

ORIGINAL ARTICLE

Association Between Birth Weight and Wasting in Children: A Case-Control Study

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ABSTRACT

Wasting is an acute malnutrition condition in children under five defined by WHZ <-2 SD. Low birth weight may increase wasting risk due to limited energy reserves and higher infection susceptibility. This study aimed to examine the relationship between birth weight and wasting among children aged 1–5 years in Genuk Primary Health Center, Semarang, Indonesia. This case-control study included 68 children aged 1–5 years in the Genuk Public Health Center area, Semarang, selected by total sampling. Birth weight data were obtained from MCH books/health records, while wasting status was determined using WHZ from e-PPGBM. The association was analyzed using Spearman correlation coefficient test. The mean WHZ-score in the wasting group was found -2.29, while the mean WHZ-score in the non-wasting group was -0.33. The analysis of the relationship between birth weight and wasting incidence showed a p-value of 0.023 (i.e., $p < 0.05$) and a Spearman correlation coefficient (r) of 0.275. Birth weight was found significantly associated with wasting among children aged 1–5 years in Genuk Public Health Center, Semarang, Indonesia, with a weak correlation.

Keywords: Low birth weight, wasting, under-five children, Indonesia

International Journal of Human and Health Sciences Vol. 10 No. 04 October'26

DOI: <https://doi.org/10.31344/ijhhs.v10i4.994>

INTRODUCTION

Wasting is an acute form of malnutrition in children under five years old, defined as a weight-for-height z-score (WHZ) below -2 standard deviations based on World Health Organization growth standards. This condition reflects rapid weight loss or failure to gain weight and is strongly associated with increased susceptibility to infection, impaired physical and cognitive development, and higher mortality risk¹. Therefore, wasting remains a critical public health problem that requires urgent prevention and early intervention, especially during the first five years of life, which is considered a

crucial period for growth and development². Globally, wasting continues to affect millions of children. Indonesia also faces persistent wasting prevalence, with national surveys reporting that wasting remains one of the major nutritional problems among children. Local monitoring in the working area of Genuk Primary Health Center, Semarang City, showed an increasing trend of wasting cases in late 2024, indicating the need for specific investigations of risk factors contributing to wasting in this area. Early identification of determinants is essential to reduce the burden of wasting and improve child health outcomes³.

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Birth weight is an important indicator of intrauterine growth and early nutritional status. Low birth weight (LBW), defined as birth weight less than 2500 grams, is associated with limited fat and muscle reserves, immature organ function, and weakened immune response, which may predispose children to nutritional deficiencies and infections during infancy and early childhood. Previous studies have shown that children with a history of LBW have a higher risk of developing wasting compared to children with normal birth weight. A study conducted in Martapura Timur reported a significant association between LBW and wasting among children aged 12–59 months⁴. Similarly, research in Palu City also found that birth weight was significantly related to wasting incidence among children under five⁵. These findings suggest that birth weight may play an important role in the development of acute malnutrition.

However, most previous studies investigating the relationship between birth weight and wasting were conducted in different regions and used cross-sectional designs, which may not adequately represent the nutritional context of Semarang City, particularly in Genuk Subdistrict. Moreover, there is limited evidence focusing on children aged 1–5 years in urban coastal areas such as Genuk, where socioeconomic and environmental factors may contribute differently to wasting risk. This gap highlights the need for local evidence to strengthen preventive strategies and support targeted interventions. This study supports previous findings by analyzing the association between birth weight and wasting using a case-control design, which provides a stronger approach for identifying risk factors. The novelty of this research lies in its focus on the Genuk Primary Health Center area, where wasting cases have increased, and its utilization of routine nutritional surveillance data from the Electronic Community-Based Nutrition Recording and Reporting system (e-PPGBM) combined with birth weight records from Maternal and Child Health (MCH) books.

Therefore, this study aimed to determine the association between birth weight and wasting among children aged 1–5 years in the working area of Genuk Primary Health Center, Semarang City, Indonesia. The findings are expected to provide evidence for strengthening maternal and child health programs, particularly in preventing low birth weight and reducing wasting prevalence.

METHODS

This study was an analytical observational study using a case-control design. The research was conducted in March 2026 in the working area of Genuk Primary Health Center, Semarang City, Central Java, Indonesia. The case-control approach was selected because it is suitable for identifying associations between risk factors and outcomes by comparing case (birth weight <2500 gram) and control groups (birth weight ≥2500 gram). The study population consisted of all children aged 1–5 years (12–59 months) registered in the working area of Genuk Primary Health Center during March, 2026. The sampling technique used was total sampling, where all eligible children who met the inclusion criteria were included. A total of 68 children were recruited, consisting of 34 children in the wasting group (case) and 34 children in the non-wasting group (control). The sample was determined using a 1:1 matching method, ensuring an equal number of cases and controls. The inclusion criteria in this study were children domiciled in the working area of Genuk Primary Health Center, children registered at Posyandu or Genuk Primary Health Center during the study period, children with complete birth weight data recorded in the Maternal and Child Health (MCH/KIA) book (for case low birth weight <2500 gram and for control sample normal birth weight ≥2500 gram), children with anthropometric records available in the Electronic Community-Based Nutrition Recording and Reporting System (e-PPGBM), and parents who were willing to participate. The exclusion criteria included children with genetic diseases affecting birth weight, children who were ill during anthropometric measurement, and children undergoing tuberculosis treatment. The independent variable was birth weight, categorized as low birth weight (LBW) <2500 g, normal birth weight 2500–4000 g, and high birth weight >4000 g. The dependent variable was wasting status, defined using the weight-for-height z-score (WHZ), where wasting was classified as WHZ -3 SD to <-2 SD and non-wasting as WHZ ≥-2 SD.

Birth weight data was collected from the Maternal and Child Health (MCH/KIA) book. Wasting status was determined using anthropometric measurement records (weight and height/length) obtained from e-PPGBM. Data collection was conducted across 25 Posyandu located in five villages within the

Genuk Primary Health Center area.

Statistical analyses included univariate and bivariate assessments using IBM SPSS Statistics for Windows, version 27 (IBM Corp., Armonk, NY, USA). Univariate analysis was conducted to describe respondent characteristics, wasting status, and birth weight distribution using frequency and percentage tables. Bivariate analysis was performed using the Spearman correlation test, as the variables were ordinal and did not meet parametric assumptions. Statistical significance was determined at $p < 0.05$, while the correlation coefficient (r) was interpreted to assess the strength and direction of the relationship⁶.

RESULTS

This study included 68 children aged 12–59 months, consisting of 34 children with wasting (case group) and 34 children without wasting (control group). Respondents were obtained from 25 Posyandu across five villages in the working area of Genuk Primary Health Center, Semarang City, Indonesia. Most wasting cases were found in Genuksari village. No differences were observed in respondent characteristics between the wasting and non-wasting groups including their sex, number of children in the family, maternal education, and maternal age ($p > 0.05$). The majority of children in both groups were male. Most mothers had secondary education (senior high school level) and were in the productive age group. These findings indicate that wasting in this population may not be strongly influenced by basic sociodemographic characteristics, suggesting that other factors such as birth weight may contribute more significantly to wasting incidence (Table 1). The mean WHZ-score in the wasting group was -2.29, while in the non-wasting group it was -0.33, showing a clear difference in nutritional status between both groups (Table 2). Most children had normal birth weight (92.6%), while 5.9% had low birth weight and 1.5% had high birth weight (Table 3). The Spearman correlation coefficient test showed a significant association between birth weight and wasting incidence ($p = 0.023$), with a weak positive correlation ($r = 0.275$). All children with low birth weight (100%) were classified as wasting, indicating that low birth weight may be an important early risk factor for acute malnutrition (Table 4).

Table 1: Sociodemographic characteristics of the respondents (N=68)

Variables	Wasting status				p-value
	Wasting (n=34)		Non- wasting (n=34)		
	Frequency	Percentage	Frequency	Percentage	
Gender of the child					0.804
Male	21	61.8	20	58.8	
Female	13	38.2	14	41.2	
Family planning status					0.582
No	8	23.5	10	29.4	
Yes	26	76.5	24	70.6	
Mothers' level of education					0.087
No formal education	-	-	1	2.9	
Low	13	38.2	6	17.6	
Medium	18	52.9	18	52.9	
High	3	8.8	9	26.5	
Mothers' age					0.287
Productive age	26	76.5	22	64.7	
Older age	8	23.5	12	35.3	

Chi-square test was applied to reach p-value.

Table 2. Wasting description of respondents

Nutritional status	Mean	SD	Median	Min.	Max.
Wasting	-2.29	0.56	-2.36	-2.94	-0.24
Non-wasting	-0.33	0.67	-0.30	-1.59	0.73

Table 3. Birth weight description of respondents (N=68)

Birth weight	Frequency	Percentage
Normal (2500-4000 gram)	63	92.6
Low (<2500 gram)	4	5.9
High (>4000 gram)	1	1.5

Table 4. Association between birth weight and wasting (N=68)

Birth weight	Wasting status		Total Frequency (Percentage)	r	p-value
	Wasting (n=34) Frequency (Percentage)	Non-wasting (n=34) Frequency (Percentage)			
Normal (2500-4000 gram)	30 (88.2)	33 (97.1)	63 (92.6)	0.275	0.023
Low (<2500 gram)	4 (11.8)	-	4 (5.9)		
High (>4000 gram)	-	1 (2.9)	1 (1.5)		

Spearman correlation coefficient test was done.

DISCUSSION

These findings address the research gap by providing local evidence from Genuk Subdistrict, where wasting cases have shown an increasing trend. The significant relationship supports the hypothesis that birth weight plays a role in wasting incidence among children aged 1–5 years.

The weak correlation suggests that although birth weight contributes to wasting, the condition is likely influenced by multiple factors⁵. However, the fact that all low birth weight children experienced wasting highlights the importance of early identification and nutritional monitoring for children born with low birth weight⁴.

This result supports previous studies conducted in other regions which reported that low birth weight children are more likely to develop wasting compared to children with normal birth weight⁷. The findings emphasize the benefit of strengthening maternal health interventions to prevent low birth weight, such as improving maternal nutritional status and ensuring adequate antenatal care. In addition, children with low birth weight should receive early growth monitoring and targeted nutritional support to prevent wasting during the toddler period.

CONCLUSION

This study concludes that birth weight is significantly associated with wasting among

children aged 1–5 years in the working area of Genuk Primary Health Center, Semarang City of Indonesia. The prevention of wasting among toddlers in the Genuk Primary Health Center area focuses on preventing low birth weight (LBW) through improving maternal nutritional status.

Acknowledgement: The author would like to express sincere gratitude to the Head of Genuk Primary Health Center, Semarang City, Indonesia, and all health staff for their sincere support during participant selection and data collection. The author also extends appreciation to all who participated and provided valuable information for this study. Their contribution was essential in completing this research.

Conflict of interest: There are no conflicts of interest related to this research.

Funding statement: This research not receive any financial support or funding from any institution or organization.

Ethical approval: This study has received ethical approval No. 681/XII/2025/Komisi Bioetik from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Islam Sultan Agung, Semarang, Indonesia.

Authors' contribution: All authors were equally involved in study design, participant selection, data collection, compilation and analysis as well as manuscript preparation, review, editing and final submission.

REFERENCES

1. Harding KL, Aguayo VM, Webb P. Factors associated with wasting among children under five years old in South Asia: implications for action. *PLoS One*. 2018;13(7):e0198749.
2. Kinyoki DK, Osgood-Zimmerman AE, Pickering BV, Schaeffer LE, Marczak LB, Lazzar-Atwood A, et al. Mapping child growth failure across low- and middle-income countries. *Nature*. 2020;577(7789):231-4.
3. UNICEF. Nutrition deprivation in early childhood: Child food poverty 2024. *Child Nutrition Report Brief*. New York: UNICEF; 2024.
4. Nabila NA, Widyastuti Hariati N, Pratiwi N. Relationship between toddler birth weight history, breastfeeding, and infections diseases in toddlers wasting age 12-59 months. *J Riset Pangan dan Gizi*. 2025;7(2):120-8.
5. Mulyati H, Mbali M, Bando H, Utami RP, Mananta O. Analisis faktor kejadian wasting pada anak balita 12-59 bulan di Puskesmas Bulili Kota Palu: studi cross sectional. *Aceh Nutr J*. 2021;6(2):111-7.
6. Abubakar R. Pengantar metodologi penelitian. Yogyakarta: SUKA-Press UIN Sunan Kalijaga; 2021.
7. Werdani AR. Hubungan BBLR dengan kekurangan gizi (wasting) pada anak usia 6-23 bulan. *J Ilmu Kedokteran dan Kesehatan Indonesia*. 2021;1(2):47-54.