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Low birth weight and low mother education as dominant risk factors of stunting children in Magelang Regency, Central Java

Berat badan lahir rendah dan rendahnya pendidikan ibu sebagai faktor risiko utama kejadian stunting pada anak di Kabupaten Magelang, Jawa Tengah

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Abstract

Stunting children are still highly prevalent in Indonesia, especially in Magelang Regency, a stunting locus area. Stunting risk factors were multifactorial and closely related to maternal health and education. The study aimed to analyze the relationship between low birth weight (LBW), mother education and other risk factors with Magelang Regency stunting. This study used a case-control design and involved 328 children aged 24-59 months. The stunting group was 162 children, and the normal group was 166 children. Nutritional status was measured using median z-score height for age from WHO anthropometric standard. Children's birth weight was obtained from Maternal and Child Health books records. Other socio-demographic characteristics were obtained through interviews with mothers. The bivariate association was analyzed using Chi-square with a 95% Confidence Interval (CI). Multivariate analysis was carried out using logistic regression. The result showed that children who had a low birth weight of 7,418 higher risked being stunted (p= 0,000), and low mother education of 1,604 higher risked to be had stunted children (p= 0,041). In conclusion, LBW and low mother education are Magelang's primary determinants of stunting.
Keywords: Low birth weight, mother education, stunting

Abstrak

Stunting anak masih sangat tinggi di Indonesia, khususnya di Kabupaten Magelang sebagai salah satu daerah lokus stunting. Faktor risiko stunting bersifat multifaktorial dan berkaitan erat dengan kesehatan dan pendidikan ibu. Penelitian bertujuan untuk menganalisis hubungan antara berat badan lahir rendah (BBLR), pendidikan ibu, dan faktor risiko lain dengan kejadian stunting di Kabupaten Magelang. Penelitian menggunakan desain kasus kontrol dan melibatkan 328 anak usia 24-59 bulan. Kelompok stunting sebanyak 162 anak dan kelompok normal sebanyak 166 anak. Status gizi diukur dengan menggunakan median *z-score* tinggi badan menurut umur dari standar antropometri WHO. Berat badan lahir anak diperoleh dari catatan buku Kesehatan Ibu dan Anak. Karakteristik sosio-demografis lainnya diperoleh dengan wawancara ibu. Asosiasi bivariat dianalisis menggunakan *Chi-square* pada 95% *Confidence Interval* (CI), sementara analisis multivariat menggunakan regresi logistik. Hasil penelitian menunjukkan bahwa anak dengan BBLR 7,418 berisiko lebih tinggi untuk mengalami stunting (p= 0,000), dan rendahnya tingkat pendidikan ibu 1,604 berisiko lebih tinggi untuk memiliki anak yang stunting (p= 0,041). Kesimpulan, berat badan lahir rendah (BBLR) dan rendahnya tingkat pendidikan ibu menjadi faktor risiko utama stunting.
Kata Kunci: Berat badan lahir, pendidikan ibu, stunting

Introduction

Globally, about 22% or 149,2 million children under five years around the world were stunted in 2020 (WHO, 2021). The prevalence of stunting in Indonesia as a middle-income country was 30,8% in 2018 (Kemenkes RI, 2018) and decreased slightly to 24,4% in 2021 (Kemenkes RI, 2021).

Child stunting has early and long-term consequences, including a high risk of mortality and morbidity, developmental problems, and impaired cognitive function. As adults, stunted children have an increased risk of developing a non-communicable disease like diabetes, hypertension, or dyslipidemia and are more susceptible to becoming overweight or obese when experiencing rapid weight gain. Some determinants of stunting have been studied for decades, including inadequate maternal nutrition, lack of nutrition during intrauterine pregnancy, and low birth weight (Al Rahmad et al., 2020; Soliman et al., 2021).

Early studies revealed that low birth weight had become a significant predictor for stunting children. Poor mother nutrition during gestation increases the risk of preterm birth, resulting in an undernutrition infant (Abbas et al., 2021; Aryastami et al., 2017). The UNICEF-WHO estimates that 1 in 7 babies have low birth weight globally. More than 20 million babies worldwide are at serious risk of stunting, a high mortality rate, and developmental problems (UNICEF & WHO, 2019). Determinants of low birth weight are multifactorial and include socio-demographic and biological factors. In developing countries, low birth weight is related to preterm birth and is caused by a lack of maternal health and nutrition. An infant's birth weight represents the fetus's and mother's nutritional status during gestation (Bansal et al., 2018; Miko & Al-Rahmad, 2017).

The Indonesian government struggles to reduce the prevalence of stunting by targeting 14% of cases in 2024. Determining the locus of stunting becomes an effort to centralize the program for reducing stunting. Magelang Regency is one of the stunting locus areas that need an optimization program to reduce stunting prevalence. Considering this condition, we aim to determine the association of low birth weight and other factors with stunting in Magelang Regency children aged 24-59 months.

Method

This study used a case-control design and involved 328 children aged 24-59 months. The children were divided into two groups: 162 stunting children as cases and 166 normal children as controls. Data were collected from August to November 2021 in eight areas of primary health facilities with a high prevalence of stunting in the Magelang Regency: Salam, Sawangan, Mungkid, Borobudur, Muntilan, Salaman, Tegalrejo, and Mertoyudan.

The children's height was measured by a multifunctional measuring instrument with 0,1 cm accuracy. The nutritional status of children was measured using the median z-score height for age from the WHO anthropometric standard. Children with median heights for their age below minus 2 of the median standard deviation (-2SD) were grouped as stunted children. Children's birth weight is the weight of a live infant recorded soon after birth deliveries, obtained from Maternal and Child Health records. Birth weight was noted in grams (g). Infants with birth weights less than or equal to 2500 g were grouped as having low birth weight, whereas infants with birth weights greater than or equal to 2500 g were grouped as having normal birth weight. Other socio-demographic characteristics were obtained through interviews with mothers.

Data were analyzed using SPSS 21 software. A bivariate association between low birth weight and other risk factors for stunting was analyzed using chi-square with a significance level of P 0.05 and 95% confidence interval (CI). Multivariable analysis was carried out using logistic regression. The multivariable logistic regression model included p-values less than 0,25 from the bivariate analysis. The strength of the association was determined by calculating the adjusted odds ratio (aOR) with 95% confidence intervals (CIs). A p-value less than 0,05 was considered statistically significant. The National Commission for Health Research Ethics at the Health Research and Development Agency agreed upon the research and has been approved under number LB.02.01/2/KE.352/2021.

Result and Discussion

The study results related to the characteristics of subjects based on the socio-demographics of

children aged 24-59 months and the characteristics of parents are presented in Table 1.

Overall, the majority (64,7%) was in the 36-59 months age group, with the numbers of boy and girl children being almost the same. Regarding parents' characteristics, approximately 48% of mothers graduated from senior high school, more than other levels of education, and so is for fathers (45,3%). Most mothers were unemployed (68%), while most fathers worked as housekeepers, domestic, and other helpers (38,7%).

Table 1. Children's and parent's socio-demographic characteristics (n=328)

Characteristic	n	%
Age		
24-35 months	116	35,3
36-59 months	212	64,7
Sex		
Boys	164	49,1
Girls	164	50,9
Mothers education		
No education	3	0,9
Graduate primary school	41	12,5
Graduate junior high school	98	29,9
Graduate senior high school	158	48
Graduate higher school	28	8,7
Fathers education		
No education	1	0,3
Graduate primary school	64	19,5
Graduate junior high school	87	26,5
Graduate senior high school	148	45,3
Graduate higher school	28	8,4
Mothers occupation		
Unemployed	223	68
Government employee	5	1,5
Farmer, fisher	2	0,6
Housekeeper, domestic and related helper	22	6,7
Private employee	29	9
Trader	45	13,7
Others	2	0,6
Fathers occupation		
Unemployed	1	0,3
Government employee	5	1,5
Farmer, fisher	11	3,2
Housekeeper, domestic and related helper	127	38,7
Private employee	66	20,1
Trader	116	35,8
Others	2	0,6

Table 2 summarizes the result of the Chi-square test. They are two variables that are significantly correlated to stunting. The variables include low birth weight (OR= 7,043 95% CI= 2,386-20,794) and low birth length (OR= 1,863 95% CI= 1,181-2,938). There were seven variables with a p-value of 0,25 in the bivariate analysis and included in the multivariate analysis. The results of the multivariate analysis in Table 3 shows that children with low birth weight had a higher possibility of being stunted (OR= 7,418; 95% CI= 2,498–22,028). Children with a mother with low education also tend to have more risk of stunting (OR= 1,604; 95% CI= 1,020-2,520).

Our result showed a significant relationship between a history of low birth weight (LBW) and the incidence of stunting (p= 0,000). Furthermore, the results of the multivariate analysis found that children aged 24-59 months with a history of LBW had a 7,418-fold higher risk of becoming stunted than children born with normal weight. Several previous studies in Indonesia found something similar to the findings in this study. In Banten Province, children under five years old born with LBW had a 3,12 times greater risk of experiencing stunting compared to children born with normal weight (Rahayu Diah Kusumawati et al., 2019). Meanwhile, in Makassar, South Sulawesi also found something similar: LBW is the main risk factor for stunting in children aged 6–60 months (Febriani et al., 2020). Some previous studies also agreed that LBW is a prominent factor that significantly affects stunting in children under five years (Podungge et al., 2021; Sartika et al., 2021; Wijayanti & Djuwita, 2020).

This finding is consistent with similar studies conducted in several countries where LBW is associated with stunting. The research in India stated that LBW is associated with stunting in preschool children (Halli et al., 2022). Several other studies found that one of the factors associated with stunting in children aged 0-23 months in Bangladesh and children aged 6-59 months in Northwest Ethiopia is LBW (Gonete et al., 2021; Mistry et al., 2019). Birth weight is an essential indicator of a baby's health. Babies with LBW are at risk for stunted growth, higher nutritional deficits, and death during the first year of life (Zoleko-Manego et al., 2021). When a child has a caloric intake deficit,

weight loss occurs, and when the deficit is chronic, there is a reduction in the rate of growth, which results in stunting (Bose, 2018).

Table 2. Bivariate analysis of low birth weight and another risk factor of stunting in children aged 24-59 months in Magelang Regency

Variables	Stunting		Normal		OR	p-value
	n	%	n	%	95% CI (Lower-Upper)	
Age						
24-35 months	57	35,2	59	35,5	0,985	0,519
36-59 months	105	64,8	107	64,5	(0,626 – 1,548)	
Sex						
Boy	78	48,1	86	51,8	0,864	0,290
Girl	84	51,9	80	48,2	(0,560 – 1,332)	
Low Birth Weight						
Yes	24	14,8	4	2,4	7,043	0,000*
No	138	85,2	162	97,6	(2,386 – 20,794)	
Low Birth Length						
Yes	71	43,8	49	29,5	1,863	0,005*
No	91	56,2	117	70,5	(1,181 – 2,938)	
Premature						
Yes	40	24,7	30	18,1	1,486	0,092[a]
No	122	75,3	136	81,9	(0,872 – 2,532)	
Basic Immunization						
Incomplete	21	13,0	24	14,5	0,881	0,408
Complete	141	87,0	142	85,5	(0,469 – 1,655)	
Advanced Immunization						
Incomplete	56	34,6	67	40,4	0,781	0,166[a]
Complete	106	65,4	99	59,6	(0,499 – 1,222)	
Early Initiation of Breastfeeding						
No	86	53,1	86	51,8	1,053	0,452
Yes	76	46,9	80	48,2	(0,682 – 1,624)	
Exclusive Breastfeeding						
No	46	28,4	48	71,1	1,026	0,507
Yes	116	71,6	118	28,9	(0,636 – 1,656)	
Given Complementary Food						
< 6 months	38	23,5	34	20,5	1,190	0,302
≥ 6 months	124	76,5	132	79,5	(0,705 – 2,008)	
Weaning						
< 6 months	15	9,3	17	10,2	0,89	0,455
≥ 6 months	147	90,7	149	89,8	(0,431 – 1,857)	
Mother as Primary Caregiver						
No	16	9,9	27	16,3	0,564	0,060[a]
Yes	146	90,1	139	83,7	(0,291 – 1,092)	
Mother Education						
Low	78	48,1	64	38,6	1,480	0,050[a]
High	84	51,9	102	61,4	(0,954 – 2,295)	
Father Education						
Low	84	51,9	69	41,8	1,498	0,088
High	78	48,1	96	58,2	(0,968 – 2,319)	
Father Occupation						
Unemployed	0	0	1	0,6	-	0,506
Employed	162	100	165	99,4		
Mother Occupation						
Unemployed	116	71,6	106	63,9	1,427	0,083[a]
Employed	46	28,4	60	36,1	(0,896 – 2,274)	

*p-values < 0,05 will be considered significant

[a]p-values < 0,25 will be included in the multivariate analysis

OR= Odds Ratio, CI= Confident Interval

Table 3. Multivariate analysis of low birth weight and other factors of stunting in children aged 24-59 months in Magelang Regency

Variables	First Model			Final Model		
	OR	p-value	95%CI	OR	p-value	95%CI
Low Birth Weight	5,655	0,003	1,777-18,001	7,418	0,000	2,498-22,028
Mother Education	1,501	0,117	0,904-2,491	1,604	0,041	1,020-2,520
Premature	1,424	0,210	0,820-2,472	-	-	-
Father Education	1,240	0,438	0,719-2,139	-	-	-
Mother Occupation	1,177	0,538	0,700-1,981	-	-	-
Low Birth Length	1,145	0,653	0,643-2,069	-	-	-
Advanced Immunization	0,672	0,104	0,416-1,085	-	-	-
Mother as Primary Caregiver	0,648	0,243	0,313-1,343	-	-	-

*p-values < 0,05 will be considered significant
[a]p-values < 0,25 will be included in the multivariate analysis
OR= Odds Ratio, CI= Confident Interval. Models were adjusted to covariates

Low-birth-weight babies need to get a balanced nutritional intake. However, sometimes this is not possible due to family socioeconomic limitations or a lack of knowledge or awareness on the mother's part, thereby increasing the risk of stunting. Previous studies found that children with LBW were born to families with low socioeconomic status and poor maternal health conditions (Abeway et al., 2018; Gonete et al., 2021; Mistry et al., 2019). Short-term effects of stunting include illness and death. In contrast, long-term effects include an increased risk of non-communicable diseases, poor development and learning in children, and less work productivity (Soliman et al., 2021). A previous study in rural Rwanda found that half of the children with low birth weights were more likely to have developmental delays. Stunting was the main predictor of developmental delay (Ahishakiye et al., 2019).

LBW can be reduced by increasing maternal nutrition and knowledge during pregnancy, resulting in a balanced nutritional intake to prevent infant stunting (Giyarsih et al., 2021; Rahayu Diah Kusumawati et al., 2019; Wijayanti & Djuwita, 2020). Furthermore, effective results in overcoming the stunting problem will be achieved if the intervention is conducted comprehensively at the community, household, and individual levels to support nutrition and child development (Mistry et al., 2019; Mulyaningsih et al., 2021; Rahmad et al., 2022).

Meanwhile, our study also revealed that maternal education significantly affected the incidence of stunting in children aged 24-59 months. Multivariate analysis found that lower mother education had a 1,604 times higher risk of causing stunting in children than higher mother education. This result was similar to the study conducted in East Java province, Indramayu district, and South Jakarta (Fauzi et al., 2020; Husnaniyah et al., 2020; Laksono & Megatsari, 2020; Utami et al., 2019). Contrastingly, a study in Siantan Hulu Public Health Service showed that a mother's education did not associate with the incidence of stunting in children aged 24-59 months (Mentari & Hermansyah, 2019).

The first 1000 days of life are critical to optimizing the foundation of growth, health, and brain development. This period needs balanced nutrition and parents' awareness of their children (Budiastutik & Nugraheni, 2018). To ensure her children get enough food, a mother must plan menus, go shopping, cook, and prepare food. In addition, mothers are expected to be able to provide food of the right type and amount so that children can grow and develop optimally (Husnaniyah et al., 2020).

Parent education is a substantial factor affecting the parenting method and the fulfillment of children's nutrition. The higher level of the mother's education positively impacts the family's eating habits so that the family's nutritional needs will be fulfilled. Mother's education level also affects how to capture and absorb information related to nutrition and children's health, so understanding of children's nutritional intake will also increase (Rachman et al., 2021).

A limitation that we have found in this study is that it was only conducted in 8 kecamatan out of a total of 21 kecamatan in Kabupaten Magelang. Therefore, our findings may not truly represent the entire population of the Magelang district.

Conclusion

In conclusion, the study revealed that children with LBW are more likely to develop stunting among children aged 24-59 months in Magelang Regency, Central Java, as one of Indonesia's most locus stunting areas. Mother education should also be provided before and during pregnancy, mainly in the first 1000 days of life, to prevent undernutrition in mother and child.

Therefore, efforts should be made at early marriage couples and for all women of childbearing age to increase understanding about the importance of maintaining nutritional status before pregnancy until delivery of healthy babies.

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