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Article

The Correlation Between Low Birth Weight And Stunting Incidence In Balet Baru Village, Sukowono District, Jember Regency

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Abstract: Stunting is an indicator of chronic nutritional disorders and is still a complex public health problem. One of the direct risk factors for stunting is Low Birth Weight (LBW). This study is an analytical observational study that aims to determine the correlation between the history of Low Birth Weight (LBW) and the incidence of stunting in toddlers. The research was carried out in Balet Baru Village, Sukowono District, Jember Regency. The population in this study were all children aged 6 months to 5 years who are recorded in the Maternal and Child Health (KIA) register in Balet Baru Village. The total number of research subjects was 168 toddlers in a case-control design. Bivariate analysis is used to determine the relationship between LBW history and stunting incidence using the Chi-Square test. The results of the analysis showed a *p-value* of 0.002 ($p < 0.05$), which means that there is a statistically significant correlation between the history of LBW and the incidence of stunting in children aged 6 months to 5 years. An *odds ratio* (OR) value of 4.640 shows that children with a history of LBW have a 4.64 times greater risk of stunting than children without a history of LBW.

Keywords: low birth weight; stunting; toddlers

1. Introduction

Stunting is an indicator of chronic nutritional disorders and is still a complex public health problem, both globally and in Indonesia. This condition is not only characterized by short posture, but also accompanied by impaired cognitive, motor, and metabolic development of the child. Stunting is indicated by having a height-for-age Z-score below -2 standard deviations. [1,2]. In Indonesia, stunting is a national priority issue because it contributes to the low quality of human resources and an increase in long-term health burden. According to WHO, the prevalence of stunting in Indonesia is ranked as the third highest country in South-East Asia.[3]. Based on data from the 2022 Indonesian Nutrition Status Study (SSGI), the prevalence of stunting under five nationally is 21.6%, while in East Java Province it is 17.7%. However, Jember Regency shows a much higher figure, which is 34.9%, placing it as an area with a significant stunting burden [4,5]. The decrease of stunting prevalence is targeted to be around 2.7% each year [6].

One of the direct risk factors for stunting is Low Birth Weight (LBW), which is a body weight of less than 2500 grams without taking into account gestational age. Low birth weight is closely related to early growth disorders, especially at 0–6 months of age, and is often the result of intrauterine growth disorders or premature birth. Babies with LBW tend to have breastfeeding problems, indigestion, and nutritional deficiencies that can have long-term impacts on growth and development, including a higher risk of stunting. In East Java Province, the prevalence of LBW in 2022 reached 4.1%, higher than the national figure of 3.3%, while in Jember Regency it was recorded at 5.2% of total births [7,8].

The high prevalence of stunting and LBW in Jember Regency, especially in Balet Baru Village, Sukowono District, shows that the existing interventions have not been running optimally. These problems not only reflect medical issues, but are also closely related to the social, economic, educational, and nutritional determinants of the mother before and during pregnancy. Although there have been many studies on the causes of stunting, there are still limited studies that specifically examine the relationship between the history of LBW and the incidence of stunting especially in areas with high prevalence rates such as Balet Baru. Sukowono has contributed as one of the villages with a high infant mortality rate (IMR) in Jember, whilst one of the causes of infant mortality is low birth weight. Therefore, this study is important to explain the relationship between LBW and stunting in the region and provide evidence-based intervention recommendations that can be used in efforts to address stunting more effectively and targeted.

2. Materials and Methods

This study is an analytical observational study using *a case-control* design that aims to determine the correlation between the history of Low Birth Weight (LBW) and the incidence of stunting in toddlers. The research was carried out in Balet Baru Village, Sukowono District, Jember Regency, in May 2025.

The population in this study were all children aged 6 months to 5 years who are recorded in the Maternal and Child Health (KIA) register in Balet Baru Village. The data source analysis has gone through validation, coding and tabulation. Sampling was carried out using a formula for determining sample size according to Dahlan (2016), and based on calculations, the minimum number of samples for each group was 30 [9]. In its implementation, the number of subjects in the case group was 42 children (total sampling), while the control group was 126 children with a ratio of 1:3 using consecutive sampling. Thus, the total number of research subjects was 168 toddlers.

Univariate analysis aims to describe the frequency and proportion distribution of each variable, while bivariate analysis is used to determine the relationship between LBW history and stunting incidence using the Chi-Square test. The significance level used was $p \leq 0.05$. If *the p-value* is less than or equal to 0.05, then it is stated that there is a significant correlation between independent and dependent variables.

3. Results and Discussion

3.1. Results

The results of data collection in this study were carried out in the working area of the Sukowono Public Health Centre, using secondary data from the results of the nutritional status examination of the Posyandu activity at Balet Baru Village of February 2025. The data collected included the child's gender, age, birth weight, and nutritional status. The total data obtained was 168 toddlers, which were grouped into 42 toddlers in the case group (stunting) and 126 toddlers in the control group (non-stunting).

The characteristics of the subjects (Table 1) based on age showed that in the stunting group, the majority age of stunted toddlers were 25–36 months and 37–48 months, each with 12 children (28.6%). In comparison, in the non-stunting group the toddlers' age were distributed almost evenly through age 13-60 months.

Table 1. Age characteristics of research subjects.

Age (months)	Stunting		Non-Stunting		Total	%
	N	%	N	%		
6-12	1	2.4	9	7.1	10	6.0
13-24	8	19.0	29	23.0	37	22.0
25-36	12	28.6	32	25.4	44	26.2
37-48	12	28.6	27	21.4	39	23.2
49-60	9	21.4	29	23.0	38	22.6
Total	42	100	126	100	168	100

Based on gender (Table 2), the trend shows similar conditions. In both groups (case and control groups) the gender was dominated (over 50%) by boys.

Table 2. Gender of Research Subjects

Gender	Case Group		Control Group		Total	%
	N	%	N	%		
Boy	24	57.1	68	54.0	92	54.8
Girl	18	42.9	58	46.0	76	45.2
Total	42	100	126	100.0	168	100

The distribution of LBW history (Table 3) shows that of the 42 children who were stunted, as many as 12 children (28.6%) had a history of LBW, while 30 children (71.4%) had no history of LBW. In the control group, only 10 children (7.9%) had a history of LBW, while 116 children (92.1%) had no such history. This shows that a higher proportion of LBW is found in the group of children with stunting.

Table 3. Frequency Distribution of Birth Weight and Bivariate analysis

Birth Weight	Case Group (Stunting)		Control Group (Non-Stunting)		Total	%
	N	%	N	%		
Low Birth Weight	12	28.6	10	7.9	22	13.1
Normal Weight	30	71.4	116	92.1	146	86.9
Total	42	100	126	100	168	100
OR			4.640			
p-value			0.002			

Bivariate analysis was performed using the Chi-Square test to test the correlation between LBW history and stunting incidence. The results of the analysis showed a *p-value* of 0.002 ($p < 0.05$), which means that there is a statistically significant correlation between the history of LBW and the incidence of stunting in children aged 6 months to 5 years in Balet Baru Village. An *odds ratio* (OR) value of 4.640 shows that children with a history of LBW have a 4.64 times greater risk of stunting than children without a history of LBW.

3.2. Discussion

The results of the study in Balet Baru Village, Sukowono District, showed that of the 168 children studied, there were 42 children who were stunted and 12 of them had a history of LBW (28.6%). Meanwhile, in the non-stunting group of children, only 10 children (7.9%) had a history of LBW. The results of the Chi Square test showed a

significant relationship between LBW and stunting incidence (p = 0.002) with an Odds Ratio (OR) value of 4.640. This means that children with a history of LBW have a 4.64 times greater risk of developing stunting compared to children who do not have a history of LBW.

The findings are in line with the results of a study in Zimbabwe that showed that babies with low birth weight had a 19% higher chance of stunting than babies with normal birth weight. Children with LBW generally have limited nutritional reserves and are prone to metabolic disorders, which can affect growth and development, as well as increase susceptibility to chronic diseases later in life. The risk increases if LBW babies are also born prematurely, because they have not experienced optimal organ maturation [10].

This study is in line with research by Putri et al. (2019) which states that there are 10 toddlers who have a history of LBW, consisting of 6 stunted toddlers and 4 normal toddlers. Toddlers with low birth weight but have a normal nutritional status may be caused by toddlers having sufficient energy and protein consumption and not having a history of chronic infectious diseases. On the other hand, LBW toddlers who experience stunting are known to have a deficit in energy consumption and have a history of chronic infectious diseases. If energy needs are not met to maintain metabolism, then to meet energy needs, they are obtained from fat and glycogen reserves in the muscles. If conditions like this occur for a long time, catabolism will occur which is useful for meeting energy needs. Hence, the impact of lack of energy consumption is growth disorders in children [11,12]

Low birth weight is also associated with long-term morbidity, including impaired weight and height growth, neuro-psychomotor developmental disorders, as well as an increased risk of non-communicable diseases such as obesity, hypertension, type 2 diabetes mellitus, and cardiovascular disease in adulthood. Therefore, LBW is an important indicator in early risk identification of stunting [13,14].

Stunting is a problem in the growth and development process of children that is caused by chronic nutritional problems and requires serious attention. There are two main aspects of direct causes of stunting, namely inadequate nutritional intake and recurrent infections. Babies with LBW can experience breastfeeding and indigestion disorders due to small, malfunctioning digestive organs, resulting in malnutrition and electrolyte imbalances. However, furthermore, the causes of stunting are multifactorial and complex, involving socioeconomic aspects of the family, environmental sanitation, caregiver education, and maternal and child health conditions before and after birth. [9,15,16,17].

One of the important prenatal factors that has been proven to contribute to the incidence of stunting is Low Birth Weight (LBW). Low birth weight is a condition of babies born with a body weight of less than 2,500 grams and is closely related to premature birth, intrauterine growth restriction (IUGR), or a combination of both. In developing countries such as Indonesia, the majority of LBW cases are often associated with IUGR. This intrauterine growth delay can result in disruption of the development of the child's organ system and metabolic system that continues into childhood and adulthood, including causing linear growth failure [18, 19].

However, not all studies found a consistent association between LBW and stunting. Research by Suyami et al. (2023) states that children with a history of LBW who get improved nutritional status in the first 6 months of life have the same growth opportunities as children born with normal weight. In other words, the effects of LBW on stunting can be minimized if good nutritional and environmental interventions are provided early in a child's life [20].

Low birth weight is closely related to stunting which can increase the risk of recurrent diarrhea (21). Factors that influence this are due to environmental factors (social), household factors, maternal and child factors (22). The maternal factor is caused by different perspectives regarding health programs and the experiences of each mother as well as the complexity of the economic role and educational background (23).

This research has several limitations. The study only assessed one risk variable (LBW) without examining other multifactorial factors that contribute to stunting. WHO groups the causes of stunting into household factors (e.g. maternal nutritional and health status, breastfeeding practices and MP-ASI, and environmental conditions), and socioeconomic aspects (access to health services, parental education, sanitation conditions, and local culture). The absence of an assessment of the short stature of the family is also one of the limitations in the interpretation of the data. To minimize the risk of bias, a diagnosis approach can be used that considers weight age < height age < chronological age, as well as monitoring height gain in the last three months.

Another possibility of potential bias is measurement bias in the measurement of height and birth weight of the toddlers. The research did not use primary data, therefore not knowing how the measurements had been done, and relied on the secondary data of the KIA records.

According to the discussion elaborated, a more comprehensive follow-up study is needed to identify the factors causing the high rate of stunting in Balet Baru Village more comprehensively. Future research should also use a longitudinal approach to evaluate the long-term effects of LBW on child growth and the effectiveness of early nutrition interventions.

4. Conclusions

The results showed a significant relationship between low birth weight (LBW) and the incidence of stunting in children aged 6 months to 5 years in Balet Baru Village, Sukowono District, Jember Regency, where children with a history of LBW had a 4.64 times greater risk of stunting than children without a history of LBW. These findings confirm the importance of monitoring child growth from an early age, especially in infants with LBW. Therefore, more attention is needed from health workers to this group through monitoring growth and development, nutritional counselling to mothers since pregnancy, and strengthening interventions in the First 1000 Days of Life, such as initial identification of LBW infants and follow up with targeted nutrition programs. Further research is also recommended to explore other factors that contribute to stunting more comprehensively to support comprehensive and sustainable prevention efforts.

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