

## Risk Factors for Stunting in School Children at Poboya Elementary School

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### Abstract

Stunting is a condition of malnutrition that describes stunted growth, which has been going on for a long time and requires time to recover. Poboya gold mining is the largest source of the entry of mercury metal, the danger posed is that it affects growth. This study aims to determine the risk factors for stunting in school children at SDN Poboya Palu. This type of research is quantitative with the case-control method. The number of samples used in this study was 171 respondents consisting of 57 cases and 114 controls with a ratio of 1: 2. Sampling using total sampling technique. Data on macro nutrition, education, employment, family income, and food security were obtained through interviews using a questionnaire. Data analysis used univariate and bivariate analysis. Data were obtained from statistical analysis using the Odds ratio (OR) test. The results showed macro nutrition (carbohydrate OR = 260 (95% CI 112-600), protein OR = 2.462 (95% CI 1.284-4.719), fat OR = 2.244 (95% CI 1.1694-3.09)), maternal education OR 2.708 (95% CI 1.377-5.326), maternal occupation OR = 3.478 (95% CI 1.790-6.757), family income OR = 3.076 (95% CI 1.592-5.944) and food security OR = 4.706 (95% CI 2.365-9.365). In the research which is a risk factor for the incidence of stunting macro nutritional intake (protein and fat), mother's education, maternal work, family income, and household food security.

**Keywords:** Stunting, Macro Nutrition, Mother Education, Family Income, Household Food Security

### Key Messages:

- Children in food-insecure households have a 4.706 times greater risk of stunting compared to food-insecure households

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Received: 10 May 2022

Accepted: 25 May 2022

DOI: <https://doi.org/10.56303/jhnr.v1i1.1>

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## 1. Introduction

Stunting is another form of growth failure. Children who experience stunting are often seen as having a normal, proportional body, but in fact, their height is shorter than the normal height of children their age (1). Stunting can also occur before birth and is caused by very poor nutritional intake during pregnancy, very poor food parenting patterns, and low food quality in line with the frequency of infection so that it can inhibit growth (2). At school age, children need more nutrients for growth and activity (3). This is because at this time there is rapid physical, mental, intellectual, and social growth, so this group needs special attention. Although not as fast as toddlerhood, the growth of children aged 5-12 years is still going fast. At this time children begin to take education and have a

variety of activities to support their physical and cognitive development.

Mercury is a very toxic chemical element, it can mix with enzymes in the human body causing a loss of the ability of enzymes to act as catalysts for important body functions (4). The impact of mercury that accumulates in the environment will have an impact on the agricultural land of the Poboya community where crop failure occurs, so that it will have an impact on food availability in the Poboya mining area (5).

Research in Poboya Village is to see the impact of mining activities in the Poboya Village area on the nutritional status of children, especially for children who experience stunting. Based on the results of initial observations by measuring height based on age in students at SDN Poboya Palu as many as 218 children who have been measured there are 59 children who experience short nutritional status (27%). The purpose of the study was to determine the relationship between macronutrient intake, food security, education, employment and family income with the incidence of stunting in school children at SDN Poboya.

## 2. Methods

The type of research is observational analytic with case control design. This research was conducted in January - August 2018 in the Poboya Village Area. The case population in this study were students of SDN Poboya grades I, II, III, IV and V which had been previously measured. In this case, class VI students were not included in the study because at the time of the initial measurement, class VI students were busy preparing for the national exam. The sample population in this study were students in grades I-IV who had been measured and experienced stunting as many as 57 students, while the control population in this study were those who were not stunted. The number of case and control samples used a ratio of 1:2 with a case sample of 57 students and a control sample of 114. The number of samples to be examined in this study is 171 samples. For each sample selected based on age criteria as matching.

Data was collected by interview using a characteristic questionnaire, and FFQ (Food Frequency Questionnaire) and to obtain information about the incidence of stunting obtained from the results of measurements of Height/Age.

Data analysis was carried out using a computer data analysis program to compare risk factors with stunting incidence between control cases, then the Odds Ratio (OR) formula was used. The presentation of the data in this study is presented in the form of a frequency distribution table accompanied by explanations to see the relationship between the dependent variable (stunting) and the independent variables, namely macro nutrition (carbohydrates, protein, fat), food security, education, employment and income.

## 3. Results

Table 1 shows that most of the 11-year-old children were 45 samples (26.3%) and a small portion of 7 years old were 9 samples (5.3%), most of the samples were female, namely 86 samples (50.3 %), while the male gender were 85 samples (49.7%). As for the education of the respondents' mothers, most of the mothers had low educational status, namely 93 respondents (54.4%) and most of the mothers did not work, namely 103 samples (60.2%), family income in the high category as many as 100 samples (58,5%).

**Table 1. Characteristics of Respondents**

Characteristic	n	%
<b>Age (Years)</b>		
7	9	5.3
8	37	21.6
9	23	13.5
10	39	22.8
11	45	26.3
12	18	10.5
<b>Sex</b>		
Male	85	49.7
Female	86	50.3
<b>Education Mothers</b>		
Low	93	54.4
High	78	45.6

Characteristic	n	%
<b>Mother's Job</b>		
Working	68	39.8
Not Working	103	60.2
<b>Family Income</b>		
Low	71	41.5
High	100	58.5
Total	171	100

Table 2 shows that carbohydrate intake is included in the sufficient category as many as 119 samples (69.6%), adequate protein intake as many as 100 samples (58.5 %), adequate fat intake as many as 106 samples (62.0%). The status of household food security shows that the majority of households that are food insecure are 93 samples (54.4%), while food insecure households are 78 respondents (45.6%).

**Table 2. Nutritional Intake, Household Food Security and Stunting Nutritional Status of Respondents**

Nutritional Intake, Food Security, Stunting	n	%
<b>Carbohydrate intake</b>		
Less	52	30.4
Enough	119	69.6
<b>Protein Intake</b>		
Less	71	41.5
Enough	100	58.5
<b>Fat Intake</b>		
Less	65	38.0
Enough	106	62.0
<b>Household Food Security</b>		
Food Insecurity	78	45.6
Food security	93	54.4
<b>Stunting Incident</b>		
Stunting	57	33.33
Normal	114	66.67
Total	171	100

Table 3 shows that the factors that have a significant risk of stunting are protein and fat, household food security, mother's education and occupation and family income. The risk factor with the highest OR is household food security where children with food insecure households have a 4.706 times greater risk of experiencing stunting compared to food insecure households.

**Table 3. Risk Factors, Stunting and OR Value**

Risk Factor	Stunting Incident				Total	OR (CI 95%)
	Stunting		Normal			
	n	%	n	%		
<b>Carbohydrate intake</b>						
Less	8	14.0	44	38.6	52	0.260 (0.112-6.00)
Enough	49	86.0	70	61.4	119	
<b>Protein Intake</b>						
Less	32	56.1	39	34.2	71	2.462 (1.284 – 4.718)
Enough	25	43.9	75	65.8	100	
<b>Fat Intake</b>						
Less	29	50.9	36	31.6	65	2.244(1.169 – 4.309)
Enough	28	49.1	78	68.4	106	
<b>Education Mothers</b>						
Low	40	70.2	53	46.5	93	2.708(1.377 – 5.326)
High	17	29.8	61	53.5	78	
<b>Mother's Job</b>						
Working	34	59.6	34	29.8	68	

Risk Factor	Stunting Incident				Total	OR (CI 95%)
	Stunting		Normal			
	n	%	n	%		
Not Working	23	40.4	80	70.2	103	3.478(1.790 – 6.757)
<b>Family Income</b>						
Low	34	59.6	37	32.5	67	3.076(1.592 – 5.944)
High	23	40.4	77	67.5	104	
<b>Household Food Security</b>						
Food Insecurity	40	70.2	38	33.3	78	4.706(2.365 – 5.365)
Food security	17	29.8	76	66.7	93	
Total	57	100	114	100	171	

#### 4. Discussion

Protein is a nutrient needed by the body for growth, building body structure (muscle, skin, and bone) and as a substitute for worn out tissue. Protein is one of the macronutrients that functions as a building block, maintains cells and body tissues and helps in the metabolism of a person's immune system (6). Based on the results of statistical tests in this study, it showed that protein intake was a risk factor for stunting with an OR value of 2.462. This shows that children with low protein intake have a 2.462 times greater risk of experiencing stunting. Protein has a very important influence on growth, in general the function of protein is for growth, the formation of structural components and the formation of antibodies. Syifa's research (2016) stated the same thing that protein intake is a risk factor for stunting in children aged 1-3 years (7). Children with low protein intake have a risk of 1.71 times more risk of stunting (95% CI 1.30-2.26).

Fat is a structural component of all body cells that are needed for body physiology. Fats consist of triglycerides, phospholipids and sterols, each of which has a specific function for human health (8). Fat intake during growth functions for the development of body cells. Fat nutrients play a role in transporting fat-soluble vitamins that the body needs. Therefore fat is one of the growth factors (9). Based on the results of statistical tests in this study, it showed that dietary fat intake was a risk factor for stunting with an OR value of 2.244. This shows that children with low fat intake have a 2,244 times greater risk of experiencing stunting. This is in line with Azmy's research (2018), which states that the less fat consumption, the 1.7 times greater risk of experiencing stunting (95% CI 0.52-5.26) (10). This study is also in line with Haya (2016), showing that children with normal nutritional status are 65% with sufficient fat intake, while children who are stunted are 83.1% with less fat intake (11). Children whose fat adequacy level is less likely to be stunted are 7.65 times compared to children whose fat adequacy level is good.

Children of mothers who have low educational background can cause stunting. This is in line with the opinion of Suhardjo (2003), which states that the low level of maternal education is closely related to the level of knowledge of health care and awareness of the health and nutrition of children and their families. Higher education levels are expected to have better knowledge or information about nutrition (12). The level of education also determines whether or not a person easily absorbs and understands the nutritional knowledge they acquire. This can be used as a basis for distinguishing appropriate extension methods. From the importance of family nutrition, education is needed so that someone is more responsive to nutritional problems in the family and can take action as soon as possible. Mothers who can guide children on how to eat healthy and nutritious food will improve the nutritional status of children. The level of education will affect the health and welfare of children, because this cannot be separated from the nutritional status of children. Mothers with a high level of education will have a clearer opportunity to absorb information when compared to mothers who are less or uneducated (13). The results in this study indicate that maternal education is a risk factor for stunting in school children. Based on the results of statistical tests, obtained OR is 2.708. This shows that children whose mothers have low education have a 2.708 times greater risk of suffering from stunting compared to children whose mothers have higher education.

Mother's work can affect the nutritional status of the family, especially children under five and school age. If a mother works from morning to evening, it will result in wasted time for the child and his family, lack of time devoted to paying attention to the child both in caring for, nurturing and providing food for the child. Working

mothers have a dual role, namely as housewives and working women. However, the mother has the responsibility to take care of the household. This can have an impact on the health condition of the family, especially the nutritional state of children under five, school-aged children and other family members. Mothers do not have enough time to pay attention to children's food (14). The results in this study indicate that the mother's occupation is a risk factor for the incidence of stunting in school children. Based on the results of statistical tests, obtained OR is 3,478. This shows that children whose mothers work are 3,478 times more likely to suffer from stunting compared to children whose mothers do not work.

Family income greatly affects daily food consumption. If the income is low, the food consumed does not consider the nutritional value, but the material value will be taken into consideration. Low family income is a problem that interacts with the emergence of malnutrition problems (15). An increase in family income will increase the opportunity to buy food with better quality and quantity, on the contrary, a decrease in income will cause a decrease in food purchasing power, both in quality and quantity (16). Family food consumption is influenced by family purchasing power in addition to parents' eating habits and parental knowledge (17).

Children from food insecure households can cause stunting(18). Food insecurity has consequences for decreasing nutritional status and public health (19). The main indicator of deteriorating nutritional and health conditions is the increase in cases of malnutrition in the community. Household food security is an indirect factor that affects the nutritional status of children under five(20). Children who come from poor families are very vulnerable to malnutrition. These children tend to consume less energy and protein than children from rich families. However, children under five in the study area are generally the first priority in the distribution of food in the family, so that economic conditions and the level of household food security are thought to have little influence on changes in food consumption and nutritional status of children under five (21).

Food insecurity in the family in the long term can affect food consumption by reducing the quantity and quality of food for all family members, especially toddlers continuously, resulting in insufficient nutrition needed by the body and negatively impacting the growth of toddlers, especially height (22). This study shows that household food security is a risk factor for stunting in school children. Based on the results of statistical tests, the OR is 4.706. This shows that children in food insecure households have a 4.706 times greater risk of suffering from stunting compared to children in food insecure households. This is in line with Nagari and Nindya's research (2017), which states that there is a significant relationship between household food security status and children's nutritional status ( $p = 0.010$ ) (23). Hadley et al (2017) research, which states that food insecure households are 2.29 times (95% CI 1.00-5.25) more at risk for stunting (24). Research by Thamilini, et al (2015) states that food insecure households are 1.55 times greater at risk of stunting in children than food insecure households (25).

## **5. Conclusion**

Factors that have a significant risk of stunting are protein and fat, household food security, mother's education and occupation and family income. The risk factor with the highest OR is household food security where children with food insecure households have a 4.706 times greater risk of experiencing stunting compared to food insecure households.

**Funding:** None

**Acknowledgments:** The author would like to thank the Lurah Poboya and SD Poboya for their permission and assistance in carrying out the research.

**Conflicts of Interest:** The authors declare no conflict of interest.

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