

## Risk Factor Analysis of Family Characteristics and Health History of Children Under Five on The Incidence of Stunting in Sidenreng Rappang, South Sulawesi, Indonesia

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### ABSTRACT

**Background:** Stunting was one of the global nutritional problems that are still widely found, especially in developing countries. In Asia, 87 million children were stunted. This study aimed to look at the risk of family characteristics and health history on the incidence of stunting.

**Subjects dan Method:** This was a case-control study conducted in the Sidenreng Rappang district. The dependent variables were family characteristics consisting of maternal education and household members and health history consisting of LBW and infectious diseases. The independent variable was stunting. The target population in this study was all stunting toddlers in the district based on data from the 2019 statistical agency report. The sample selection technique was simple random sampling. The case samples obtained was 51 respondents and the control was 51 respondents so the total sample was 102 respondents. The data were using a questionnaire as a variable measuring instrument. The data were analyzed using logistic regression.

**Results:** We found toddlers from mothers with low education are more at risk of stunting than those with higher education (OR= 2.89; CI= 1.24 to 6.74; p=0.022). Toddlers who live with more than 4 family members were more at risk of stunting than 4 people or less (OR= 0.63; CI= 0.23 to 1.87; p=0.596). Toddlers with low birth weight were more at risk of stunting than those with normal birth weight (OR= 10.44; CI= 3.28 to 33.30; p=0.000). Toddlers with a history of infection were more at risk of stunting than those without a history of infection (OR= 2.50; CI= 1.10 to 5.64; p=0.043).

**Conclusion:** The highest risk factor for stunting is the low birth weight factor.

**Keywords:** stunting, mother's education, LBW, infection history

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### Cite this as:

Sulaiman Z, Febrianti D, Said S, Adri K (2021). Risk Factor Analysis of Family Characteristics and Health History of Children Under Five on The Incidence of Stunting in Sidenreng Rappang. *J Epidemiol Public Health*. 06(03): 291-298. <https://doi.org/10.26911/jepublichealth.2021.06.03.03>.



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### BACKGROUND

The three main indicators used to define malnutrition, namely, stunting, underweight, and wasting, the three indicators represent different nutritional problems for children as measured by the index of height for age, weight for height, and weight for

age. The Lancet said that pregnant women and children who have malnutrition have a strong association with stunting at the age of two years and have long-term consequences (Cruz et al., 2017). Stunting was a chronic malnutrition problem caused by inadequate nutritional intake for a long

time due to feeding that is not following nutritional needs (Millennium Challenge Account Indonesia, 2013; Owino et al., 2016). Stunting was defined as a condition where height is at  $\leq -2.0$  height-for-age z-score (Mahmudiono et al., 2017).

In 2016, 22.9 percent or 154.8 million children under the age of 5 years were reported to be stunted worldwide, while in Asia alone 87 million children were stunted (UNICEF, 2020). Indonesia were the fifth largest stunting country in the world, according to the 2013 Basic Health Research, of 37.2% (nearly 9 million) under five, there are 29.6% are stunted. (UNICEF, 2020). According to the Ministry of Health's 2020 performance report, the number of stunting cases in South Sulawesi was 34.8% (Kemenkes, 2021). Based on the 2019 Central Statistics Agency report, the stunting prevalence in Sidenreng Rappang district was 26.10% (BPS, 2019).

Special nutrition intervention efforts for toddlers were focused on the first 1000 days of life (DOL) group, namely pregnant women, breastfeeding mothers, and children 0-23 months because the most effective prevention of growth and development delays occurs in 1000 (DOL) (Agosti et al., 2017). Negative Results Possible impacts Nutritional problems in the short term were disorders of brain development, intelligence, growth disorders, and metabolic disorders of the body. In the long term, the dire consequences are cognitive decline and learning, decreased immunity leading to illness, and a high risk of diabetes, obesity, cardiovascular disease, cancer, stroke, and disability in old age and uncompetitive quality. Work causes low economic productivity. The 1000 DOL period was 270 days during pregnancy and 730 days when the baby was born for the first time (Kemenkes RI, 2018). A recent longitudinal study of children from Brazil,

Guatemala, the Philippines, India, and South Africa showed that growth retardation were associated with early school dropout, with adults stunting under 2 years, a year earlier than those who did not grow retardation (Kemenkes RI, 2018). Chronic malnutrition (stunting) was not caused by one factor alone but is caused by many factors, where these factors are interrelated. Three main factors cause growth retardation, namely (Fu et al., 2017): 1) imbalanced food intake (based on the nutrient content in the diet namely carbohydrates, proteins, fats, minerals, vitamins, and water), 2) past low birth weight (LBW) and 3) medical. In general, the causes of growth retardation can be divided into 3 levels, namely community, household (family), individual level. At the city level, the economic system, the education system, the health and sanitation system, and the drinking water system are factors that cause stunted growth. Inadequate food quality and quantity, income level, number and structure of family members, inadequate child care, inadequate health care, and inadequate sanitation and drinking water are factors that cause stunted growth. These factors occur because of the p-factor. This study aimed to look at the risk of family characteristics and health history on the incidence of stunting.

## SUBJECTS AND METHOD

### 1. Study Design

This was a case-control study. This study was carried out in Sidenreng Rappang Regency in 2021.

### 2. Population and Sample

The target population in this study was all stunting toddlers in the Sidenreng Rappang district based on data from the 2019 statistical agency report. The sample selection technique was simple random sampling. The withdrawal of the number of control

samples in this study used the Lemeshow formula (1997). The number of case samples obtained was 51 respondents so that the control sample was also 51 people and the total sample used was 102 respondents.

### 3. Study Variables

The dependent variable was family characteristics consisting of maternal education and household members and health history consisting of a history of low birth weight and a history of infectious diseases. The independent variable was stunting.

### 4. Operational Definition of Variables

Stunting in this study was a condition experienced by toddlers when height measurements show at  $\leq -2.0$  height-for-age z-score. Maternal education was the level of formal education the mother has taken and received a graduation certificate. Household members in this study were the number of individuals who live permanently in one house. A history of LBW is a toddler's weight at birth below 2500 grams. The history of infection means that the toddler has been exposed to an infectious disease.

### 5. Study Instruments

The instruments used in this study were questionnaires and observation sheets. Stunting data and history of LBW were obtained based on records of Posyandu activities. Mother's education data is taken based on the mother's information as evidenced by a graduation certificate. Data on household members and history of infection are recorded based on the results of observations and information from respondents.

### 6. Data analysis

The data were analyzed using logistic regression model.

### 7. Research Ethics

Research ethical issues including informed consent, anonymity, and confidentiality, were addressed carefully during the study process.

## RESULTS

### 1. Univariate Analysis

The number of respondents in this study were 51 cases and 51 controls.

**Table 1. Frequencies of toddlers based on family characteristics and history of infection**

Variable	Frequency	Percentage
<b>Mother's education</b>		
Low	36	35.3
High	66	64.7
<b>Household member</b>		
more than 4	85	83.3
4 or less	17	16.7
<b>Low birth weight</b>		
LBW	28	27.5
Normal	74	72.5
<b>History of Infection</b>		
Yes	41	40.2
No	61	59.8

Table 1 shows the results of this study indicate that of the 102 respondents, there are 36 respondents (35.3%) with low education and 66 respondents (64.7%) with high education. Based on the number of household members, 85 respondents (83.3%) were more than 4 people and 17 respondents (16.7%) were 4 or fewer. There

are 28 respondents (27.5%) who have a history of low birth weight and 74 respondents (72.5%) who were born with normal weight. Based on the history of infectious diseases, there were 41 respondents (40.2%) who had been exposed to infectious diseases and 61 respondents (59.8%) who did not.

## 2. Bivariate Analysis

**Table 2. Correlation analysis of influencing factors on stunting (Chi Square Analysis)**

Variables	Sample				p
	Case		Control		
	n	%	n	%	
<b>Mother's education</b>					
Low	24	47.1	12	23.5	0.022
High	27	52.9	39	76.5	
<b>Household member</b>					
more than 4	41	80.4	44	86.3	0.596
4 or less	10	19.6	7	13.7	
<b>Low birth weight</b>					
LBW	24	47.1	4	7.8	0.000
Normal	27	52.9	47	92.2	
<b>History of Infection</b>					
Yes	26	51.0	15	29.4	0.043
No	25	49.0	36	70.6	

Table 2 shows that respondents who have mothers with low education are 24 (47.1%) respondents from the case group and 12 (23.5%) control groups, while respondents with higher education are 27 (52.9%) respondents from the case group and 39 (23.5%) from the control group, with  $p=0.022$ . It means that there is a significant correlation between mother's education and stunting. Respondents who have more than 4 household members are 41 (80.4%) respondents from the case group and 44 (86.3%) from control groups, while respondents who have 4 or less of household members are 10 (19.6%) respondents from the case group and 7 (13.7%) from the control group, with  $p=0.596$ , this means that there is no significant correlation

between mother's education and stunting. Respondents with LBW history are 24 (47.1%) respondents from the case group and 4 (7.8%) from control groups, while respondents without LBW history are 27 (52.9%) respondents from the case group and 47 (92.2%) from the control group, with  $p<0.001$ , this means that there is significant correlation between LBW History and stunting. Respondents with infection history are 26 (51.0%) respondents from the case group and 15 (29.4%) from control groups, while respondents without infection history are 25 (49.0%) respondents from the case group and 36 (70.6%) from the control group, with  $p=0.043$ , this means that there is a significant correlation between infection history and stunting.

### 3. Multivariate Analysis

**Table 3. Effect of Mother's education, Low birth weight, History of Infection with the Incidence of Stunting (Logistic Regression Analysis)**

Variable	OR	95% CI		p
		Lower limit	Upper limit	
Mother's education	2.89	1.24	6.74	0.022
Household Member	0.65	0.23	1.87	0.596
Low birth weight	10.44	3.28	33.30	0.000
History of Infection	2.50	1.11	5.64	0.043

Based on the results of risk analysis, it was found that the risk of stunting in mothers with low education was 2.89 times higher than those with high education (OR= 2.89; 95% CI= 1.24 to 6.74; p=0.022). Whereas for a household member, the household member that was more than 4 people were 0.65 times higher than those have 4 or less (OR= 0.65; 95%CI= 0.23 to 1.87; p= 0.596). LBW is 10.44 times more at risk than those born with normal weight (OR= 10.44; 95%CI= 3.28 to 33.30; p=0.000). Toddlers with a history of infection are at 2.50 times higher risk than those without a history of infection (OR= 2.50; 95%CI= 1.11 to 5.64; p=0.043).

### DISCUSSION

This study shows that there is a significant association between mother's education and the incidence of stunting (OR= 2.89; 95% CI= 1.24 to 6.74; p=0.022). These results are in line with research on the determinants of stunting in children in Indonesia which found that one of the determinants of stunting was low maternal education (Beal et al., 2018). Another study in Pakistan showed that mothers without formal education were more susceptible to nutritional disorders than those with formal education (Khan et al., 2019; Fadare et al., 2019). A mother's education can show her capacity in terms of knowledge. Avoiding stunting in children requires adequate knowledge. Fulfillment of nutrition from pregnancy to toddler age needs to

be supported by family knowledge and awareness. If a mother knows the importance of exclusive breastfeeding, then she will try to continue to maintain it until her child is 6 months old. on the other hand, if she does not know it, then there is no motivation to do it. A study conducted in Nigeria found that mother's knowledge had a positive effect on the nutritional status of children (Fadare et al., 2019). Therefore, the education of mothers or prospective mothers needs to be considered by all parties. For mothers with low education, increasing knowledge can be done by counseling and mentoring nutritional problems to prevent nutritional disorders in children, especially stunting.

Household member in this study had no significant effect on stunting with (OR= 0.65; 95%CI= 0.23 to 1.87; p=0.596). The results of this study show different results from research conducted on toddlers in Sumatra which shows that the dominant factor associated with stunting is household members (Oktarina and Sudiarti, 2014). Based on these results, we assume that household members do not have a direct influence on saturation, but can be the second factor that plays a role in the main factor. With these results, we suggest that there are further researchers who can investigate more deeply the influence of household members on stunting so that they can enrich scientific knowledge.

History of LBW had a significant effect on the incidence of stunting with

(OR= 10.44; 95%CI= 3.28 to 33.30;  $p < 0.001$ ). A study aimed to analyze risk factors and various nutrients associated with stunting among children aged 6–60 months, found that LBW is the main risk factor contributing to stunting and is strongly associated with low zinc levels (Febriani et al., 2020). Another study showed that LBW was a predictor of stunting in children aged 0-11 months (Sartika et al., 2021). Babies born with low birth weight have a very high risk of growth deficiency (Pawar et al., 2018). Low birth weight is an indication of nutritional deficiency in the baby while in the womb (Zhao et al., 2020). So that the appropriate intervention to deal with this problem must be maximized so that growth can return to normal. Babies born with low weight can cause growth disorders, especially during the first 1000 days of life which is an important period in the growth of toddlers. Starting from the age of 23 months of pregnancy, the baby's growth needs to be taken seriously because from that time on it can have an impact on the first 1,000 days of life (Petry et al., 2016). Therefore, stunting prevention can be carried out from gestational age, especially in terms of nutrition.

History of infection in this study had a significant effect on the incidence of stunting (OR= 2.50; 95%CI= 1.11 to 5.64;  $p = 0.043$ ). A studies have shown that the incidence of stunting is associated with diarrhea and acute respiratory distress in infants under five years old (Arini et al., 2020). An other study show Zika virus infection during pregnancy can have implications for growth disorders in the fetus (Yockey et al., 2018). Infectious diseases are one of the direct causes of growth retardation. The relationship between infectious diseases and food compliance cannot be separated. The presence of infectious

diseases will worsen the situation with insufficient food intake. Malnourished children are more prone to infectious diseases. Infectious diseases Children suffering from infectious diseases with a duration The longer the time, the greater the likelihood of being stunted. This infectious disease is usually characterized by decreased appetite and vomiting, so the young child's ingestion does not meet his needs. Conditions like these have bad effects on child growth.

Based on the results and discussion that we describe, it is concluded that the highest risk factor for stunting is the low birth weight factor. The limitation of this study lies in the variables studied are indirect factors that cause stunting. The main cause of stunting is nutritional deficiency. Therefore, research on the relationship of the variables that we studied with malnutrition can be studied further.

#### **FUNDING AND SPONSORSHIP**

This research is funded by the Ministry of Research and Technology of the Republic of Indonesia, with a novice lecturer research scheme in 2021.

#### **ACKNOWLEDGEMENT**

We are proud to be participating in the Journal of Epidemiology and Public Health.

#### **CONFLICT OF INTEREST**

We declare that there is no conflict of interest in the process of this research.

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