is the Regional Water Utility Company (PDAM), with 93.5% of respondents reporting its use, while only 6.5% do not use it, The use of pump wells is also quite high, with 84.4% of respondents utilizing them, and only 15.6% not doing so. Meanwhile, dug wells are used by 66.7% of the population, while the remaining 33.3% do not utilize them, The majority of the population, namely 91.4%, already have their own toilet facilities, while only 8.6% do not and children who have a history of illness (21.7%) are more prone to stunting.

Table 1. Distribution of socio-demographic characteristics of respondents (n=195)

Characteristics	Stunting		Non Stunting	
	n	%	n	%
Child's Age (Months)				
6-11	21	16.3	108	83.7
12-23	14	21.2	52	78.8
Child's Gender				
Male	16	16.5	81	83.5
Female	19	19.4	79	80.6
Father's Occupation				
Fisherman	0	0	2	100

Farmer	24	21.8	86	78.2
Civil Servant	0	0	10	100
Driver	3	20.0	12	80.0
Private Sector	7	14.9	40	85.1
Self-employed	1	9.1	10	90.9
Mother's Occupation				
Working	2	6.9	27	93.1
Not working	33	19.9	133	80.1
Father's Education				
Low	15	17.6	70	82.4
High	20	18.2	90	81.8
Mother's Education				
Low	22	27.5	58	72.5
High	13	11.3	102	88.7
Clean Water Facilities				
Regional Water Utility	6	6.5	86	93.5
Pump Well	5	15.6	27	84.4
Dug Well	14	33.3	28	66.7
Rainwater Harvesting Tank	10	34.5	19	65.5
Toilet Ownership				
Yes	13	8.6	139	91.4
No	22	51.2	21	48.8
History of Infectious disease (last 2 weeks)				
Yes	31	21.7	112	78.3
No	4	7.7	48	92.3

Table 2 shows the bivariate analysis of the association between socio-demographic variables and nutrient intake on the incidence of stunting in children aged 6-23 months using the chi-square test.

As shown in Table 2, father's occupation, mother's education, clean water facilities, toilet ownership, history of infectious diseases, protein intake and zinc intake were statistically significantly associated (p-value > 0.05) with the incidence of stunting in children aged 6-23 months.

Tabel 2. Bivariate analysis of the association between social demographic variables and nutritent intake with the incidence of stunting in children aged 6-23 months.

Variable	**Stunting**		**Non Stunting**		***p-Value***
	n	%	n	%	

Father's Occupation					
Formal	2	4.1	47	95.9	0.007*
Non-formal	33	22.6	113	77.4	
Mother's occupation					
Working	2	6.9	27	93.1	0.156
Not working	33	19.9	133	80.1	
Father's education					
Low	15	17.6	70	82.4	1.000
High	20	18.2	90	81.8	
Mother's education					
Low	22	27.5	58	72.5	0.007*
High	13	11.3	102	88.7	
Clean Water Facilities					
Protected	11	8.9	113	91.1	0.000*
Unprotected	24	33.8	47	66.2	
Toilet Ownership					
Yes	13	8.6	139	91.4	0.000*
No	22	51.2	21	48.8	
History of infectious disease					
Yes	31	21.7	112	78.3	0.041*
No	4	7.7	48	92.3	
Energy intake					
Adequacy	10	17.2	48	82.8	1.000
Inadequacy	25	18.2	112	81.8	
Protein intake					0.000*

Adequacy	25	30.1	58	69.9	
Inadequacy	10	8.9	102	91.1	
Carbohydrate intake					
Adequacy	11	22.9	37	77.1	0.414
Inadequacy	24	16.3	123	83.7	
Fat intake					
Adequacy	20	20.6	77	79.4	0.435
Inadequacy	15	15.3	83	84.7	
Zinc Intake					
Adequacy	5	8.5	54	91.5	0.039*
Inadequacy	30	22.1	106	77.9	

*Significant test at P<0.05

Table 3 presents the results of logistic regression analysis between sociodemographic, sanitationtal, and nutritional intake variables and the incidence of stunting among children aged 6–23 months. Based on the analysis, maternal education (OR=2.84; p=0.012), toilet ownership (OR=8.95; p=0.000), and protein intake (OR=4.28; p=0.001) were found to be significantly associated with stunting. Protective factors against stunting included zinc intake (OR=0.28; p=0.021) and medical history (OR=0.28; p=0.036). Access to clean water was not statistically associated with stunting (OR=1.37; p=0.058).

Tabel 3. Multivariate Analysis with Logistic Regression

Variables	**OR**	***p-value***	**95% CI**
Mother's education	2.84	0.012	1.25-6.42
Clean Water Facilities	1.37	0.058	0.43-4.34
Toilet Ownership	8.95	0.000	2.86-27.93
Protein	4.28	0.001	1.84-9.93
Zinc	0.28	0.021	0.09-0.82
Medical History	0.28	0.036	0.08-0.92

4. DISCUSSION

Maternal education level has a significant impact on the incidence of stunting in children. Mothers with higher education levels tend to have a better understanding of nutrition, health, and parenting, which in turn can prevent stunting. The study. [8] confirms that increasing maternal education is a key intervention in reducing stunting rates globally. The study. [9] found that there was a significant relationship between maternal education level and the incidence of stunting ($p < 0.05$). Where mothers with low education have more stunted children than mothers with higher education.

The availability of clean water facilities does not have a statistically significant relationship with the incidence of stunting.

Therefore, a multisectoral approach involving nutrition education, sanitation, and clean and healthy living behavior must continue to be strengthened in order to effectively address stunting. Nutritional status analysis showed that the prevalence of stunting among children from households with access to clean water was 24.5%, while in households without access to clean water, it was 28.2%. Although there was a difference in percentages, statistical analysis using the Chi-Square test showed a p-value of 0.311, indicating no statistically significant association between clean water facilities and stunting ($p > 0.05$). [10]

Ownership of proper latrines is significantly associated with the incidence of stunting among children under five. Children living in households without proper latrines are nearly twice as likely to experience stunting compared to those living in households with latrines. Out of 150 respondents, 58% of the children lived in homes without proper latrines. The prevalence of stunting in the group without proper latrines was 42.5%, while in the group with proper latrines it was only 21.8%. The Chi-Square test showed a p-value of 0.001 (< 0.05), indicating a statistically significant relationship between latrine ownership and the incidence of stunting. [11]

Stunting is a condition where a child's height is lower than their age standard, often caused by chronic malnutrition, especially protein. Protein plays an important role in a child's growth and development, including the formation of muscles, bones, skin, hair and nails, as well as immune system and brain function. Several research studies in Indonesia show a significant association between protein intake and the incidence of stunting in children under five. A literature review study. [12] found that protein intake less than the daily requirement was associated with an increased risk of stunting in children under five. The study. [13] also concluded that there is an association between low protein intake and the incidence of stunting in children under five in Indonesia.

One important micronutrient that plays a role in child growth is zinc. Zinc functions in growth hormone synthesis, bone lengthening, enhancing the immune system, and increasing the sensitivity of the taste buds which can increase children's appetite. [14] The study. [15] found a significant relationship between zinc intake and the incidence of stunting in toddlers. Other studies have also shown that zinc intake is the dominant factor associated with stunting in children aged 6-24 months. Children with insufficient zinc intake have a higher risk of stunting compared to children with sufficient zinc intake. [16]

Prevention of infectious diseases through improving sanitationtal health and providing clean water in households is one of the important efforts in preventing stunting in toddlers. A study conducted by. [17] showed a significant relationship between the history of infectious diseases and the incidence of stunting in children aged 12-59 months ($p=0.000$). Another study by. [18] found that children aged 24-36 months with a history of frequent infectious diseases had a 4.2 times greater risk of stunting compared to children who rarely suffered from infectious diseases ($p=0.001$).

5. CONCLUSION

This study reveals several significant factors associated with stunting in children. The variables examined in this research show a strong correlation with the prevalence of stunting. Children whose fathers work in the informal sector and whose mothers have a low level of education tend to have a higher prevalence of stunting. A history of illness in children also increases the risk of stunting, while inadequate nutritional intake has a significant negative impact on growth. Further research should explore the relationship between family economic status and parenting patterns in greater depth, as well as identify other potential factors influencing stunting that were not captured in this study. In addition, follow up studies on nutritional intake particularly protein and zinc are necessary to gain a better understanding of the anomalies found in the relationship between protein intake and the prevalence of stunting

Acknowledgements: Nil

Conflict of Interest: None.

Source of Support: Nil

Consent to Publication: Author(s) declared taking informed written consent for the publication of clinical photographs/material (if any used), from the legal guardian of the patient with an understanding that every effort will be made to conceal the identity of the patient, however it cannot be guaranteed

Author Contributions: Author(s) declared to fulfil authorship criteria as devised by ICMJE and approved the final version.

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