



CORRELATION BETWEEN BIRTH WEIGHT AND STUNTING IN CHILDREN UNDER FIVE: A CASE-CONTROL STUDY

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ABSTRACT

Stunting is a condition in which children experience delayed growth and development due to poor nutrition, recurrent infections, and inadequate psychosocial stimulation. The prevalence of children under 5 affected by stunting in 2020 is 22.3% or 148.1 million children worldwide. The analytical case-control study explored the prevalence of child stunting and determined the association between birth weight and stunting occurrence among children under 5 years. It shows statistically significant with a p-value of 0.009 (p-value < 0.05). A history of birth weight <2500 gr babies have a 3,660 times greater risk of experiencing stunting compared to children under 5 who were born with birth weight \geq 2500 gr (CI=95%). There was a significant association between birth weight and stunting incidence among children under 5 years.

Keywords: birth weight; stunting; children under five

Introduction

Child growth is internationally recognized as a reflection of a child's nutritional status. Childhood stunting refers to children who are too small for their age due to chronic or recurrent malnutrition. Stunting is a risk factor for infant mortality and an indicator of inequalities in human development. Children who are stunted fail to reach their physical and cognitive potential. Child stunting is one of the World Health Assembly's nutrition target indicators¹.

Stunting is a condition in which children experience delayed growth and development due to poor nutrition, recurrent infections, and inadequate psychosocial stimulation. Children are determined to be stunted if their height-for-age ratio is two standard deviations lower than the average of the WHO child growth standards².

About half of all passings in children under 5 are inferable to undernutrition; undernutrition puts children at a more prominent hazard of passing on from common contaminations, increases the

recurrence and seriousness of such contaminations, and delays recuperation. The prevalence of children under 5 affected by stunting in 2020 is 22.3% or 148.1 million children worldwide³.

Based on the results of the Ministry of Health's Indonesian Nutrition Survey, the prevalence of stunting among young children in 2020 was 26.9%. This means more than a quarter of Indonesian children experienced stunting this year. However, this value decreased by 2.5% in 2021 compared to 2020 to 24.4%. Based on the prevalence of stunting, the incidence of stunting in Indonesia remains a problem. This is because the prevalence in the country still exceeds the permissible value set by WHO (20%)⁴. The results of the 2021 Indonesian Nutritional Status survey show that 1 in 4 Indonesian children experience stunting or it is still at 24.4%, consisting of 5.4% severe and 19.0% moderate or 5.33 million children under five⁵.

Stunting occurs when the fetus is still in the womb and only appears when the child is two years old. Stunting describes a condition of malnutrition that has been going on for a long time and requires time for the child to develop and recover. The phenomenon of stunting can affect poor motor and mental development in childhood. early childhood, as well as poor cognitive achievement and school performance in later childhood⁶.

Low birth weight (LBW) has moreover been distinguished as a chance calculation for child dreariness and mortality, particularly among children under age five⁷⁻⁹. From meta-analysis, hindering children have IQ scores 2.14 times lower than children who are not hindering, and the comes about are factually noteworthy (aOR=2.14; 95% CI=1.14 to 4.01; p=0.02). It was concluded that hindering harmed children's cognitive capacities, which come about in a need of IQ¹⁰. Stunting has a very serious impact,

namely that it can hinder a child's physical and mental development, which of course requires special attention¹¹. This study aimed to analyze the correlation between history of birth weight and stunting incidence among children under five.

Methods

The analytical case-control study was conducted from January to March 2023 to explore the prevalence of child stunting and determine the association between birth weight and stunting occurrence among children under five years in Karangdadap District, Pekalongan Regency, Central Java Province, Indonesia.

The sample size was calculated using a formula with specified absolute precision¹² according to the following assumptions: Odds Ratio (OR) of stunting among children is 3,58¹³ with 95% confidence interval and 5% specified absolute precision. A stratified random sampling technique was employed to identify study subjects. The calculated sample size was at least 33. Also, approximately 10% was added to adjust for non-responses. Thus, the final sample size was at least 37 in each group. So, for the total number of respondents is 74 children under five.

Information was obtained by interviewing the study subjects the researcher and trained research assistants. The structured questionnaire comprised characteristics, birth weight, and stunting of study subjects, and it was modified and revised by the authors and the experts. Stunting was evaluated using length/height for age from the national standard¹⁴.

All participants were provided with written informed consent approved by the Ethics Committee of Poltekkes Kemenkes Semarang on December 30th, 2022, Number 0802/EA/KEPK/2022. Collected data were analyzed using the Chi-square test. It was carried out to determine the relation between

birth weight and stunting incidence. OR was also calculated to show the risk level of birth weight to stunting incidence.

Results and Discussion

The results of the analysis of the characteristics of respondents' mothers in Table 1 show that most of them have mothers aged 20-35 years old (60%). The study that was conducted in 2022 discovered the correlation between maternal age during pregnancy and the incidence of stunting that pregnant women under the age of 20 were at greater risk for stunting compared to women aged ≥ 20 years (OR 1.37 – 7.56). Women at a younger age were at greater risk of having stunting children¹⁵.

Table 1. Respondents Characteristics

Respondents Characteristics	Stunting				Total	
	Yes		No		n	%
	n	%	n	%		
Mother's age (years)						
<20 & >35	7	9,5	7	9,5	14	19,0
20-35	30	40,5	30	40,5	60	81,0
Mother's height (cm)						
<150	20	27,0	14	18,9	34	45,9
>150	17	23,0	23	32,2	40	54,1
Mother's Education						
Elementary	12	16,2	8	10,8	20	27,0
Middle School	12	16,2	11	14,9	23	31,1
High School	11	14,9	17	23,0	28	37,8
College	2	2,7	1	1,4	3	4,1
Mother's Work						
Housewife	21	28,4	18	24,3	39	52,7
Employee	16	21,6	19	25,7	35	47,3

The most stunted toddlers have mothers with a height less than 150 cm (27.0%). Meanwhile, toddlers who are not stunted are more likely to have parents with a height of more than 150 cm, 32.2%. Another maternal factor that can influence stunting rates is maternal height. The study conducted in 2022 showed a significant association between them ($p = 0.044$). The correlation between mother's height and child's linear growth is due to a combination of genetic factors and maternal environmental factors. Short mothers have lower protein and energy

reserves, smaller reproductive organs and narrower fetal development space, which affects the development of the fetus across the placenta and the development of the fetus. Infant development through the quantity and quality of breast milk. This pathology can lead to intrauterine growth retardation, which is also associated with short stature in children¹⁶.

In terms of characteristics based on education, it was found that children who were stunted mostly had mothers with elementary and middle school education, namely 16.2% each and 23.0% of children who were not stunted had mothers with high school education. Studies show that mothers with low education levels affect the risk of children under five years old being stunted by 3.01 times compared to mothers with higher education levels (aOR = 3.01; 95 CI % = 1.92 to 4.73), statistically significant ($p = 0.000$). The lower the mother's education level, the more impact it has on stunting development in children under five years old¹⁷.

In the case and control groups, most of the parents worked as housewives, namely 28.4% and 24.3%. Children of mothers who do not work are nearly twice as likely to be stunted as children of mothers who do not work (OR 1.84, 95% CI 1.05-3.23). Large differences in stunting were found across available care services: 4.444 Compared to children of non-working mothers, children of working mothers with nuclear family support were more likely to The risk of stunting was 4.5 times higher (OR 4.49, 95% CI 1.81-11.12), while no difference in rates was found for children of working mothers receive support from extended family (OR 0.69, 95% CI 0.30-1.59). Maternal employment was associated with a significantly increased risk of stunting among children in the slums studied. Because these effects appear to occur only in the absence of adequate family support, integrating appropriate childcare support for low-income urban working

mothers may be an effective strategy to reduce the incidence of chronic malnutrition among children in slums¹⁸.

Table 2. Correlation between Birth Weight to Stunting Incidence

Birth Weight (gr)	Stunting				P-value	OR
	yes		no			
	n	%	n	%		
<2500	20	69,0	9	31,0	0,009*	3,66
≥2500	17	37,8	28	62,2		

*chi-square test

Based on Table 2, children under 5 with a history of birth weight <2500 gr and experiencing stunting are 69.0%. It shows a significant p-value of 0.009 (p-value < 0.05) so there is a significant relationship between birth weight <2500 gr and the incidence of stunting. A history of birth weight <2500 gr babies have a 3.66 times greater risk of experiencing stunting compared to children under five who were born with birth weight ≥2500 gr (CI=95%).

This finding has the same result as the multivariate analysis that showed infants born with LBW were 1.74 times more likely to be stunted (95% CI 1.38–2.19) than those born with normal weight. Low birth weight is a predisposing factor to growth attainment after birth. LBW is related to preterm delivery, IUGR, or both. LBW was the most important and dominant risk factor. LBW is a factor that influences the achievement of infant growth and development after birth. Evidence also suggests that early growth retardation is associated with suboptimal cognitive development and stunted growth of internal organs can result in low cognitive abilities and an increased risk of chronic disease later in life¹⁹.

Based on 11 primary studies conducted in Brazil, Ethiopia, and Indonesia, it was shown that in a cross-sectional study, low birth weight can increase the rate of stunting in older children by 3.64 times from 0 to 60 months compared to children without PNP

(aOR = 3.64) ; 95% CI = 2.70) up to 4.90; p<0.001). Low birth weight increases the risk of stunting in children under 60 months of age²⁰.

The results from the other research show that the nutritional status factor with birth weight < 2,500 grams has a significant influence on the incidence of stunting in children and has a risk of experiencing stunting of 3.82 times. The impact of babies with low birth weight will last from generation to generation, children with LBW will have fewer anthropometric measurements during their development. Children with LBW who are accompanied by inadequate food consumption, inadequate health services, and frequent infections during the growth period will continue to result in stunted growth and produce stunted children^{21,22}.

Conclusion

There was a significant association between birth weight and stunting incidence among children under five years. A history of birth weight <2500 gr babies have a 3.66 times greater risk of experiencing stunting compared to children under five who were born with birth weight ≥2500 gr.

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