Health Dynamics
eISSN: 3006-5518
Publisher: Knowledge Dynamics
DOI: https://doi.org/10.33846/hd20206

Original Research

Logistic Regression Analysis of Risk Factors for Stunting Among Toddlers Aged 24-59 Months in Southeast Sulawesi, Indonesia

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Article history
Received: 8 January 2025
Revised: 25 February 2025
Accepted: 26 February 2025
Published Online: 28 February 2025

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How to cite this article: Fadmi FR, Mulyani S, Buton LD, Justin WOS, Riza Y. Logistic Regression Analysis of Risk Factors for Stunting Among Toddlers Aged 24-59 Months in Southeast Sulawesi, Indonesia. Health Dynamics, 2025, 2(2), 85-91. https://doi.org/10.33846/hd20206

ABSTRACT

Background: Stunting in toddlers is a health problem that can hinder human development globally.This condition has the potential to increase the number of stunting toddlers for toddlers under five years of age. The purpose of the study was to analyze the risk factors for stunting in toddlers under five during the pandemic. **Methods:** This research is an analytical survey of case-control study design with a 1:1 ratio selected using a simple random sampling technique source of data from primary and secondary data collection. Bivariate analysis was performed using Odds Ratio and chi-square tests, and multivariate analysis was performed using binary logistic regression. **Results:** The results showed that the variables that had risk factors for stunting were history of infectious disease (OR=5.769; p=0.004), low birth weight (LBW) (OR=4.444; p=0.017), history of exclusive breastfeeding (OR=4.552; p=0.010), family income (OR=6.314; p-value =0.004), knowledge (OR=3.818; p= 0.002) and the most dominant risk factor is family income. **Conclusion:** Important to reduce stunting cases through cross-sectoral collaboration regarding the modification of health services according to the socioeconomic level of the community.

Keywords: Stunting; toddlers; infection; breastfeeding; income

1. INTRODUCTION

Stunting is a major nutritional problem and is increasingly worrying, given the future relationship between stunting and the presence of non-communicable diseases. Currently, the trend of child stunting globally is increasing. Based on data from The Global Nutrition Report (2020), it is explained that almost a quarter of toddlers under five are stunted where the global pattern experiences gaps both within countries and between populations.(1) In Indonesia, the increasing number of stunted toddlers is generally caused by inappropriate food consumption patterns during which it has an impact on the emergence of various malnutrition.(2) Problematic food consumption patterns have an impact on

the emergence of various malnutrition, including stunting. This condition occurs due to an imbalance in nutritional intake, both deficiencies and excess nutrition, which can increase the risk of various diseases and increase the risk of death.[3,4] Various efforts can be carried out systematically to break the chain of stunting developments, however maximum efforts must continue to be made in order to be free from stunting. One of them can be done by early detection of the factors that cause stunting. This aims to carry out early prevention of potential stunting events in the future. Factors that influence stunting are knowledge of maternal nutrition, family income, history of infectious diseases, maternal parenting, immunization history, protein intake, and maternal intake.[5]

Public knowledge about stunting has low potential, because sociologically the culture of the people is still semi-traditional, where most of the people have very simple behavior patterns, both ways of thinking, speaking, and acting, although there are already quite advanced ones, especially in the Lemo village area, but the numbers are not yet significant. Judging from the aspect of public education, there are still many educated at the junior high and even elementary level with a very small number of graduates. The community's education climate has started to improve during the last five years when high school level schools began to enter the area, but at that age, of course, they have not been able to reduce people's understanding of health optimally. In addition, the family income factor is also suspected as a factor causing stunting. This is related to the nutritional intake of toddlers which cannot be met by the family due to economic limitations. Based on the results of an interview with a fisherman in the Lemo area, he stated that, as a fisherman, the community's income is relatively low, with an average of around one million three hundred thousand rupiah below the minimum wage per capita family income less than two million seven hundred fifty-two one hundred fifty-eight per month or fifty-five thousand four hundred and thirty-one. With this income, of course, it is very limited to support a family with more than three family members. This has implications for the fulfillment of toddlers's nutrition both during pregnancy and at the age of toddlers.

Fulfillment of balanced nutrition is very important for the growth and development of toddlers. The working area of Bone Rombo Health Center is an area that is vulnerable to the fulfillment of children's nutrition. This is because the community culture is still dominated by semi-traditional understanding that pays less attention to nutritional balance in toddlers. Therefore, this study aims to determine the factors of stunting in children aged 6-59 months and the dominant factors of stunting in the working area of Bone Rombo Health Center, Southeast Sulawesi Province using a dichotomous scale dependent variable (stunting and not stunting). Thus, this study will analyze the research data using the Logistic Regression statistical test. Logistic Regression Analysis is a regression test carried out in research if the dependent variable is dichotomous (with a minimum of 2 categories).[6] This Logistic Regression Analysis will be carried out to see the most dominant factors in influencing the incidence of stunting. In addition to being able to find out what factors have a significant influence, this ordinary logistic regression analysis can calculate the probability of an event or incident occurring, and this analysis can also be used to see the characteristics between 2 groups which are usually discussed in this case is the odds ratio.

2. METHODS

2.1 Study Design

The type of this research is this research is analytical survey research with a case control study design. The research will identify the case group and the control group and then retrospectively investigate the risk factors that might explain the incidence of exposure in the two groups.

2.2 Participants and Data Collection

The population of this study was all toddlers aged 24-59 months who experienced stunting, totaling 46 stunted toddlers and a control group of 122 non-stunted toddlers in the Bone Rombo Health Center work area, Southeast Sulawesi Province in 2022. Researchers obtained a sample of 62 samples with a case and control sample ratio of 1:1, by selecting 31 case groups and 31 control groups through a proportional random sampling technique.

2.3 Measurement and Statistical Analysis

The researchers categorized age into three categories, namely 24 to 36 months, 37 to 48 months and 49 to 59 months. Gender into male and female, the age

of the toddler's mother into 20 to 35 years and over 35 years, the education of the toddler's mother into four levels, namely elementary school, junior high school, high school and college level. While the occupation of the toddler's mother into unemployed, private or civil servant. Furthermore, the researchers categorized stunting in toddlers into stunting and not stunting; history of infectious diseases, low birth weight and history of exclusive breastfeeding into yes and no. Furthermore, family income and knowledge of the toddler's mother into low and high.

Data collection was carried out directly through interviews with mothers of toddlers one by one and from house to house using an instrument in the form of a questionnaire that was first given an explanation regarding the intent and purpose of data collection to obtain permission and willingness as respondents. Furthermore, the collected data were processed and analyzed descriptively for univariate and inferential analysis for bivariate analysis (chi square test) and multivariate (logistic regression).

2.4 Ethical Considerations

The Health Research Ethics Committee of Mandala Waluya University approved this research (dated: February 20, 2023, decision no. 002/KEP/UMW/II/2023, protocol no. 20022023002).

3. RESULTS

Most respondents are female of 53%, with an age range of 49 – 59 months 48.39%. While for mothers under five, 74.19% aged 20-35 years, with high school education level at 37.1% and not working or as housewives at 77.42%. Furthermore, the bivariate analysis aims to compare the case (stunting) and control (not stunting) groups, knowing the risk factors and causes. The results showed that respondents in the case group, 58.1% had a history of infectious diseases, 54.8% were born with low body weight (under 2.5 grams), 61.3% had no history of exclusive breastfeeding, and 80.7% had low family income and 67.7% insufficient knowledge of mothers. While respondents in the control group, 80.7% had no history of infection, 83.9% were born with normal weight (above 2.5 grams), 74.2% had a history of exclusive breastfeeding, 51.6% had high family income, and 64 5% of mother's knowledge is increased. The results of the statistical test of OR (odds ratio) show that all variables obtain an Odds Ratio (OR) value at the confidence interval (CI) = 95% more than 1 (Table 1). Thus, it can be concluded that a history of infectious disease, low birth weight (LBW), a history of exclusive breastfeeding, family income and mother's knowledge are risk factors for stunting in the Bone Rombo health centre work area.

Table 1. Bivariate analysis of stunting risk factors

Risk factors	Cases (%) n = 31	Control (%) n = 31	Total (%) n = 62	OR	CI 95% (LL – UL)	Sig.
History of infection disease						
Yes	18 (58.1)	6 (19.4)	24 (38.71)	5.769	1.843-18.064	0.004**
Not	13 (41.9)	25 (80.7)	38 (61.29)			
LBW						
Yes	25 (80.7)	15 (48.4)	40 (64.52)	4.444	1.427-13.839	0.017**
Not	6 (19.4)	16 (51.6)	22 (35.48)			
History of exclusive breastfeeding						
Not	19 (61.3)	8 (25.8)	27 (43.55)	4.552	1.544-13.424	0.010**
Yes	12 (38.7)	23 (74.2)	35 (56.45)			
Family income						
Low	17 (54.8)	5 (16.1)	22 (35.48)	6.314	1.921- 20.758	0.004**
High	14 (45.2)	26 (83.9)	40 (64.52)			
Mother knowledge						
Low	21 (67.7)	11 (35.5)	32 (51.61)	3.818	1.332-10.942	0.022**
High	10 (32.3)	20 (64.5)	30 (48.39)			

*Bivariate analysis using Chi-square test (p-value < α (0.05)
**Multivariate analysis using logistic regression (p < 0.25)

Furthermore, the candidate selection is carried out to determine the independent variables that are eligible to be included in the multivariate analysis using the Logistics Regression test using the "Enter" method with a significance value of <0.25. Table 1 shows that all independent variables have a significance value of <0.25, thus all independent variables are included in the multivariate analysis. The multivariate analysis results in Table 2 show the most dominant risk factor is family income. It is evidenced by the OR value of 16.628, its means that respondents with low family income is at risk of 16.628 times suffering from stunting than respondents with high family income. Furthermore, significant factors related to the incidence of stunting were low birth weight (p-value = 0.012), history of exclusive breastfeeding (p-value = 0.005) and family income (p-value = 0.006).

Table 2. Multivariate analysis risk factors for stunting

Risk Factors	P-value	Exp(B)	95% CI	
			Lower	Upper
History of infection disease	0.267	2.400	0.512	11.253
LBW	0.012**	9.791	1.665	57.576
History of breastfeeding exclusive	0.005**	8.823	1.897	41.038
Family income	0.006**	16.628	2.222	124.440
Mother Knowledge	0.796	1.237	0.246	6.213
Constant	0.000	0.000		

** Statistically significant; p-value is based on multivariate analysis model using logistic regression

4. DISCUSSION

Lack of intake is closely related to the high incidence of infectious diseases because malnourished toddlers may experience a decrease in body resistance and the presence of contagious diseases causes toddlers to have no appetite. As a result, a shortage of food and drink enters the body so that toddlers suffer from malnutrition.[7] The results showed. Based on the study's results, 58.1% of toddlers had a history of infectious diseases in the case group. Because some toddlers did not have complete immunization status in their MCH book, the risk of suffering from contagious diseases was greater. According to the theory that the effort to gain immunity against infectious diseases is by immunizing, this immunization is a form of health intervention in the national health system that effectively reduces under-five mortality. In addition, there are still many people, especially mothers, who ignore the prevention of infectious diseases that can attack toddlers because they focus on diseases that are currently spreading such as Covid-19.[8] According to previous research, toddlers who suffer from infectious diseases are at higher risk of stunting. It is because toddlers' nutritional intake is not met and they experience decreased nutrition which will eventually make them susceptible to stunting.[9]

The analysis results show that 19.7% of toddlers under five who are stunted but have an average birth weight or do not have low birth weight. It is due to the attitude of fulfilling certain nutrients during growth that parents cannot adequately do. 48.4% of toddlers under five do not experience stunting but have low birth weight (LBW) or are at risk because of LBW conditions is because toddlers get enough intake during their growth and development. Toddlers with a history of low birth weight will experience impaired growth and development and decreased intellectual function.[10] In addition, LBW caused by poor maternal nutrition and infectious diseases will be more susceptible to intrauterine growth retardation compared to developed countries.[11,12] The results of this study are consistent with revealing that LBW is the most dominant risk factor associated with stunting. Toddlers under five born with low birth weight are more at risk for stunting than toddlers born with average weight.[13,14]

Exclusive breastfeeding is a behavior that only provides breast milk to babies until they are six months old without giving other food and drinks except medicines.[15] Based on the relationship between exclusive breastfeeding and the incidence of stunting in toddlers in the Bone Rombo Health Center working area, 61,3% of respondents not gave exclusive breastfeeding. It is due to the habit factor of the people in the functional area of the Bone Rombo Health Center.

They tend to prioritize breastfeeding over formula milk, especially in the developing regions that have not been affected by the use of formula milk.[16] This study's results align with the statement that exclusive breastfeeding is a risk factor for stunting. Toddlers who are not exclusively breastfed are at risk of stunting compared to toddlers who are not exclusively breastfed.[17,18] Researchers determined that breastfeeding was limited or not at all on the growth and development of infants. The first 1000 days are at risk for stunting.[19,20]

Economic problems are one of the major impacts of the COVID-19 pandemic on society, such as many large and small companies that have finally had to close down, resulting in high layoffs and unemployment. This will directly affect family income.[21] Low or even no family income will make it difficult for parents to meet the nutritional needs of their families, especially their children.[22,23] The results showed that 64.52% of respondents had a low family income or an average income below the minimum wage. It is because the primary source of livelihood for most people in the Bone Rombo Health Center working area is dependent on nature, namely fishers and farmers with variable income sources. In addition, most mothers of toddlers under five work as housewives (IRT), so the primary source of family income comes from their husbands. The existence of the COVID-19 pandemic has made the economic condition of the community in the working area of the Bone Rombo Health Center worse. Another study revealed that families with incomes less than the minimum have a higher risk of toddlers with stunting than families with incomes more than the minimum wage. Household income is one of the most critical factors for stunting. Several research results in Bangladesh show that light and moderate food insecure families are more likely to have stunted toddlers than other families with sustainable food availability.[24,25]

Knowledge is a variety of symptoms encountered and obtained by humans through sensory observations. Knowledge arises when a person uses his senses or reason to recognize specific objects or events that have never been seen or felt before.[26] The results showed that 51.61% of respondents' parents, in this case, mothers of toddlers under five, had insufficient knowledge of the fulfilment of toddlers's nutrition. The inadequate knowledge of mothers is caused by the relatively low level of mother education. Most mothers of toddlers under five have an education level at the high school level, which is 37.10%. In addition, the low carrying capacity of the family causes the mother's activities to be limited in ensuring the nutritional needs of her child. The knowledge level is one factor that can indirectly affect the nutritional status of toddlers, including stunting, by first influencing the mother's behaviour.[27] Mothers with good knowledge will be able to make efforts to prevent and improve nutritional problems during the covid 19 pandemic. Knowledge will determine the mother's behaviour in providing the right type and amount of food so that her child can grow and develop optimally.[28,29]

The limitation of this study is that it uses logistic regression to find risk factors and dominant factors for stunting in toddlers, but does not calculate the probability of stunting occurring.

5. CONCLUSION

We found that stunting in toddlers is caused by a history of infectious diseases suffered by toddlers, a history of low birth weight, low family income and maternal knowledge about toddler nutrition and stunting. The most dominant risk factor for stunting is family income. Low family income is one of the consequences of COVID-19, and low income makes it difficult to obtain food with good nutritional quality. Low family income can affect the nutritional status of toddlers because most of their income is for consumption, not necessarily reflecting that what is eaten is good in terms of nutritional quality. Families with low income will buy food that is affordable and some expensive food prices tend not to be chosen or purchased so that the food served does not meet the required nutritional needs. Multisectoral collaboration is needed to overcome stunting during the COVID-19 pandemic and consider internet access as a form of maternal and child nutrition and health services.

Ethical Approval

The Health Research Ethics Committee of Mandala Waluya University approved this research (Decision no. 002/KEP/UMW/II/2023, protocol no. 20022023002).

Acknowledgement

The authors would like to thank all health workers at the Bone Rombo Health Center, Southeast Sulawesi Province and all respondents who were willing to participate without any coercion.

Competing Interests

All the authors declare that there are no conflicts of interest.

Funding Information

No funds were received for this study.

Underlying Data

Derived data supporting the findings of this study are available from the corresponding author on request.

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