History of birth weight and birth length as predictors of stunting in toddlers

Mimi Ruspita [1], Siti Harnina Bintari[2], RR Sri Ratna Rahayu[3], Eko Farida[4]

[1,3,4] Public Health Doctoral Study Program, Faculty of Medicine, Universitas Negeri Semarang

[2] Biology, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang

Corresponding author: mimiruspita74@student.unnes.ac.id

Abstract: Indonesia is still faced with nutritional problems in children under two years old. One of the nutritional problems currently is stunting. Children with a history of low birth weight and low birth length are potential factors influencing the incidence of stunting. This study aims to examine the risk of birth weight and birth length history with the incidence of stunting in toddlers. The research design used cross sectional with secondary data sources from nutritional status reports at the Community Health Center. The research sample consisted of 256 children under two years old from 3 Community Health Centers in Kendal Regency, Indonesia, which were divided into case groups and control groups, using cluster sampling techniques for regional samples and random sampling techniques for respondent samples. Bivariate data analysis used the chi-square test and multivariate data used the logistic regression test. The results of bivariate analysis show that there is a significant relationship between history of birth weight (p value = 0.000) and birth length (p value = 0.004) with the incidence of stunting in toddlers. Based on the results of multivariate analysis, it was found that a history of low birth weight was the most dominant risk factor associated with the incidence of stunting. The results of this research can be applied as a preventive measure, because history of birth weight and birth length can be use as stunting predictors in toddler's growth and development period.

Keywords: Birth weight; Birth lenght; Stunting

INTRODUCTION

Stunting is a problem of malnutrition in children that starts from the womb which can cause problems with the child's growth. Stunting is a condition of failure to growth and develop in toddler due to chronic malnutrition, especially in the first 1,000 days of life (Indonesian Health Ministry, 2018). Toddlers can be called stunted if their height are less than two standard deviations below the median child growth standard of the World Health Organization (WHO, 2014). Stunting begins when the child is in the womb and the impact appears after the child reaches two years old (Hamal et al., 2021). Stunting that occurs during infancy, if not treated immediately, will continue until school age or adolescence. The impact that can occur if a child experiences stunting in the long term can affect the immune system and result in death, the medium term impact can be a decrease in intelligence and school performance, and long term impacts such as low work capacity and risk of

obesity, degenerative diseases including hypertension, type 2 diabetes mellitus, and cardiovascular diseases (Nugraha et al., 2023).

Stunting is still commonly found in toddlers throughout the world. In 2021, there will be 149 million toddlers worldwide suffering from stunting and other health problems. More than half of toddlers who suffer from stunting live in Asia and Africa. However, the Asian continent only has a few countries with stunting prevalence above 30%, including India, Nepal, Laos and Indonesia (UNICEF, 2021). Indonesia was once the country with the third highest number of stunting cases in the Southeast Asia/South-East Asia Regional (SEAR) region in 2017 (WHO, 2018). The Indonesian Nutrition Status Survey (SSGI) recorded a reduction in the prevalence of stunting from 24.4% in 2021 to 21.6% in 2022 (Indonesia Health Ministry, 2022). However, this prevalence is still high when compared to the threshold set by WHO about 20% (Nair et al., 2017). More specifically, in the Central Java Province region in 2022, the prevalence of stunting will reach 20.8%, so it can be concluded that on average districts/cities in Central Java are still facing stunting problems. One of the districts/cities in Central Java Province, namely Kendal Regency, is ranked 8th lowest in stunting prevalence according to SGGI in 2022 in Central Java (Central Java Health Office, 2023). The stunting prevalence rate in Kendal Regency will continue to be reduced until it reaches the national target of 14% (Kendal Health Office, 2023). Based on prevalence of stunting which still high, needed efforts to prevent stunting in toddlers.

One effort to prevent stunting in toddlers is to know the risk factors for stunting, so that they can be treated as soon as possible. Several risk factors that influence the incidence of stunting include maternal employment and chronic diseases, sanitation, exclusive breastfeeding, birth weight, birth length, birth spacing, gestational age, maternal nutritional status and maternal parity (Lewa et al., 2020). Factors that influence stunting begin before pregnancy, during pregnancy and after birth. Factors before and during pregnancy are influenced by the mother's poor nutritional status which causes the mother's nutritional needs are not met, resulting in the risk of giving birth to a baby with a history of low birth weight (LBW) and low birth length due to intrauterine growth retardation (Hamal et al., 2021). Low birth weight (LBW) babies are the strongest predictor of stunting in children (Swathma et al., 2016). Toddlers with low birth weight have a risk of experiencing stunting compared to toddlers who have normal birth weight (Andini et al., 2020). Meanwhile, a history of low birth length in children can influence stunting because babies will experience growth faltering from an early age and pose a risk of ongoing growth disorders in the future, so that they are unable to achieve optimal growth (Rahmadi, 2016).

WHO has set a goal to reduce the prevalence of stunting to 40% in 2025. To achieve this goal, it is very important to determine the relative importance of risk factors for stunting with appropriate interventions. Currently, most interventions begin to be implemented in late infancy and early childhood (Svefors et al., 2019). Considering that there are still many cases of stunting found in children under 2 years old, and the various impacts that can be caused by stunting, it is necessary to study risk factor analysis, especially the history of birth weight and birth length of babies as predictors of early stunting.

METHOD

This research uses a cross sectional research design. The population in this study were all toddlers aged 0-23 months in Kendal Regency, Indonesia, in April 2024. The sampling technique for the Community Health Center area used a cluster random sampling technique, so that the samples obtained were in the areas namely Kendal Community Health Center 2, Sukorejo Community Health Center 1 and Boja Community Health Center 1. Meanwhile for the sample of respondents using random sampling techniques, 256 respondents were obtained, divided into 2 groups, a case group of 128 respondents and a control group of 128 respondents. The independent variables of this research are birth weight and birth length of toddlers, while the dependent variable is the incidence of stunting in toddlers.

The data used in this research is secondary data, namely anthropometry (weight and body length of babies at birth) obtained from nutritional status reports. Interpretation of the data obtained Low Birth Weight (LBW) if the body weight is <2,500 grams at birth, and Normal if the body weight is ≥2,500 grams at birth. Meanwhile, it is Short if the body length at birth is <48 cm, and it is Normal if the body length at birth is ≥48 cm (Swathma et al., 2016). Data processing used the SPSS application (Statistical Product and Service Solutions) version 23. Data analysis used univariate analysis in the form of frequency distribution tables of respondent characteristics, bivariate with chi-square, and multivariate with logistic regression.

RESULTS

Table 1. Respondent Characteristics, Bivariate and Multivariate Test Results

Variables	Category	Stunting Incident				*P-Value	Beta Coefficient	**OR (CI:95%)	**P-Value
		Stunting (Case)		Non-Stunting (Control)					
		n	%	n	%				
Gender	Man	83	64.8	72	56.3	0.160	-	-	-
	Woman	45	35.2	56	43.8				
Toddler Age	0-12 months	28	21.9	38	29.7	0.153	-	-	-
	13-23 months	100	78.1	90	70.3				
Birth Weight	< 2500 gr	22	17.2	3	2.3	0.000	1,897	6,669	0.004
	≥ 2500gr	106	82.8	125	97.3				
Birth Length	< 48 cm	26	20.3	10	7.8	0.004	0.643	1,902	0.134
	≥ 48 cm	102	79.7	118	92.2				

* Bivariate test result
**Multivariate test result

Based on Table 1, the number of male toddlers who experienced stunting was 83 toddlers (64.8%), while those who did not experience stunting were 72 toddlers (56.3%). The number of female toddlers who experienced stunting was 45 toddlers (35.2%), and those who did not experience stunting were 56 toddlers (43.8%). There were 28 toddlers (21.9%) aged 0-12 months who experienced stunting, while 38 toddlers (29.7%) did not experience stunting. Meanwhile, the age range of 13-23 months who experienced stunting is 100 toddlers (78.1%), while those who do not experience stunting are 90 toddlers (70.3%). Most of the stunted and non-stunted toddlers had a body weight of ≥ 2500 grams, with 106 stunted toddlers (82.8%) and 125 non-stunted toddlers (97.3%), while for birth weights < 2500 grams there were 22 stunted toddlers (17 .2%) and 2 non stunted toddlers (2.3%). The results of birth length findings for toddlers showed that birth length <48 cm were 26 stunted toddlers (20.3%) and 10 non-stunted toddlers (7.8%). Meanwhile, the history of body length ≥ 48 cm were 102 stunted toddlers (79.7%) and 118 non-stunted toddlers (92.2%).

Based on Table 1, the results of statistical bivariate analysis using chi-square test obtained P value = 0.000 < 0.05, so it can be concluded that there is a significant relationship between birth

weight with the incidence of stunting. The results of statistical bivariate analysis using chi-square test also obtained P value = 0.004 < 0.05, concluded that there is a significant relationship between birth body length with the incidence of stunting. Based on the results of the bivariate test, the independent variables history of birth weight and birth length had significant values that met the requirements for further analysis using a multivariate test with logistic regression test calculations. History of birth weight is the variable that has the greatest relationship to stunting in toddlers. This is based on the results of a multivariate analysis which shows that history of birth weight has P value closest to an alpha (α) value of <0.05, where history of birth weight has P value = 0.004, while maternal body length has P value = 0.134. The results of the multivariate analysis also be concluded that toddlers who have a history of birth weight < 2500 grams are 6,669 times risk of stunting compared to toddlers with a history of normal birth weight, and toddlers who have a history of birth length < 48 cm are 1,902 times risk of stunting compared to toddlers with a history of normal birth length, which can be seen through the Odd Ratio (OR) value.

DISCUSSION

Birth Weight as a Predictor of Stunting in Toddlers

Low birth weight is defined by WHO as a birth weight <2500 grams. Birth weight is determined by two processes, namely the length of pregnancy and the growth rate of the fetus. Newborn babies can have a birth weight < 2500 grams due to premature birth or birth small for gestational age (Swathma et al., 2016). Low birth weight is also associated with premature birth and intrauterine growth restriction. This can be a predisposing factor for achieving growth after birth (Halli et al., 2022). Children born with low birth weight in the future will have less anthropometric measurements in adulthood. Low birth weight babies accompanied by inadequate food consumption, inadequate health services, and frequent infections in children during the growth period cause stunted growth and produce stunted children (IFRI, 2000).

This research shows the results of statistical analysis of the chi-square test with P value = 0.000 < 0.05, so that there is a significant relationship between birth weight and the incidence of stunting. The results of this study are in accordance with research that children born with a low birth weight (<2500 grams) are more likely to experience stunting compared to children with a body weight ≥ 2500 grams at birth (Nshimyiryo et al., 2019)(Andin et al, 2020).

Likewise, the results of similar studies show that low birth weight influences stunting in children (Aryastami et al., 2017; Abbas et al., 2021).

Birth weight is a strong predictor of stunting in children aged 24 months (Esfarjani et al., 2013); Svefors et al., 2019). A study in Zimbabwe found that the growth of LBW babies lags far behind the growth of babies with normal weight with a significant difference in length seen at 12 months of age (Mbuya et al., 2010). A literature study in Bangladesh found that low birth weight is correlated with stunting in children under 2 years of age (Islam et al., 2020). The results of this study also showed that birth weight is the most influential factor in the incidence of stunting in toddlers, with a significance value of the logistic regression test P = 0.004. In addition, toddlers who have a history of birth weight <2500 grams are 6.669 times risk of stunting compared to toddlers with a history of normal birth weight.

Birth weight in toddlers can affect the incidence of stunting because since in the womb they have experienced intrauterine growth retardation (IUGR). Inhibited fetal growth is triggered by insufficient nutrition from the mother so that the baby lacks energy (Andini et al., 2020). In addition, babies who are born with low birth weight can also experience a disturbed digestive tract because it is not functioning properly, so they cannot absorb fat and digest protein properly. This condition can cause a lack of nutrient reserves, resulting in disrupted growth in toddlers who have low birth weight (Abdillah & Riski, 2020). Babies with low birth weight have inadequate nutrient reserves needed for height growth. Because the needs of babies increase with age, additional nutrients are needed to achieve normal height growth (Esfarjani et al., 2013).

Some toddlers in the study who were born with normal weight also experienced stunting, this can happen because if the toddler reaches the age of 6 months and above, the food given is not sufficient or the food consumed is inadequate, which can cause toddlers to experience nutritional deficiencies needed to go through their growth period. In addition, frequent infections, frequent infections during growth and not receiving good health care can result in stunted growth, increasing the risk of stunting (Karisma et al., 2022).

Birth Length as a Predictor of Stunting Incidence in Toddlers

Birth length describes the linear growth of the baby during pregnancy. Low linear measurements usually indicate a state of malnutrition due to a lack of energy and protein suffered in the past which began with fetal growth retardation. Inadequate maternal nutritional intake before pregnancy causes growth disorders in the fetus which can cause the baby to be born with a low

birth length (short). A baby who is born has a normal birth length if the baby's birth length is 48-52 cm (Swathma et al., 2016). Another study also stated that the average normal birth length is defined as the full length of a newborn baby measuring 19-20 inches or 49-50 centimeters. However, a length of around 18.5-20.9 inches or 47-53 centimeters is also considered a normal birth length (Jamshed et al., 2020).

This study shows the results of the chi-square test statistical analysis with P value of 0.004 <0.05, so there is a significant relationship between birth length with the incidence of stunting. The results of this study are in line with research conducted by Lewa et al (2020) and Hidayati (2021), that there is a relationship between birth length and the incidence of stunting. Other studies also show similar results, namely that the factor related to stunting is the baby's birth length. Measuring birth length is very important, so children who are born short must receive special treatment so that their body length can be corrected as soon as possible (Hadju & Maddeppungeng, 2020).

The results of this study did not show that birth length was a more influential predictor of stunting compared to birth weight, but several studies have shown that birth length is a strong predictor of linear growth status and stunting in the first 2 years of a child's life (Svefors et al., 2019; Krebs et al., 2022). This is also in accordance with a literature study in Bangladesh which found that low birth length was correlated with stunting in children under 2 years of age (Islam et al., 2020).

The short length of a baby's body at birth is influenced by malnutrition while still in the womb (Abdillah, 2022). Inadequate maternal nutritional intake during pregnancy results in impaired fetal growth. Disturbed fetal growth can result in babies being born with short body lengths. Disturbed fetal growth will also have an impact on growth at a later age due to malnutrition (Sumardilah et al, 2019). A birth length that is far below the normal birth average can be caused by growth retardation that has been experienced while in the womb. This condition causes toddlers with low birth lengths to be at greater risk of experiencing growth faltering (Illahi & Kurnia, 2017).

Several toddlers in the study were also born with normal body length, but experienced stunting, this can occur due to inadequate nutritional intake which results in growth faltering. Low nutritional intake accompanied by exposure to infectious diseases has an impact on the growth of these toddlers and will worsen growth faltering (Karisma et al., 2022). Children with low birth length can also survive longer than children born with normal body length. This condition emphasizes the

importance of adequate nutrition for the fetus during pregnancy to give birth to children with good nutritional status (Judiono et al., 2023).

CONCLUSION

History of birth weight and birth length are predictors of stunting events that can be done as an early preventive effort, where birth weight is the most influential factor. Therefore, by applying birth weight and birth length as predictors of stunting, health workers and families can provide more optimal nutritional needs and parenting patterns for toddlers as a future treatment for stunting.

Conflict of Interest

The author declares that there is no conflict of interest.

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