Determinant of Stunting in Children Under Five in West Java

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KEYWORDS

Stunting, Determinants; Children

ABSTRACT:

Introduction: Childhood stunting (short stature for age) continues to be a worldwide health issue as it heightens the chances of growth and developmental disruptions, along with increased mortality risk. The prevalence of stunting in West Java is 24.5%, with the fifth highest in Tasikmalaya. Nonetheless, there is limited study regarding the determinants of stunting in children in Tasikmalaya, West Java.

Objectives: To investigate the risk factors of stunting in children aged under five months in Tasikmalaya.

Methods: This cross-sectional study involved 173 children, collected consecutively, aged below 60 months, who visited the integrated health posts in 13 community health centers in Jamanis District, Tasikmalaya, from September to November 2016. Stunting is characterized as a height-for-age z-score (HAZ) that is two standard deviations below the norm established by the WHO, adjusted for sex. Statistical evaluations were performed using bivariate Chi-square tests and multivariate logistic regression analysis.

Results: Of 173 subjects, internal risk factor of stunting were low maternal education (AOR 2.88; 95%CI 1.10 to 7.55; P=0.013), birth order more than one (AOR 3.08; 95%CI 1.24 to 7.55; P<0.001), non-exclusive breastfeeding (AOR 9.92; 95%CI 1.89 to 52.51; P=0.041), and low birth weight (AOR 6.25; 95%CI 1.04 to 46.84; P=0.032) were strongly associated with stunting

Conclusions: Determinant of childhood stunting are low maternal education, birth order more than 1, non-exclusive breastfeeding, and low birth weight.

1. Introduction

Stunting represents a major nutritional challenge worldwide, especially in developing nations like Indonesia, where children experience persistent growth and developmental setbacks. Worldwide, one in four children under five years old suffers from stunted growth (UNICEF, 2019). The World Health Organization (WHO) defines stunting as a condition where toddlers fail to grow properly, which can be represented by a height z-score for age (TB / U) that falls below -2 standard deviations (WHO, 2019). In 2023, the rate of stunting in Indonesia was reported to be around 30%, with 21.5% classified

as short and 8.5% as very short. When the prevalence of stunting is 20% or above, it is regarded as a health issue that needs to be hand led promptly, making it a top priority for health development (Ministry of Health of the Republic Indonesia, 2023).

The rate of stunting among children under five in Indonesia fell from 27.7% in 2019 to 24.4% in 2021. Even so, the prevalence of stunting remains significantly above the government's target of 14% by 2024 (Litbangkes, 2021). Based on the 2019 Toddler Nutrition Status Study, the rate of stunting has reduced to 26.21%. However, the reduction in stunting rates in West Java from 2019 to 2021 is still under 2% (Riskesdas, 2019). Tasikmalaya is one of the city with highest prevalence of stunting in West Java. Based on monthly weighing report data for toddlers from the Tasikmalaya District Health Service, the prevalence of stunting cases in Tasikmalaya district over the last 3 years, namely in 2019 it was 16.27%, in 2020 it was 19.01%, and in 2021 it was 14.91% experiencing stunting (BPS Jawa Barat, 2021). There are 15 sub-districts that are special locations for stunting which have a high prevalence of stunted toddlers, namely the sub-districts of Cikatomas, Bojongasih, Culamega, Puspahiang, Salopa, Jatiwaras, Cineam, Singaparna, Cigalontang, Sariwangi, Cisayong, Sukahening, Rajapolah, Jamanis, and Sukaresik. In this study, we choose Jamanis as one of the special location with the highest number of stunting in Tasikmalaya.

Research on the risk factors associated with stunting in developing nations has produced varied outcomes and differences based on location. Consequently, the factors contributing to stunting continue to be unclear (Prawirohartono et al, 2016). A prior study indicated that high levels of household food insecurity and reduced socio-economic status significantly influenced the occurrence of stunting in Southeastern Kenya (Shinsugi et al, 2015). Furthermore, a separate study conducted in Nepal found that low family income and extended breastfeeding beyond 12 months were major contributors to stunting (Tiwari et al, 2014). Research conducted in India indicated that factors such as maternal education, age, and body mass index (BMI) were linked to stunting (Sk et al, 2021). As far as we know, there is a deficiency of national data regarding the factors that contribute to stunting in Indonesia.

Stunting in children in Indonesia necessitates preventive measures, including prompt action on potential risk factors. Therefore, recognizing these risk factors is essential for developing more effective intervention strategies. Internal risk factors encompass long-term malnutrition, restrictions in intrauterine growth (IUGR), lack of exclusive breastfeeding, and persistent infections. External factors include unimproved sanitation, unimproved water sources, low parental socioeconomic level, and large numbers of family members living in one household (Wicaksono et al, 2021). Therefore, to better understand stunting and the risk factors associated with stunting, we conducted this study among children under five in Jamanis District of Tasikmalaya.

2. Methods

This cross-sectional observational analytic study was conducted between February and April 2022. One hundred seventy three children ages 0 to 59 months who had participated in the growth monitoring program at integrated health posts run by the primary health care integrated service unit in Jamanis, Tasikmalaya, West Java, Indonesia, were included by purposive sampling. The study included children living in the district, residing with their parents, and having maternal and child health books (Buku Kesehatan Ibu dan Anak/ KIA), as well as health record cards (Kartu Menuju Sehat/KMS) issued by the Ministry of Health, Republic of Indonesia. The children's parents provided their written approval. Nevertheless, those with mental disorders, disabilities, infections, or other chronic conditions were not included.

Data of subjects were obtained from anthropometry measurements and interviews using questionnaires. Primary data were obtained to determine socio demographic items consisting of age, sex, highest level of education, and parity. The secondary information was sourced from the KIA book and KMS records to gather details on maternal health, birth statistics, and the growth progress of infants from birth to the age of 5. Also included were maternal height, gestational age, birth weight and length, and exclusive breastfeeding status. Children's heights were measured with head facing forward and standing in an upright position without footwear, using a One Med® microtoise with 1 mm accuracy.

The dependent variable was categorized as stunting or non-stunting. Stunting is identified as a WHO height-for-age Z-score below -2 standard deviations, based on sex. (World Health Organization, 2019) The independent variables included maternal education, maternal age, number of previous births, gestational age, sex of the child, age, birth order, weight at birth, length at birth, and exclusive breastfeeding practices. Maternal education was classified as low when the highest level of education attained was less than high school. High risk maternal age during pregnancy is classified as being under 20 or over 35 years old. Gestational age was classified as preterm at 37 weeks, and parity was classified as two or fewer (Ministry of Health of the Republic of Indonesia, 2019). The order of birth for children was classified as either firstborn or not firstborn. Low birth weight was defined as birth weight <2500 gram and low birth length as <48 cm. The children were deemed to have not experienced exclusive breastfeeding if it was discontinued prior to reaching 6 months of age (Ministry of Health of the Republic of Indonesia, 2019).

The questionnaires, along with secondary data gathered from samples and anthropometric measurements, were subsequently analyzed using SPSS version 25 software. Descriptive analysis was used to display the frequency of variables, as well as the median and mean differences. A Chi-square bivariate test and odds ratio (OR) were utilized to evaluate the association between potential risk

factors and stunting, while a multivariate analysis using logistic regression was conducted to determine the adjusted odds ratio (AOR) for specific variables that were significant according to the Chi-square analysis. The findings were deemed statistically significant with a P-value of <0.05 and a 95% confidence interval (95% CI). The Research Ethics Committee of the Faculty of Medicine at the University of Swadaya Gunung Jati in Cirebon, West Java, granted approval for the study.

3. Results

A total of 173 subjects were included. Characteristics of subjects are shown in **Table 1**. Bivariate analysis revealed the following significant determinant: low maternal education (OR 5.96; 95%CI 2.01 to 17.73), Parity of mother >2 (OR 0.58, 95%CI 0.48 to 0.69), high risk maternal age (OR 0.68; 95%CI 0.61 to 0.77), not first birth order (OR 4.01; 95%CI 1.85 to 10.05), low birth weight (OR 7.73; 95%CI 1.01 to 59.27) and non-exclusive breastfeeding (OR 10.95; 95%CI 3.69 to 32.5). The results of the bivariate analysis of possible risk factors and proportion of stunting are shown in **Table 2**.

Table 1 Characteristics of study subjects

Characteristics	(N= 173)
Sex, n(%)	
Male	89 (51.5)
Female	84 (48.5)
Median age (range), months	34 (12 to 58)
Median weight (range), kg	11.5 (5.0 to 18.5)
Mean height/length (SD), cm	85.64 (9.3)
Median birth weight (range), grams	3000 (1200 to 4200)
Median birth length (range), cm	49 (46 to 53)

Table 2 Analysis of Determinants of stunting (N=173)

Determinants of stunting	Stunting		OR	(95%CI)	P value
	Yes, n(%)	No, n(%)			
Maternal education, n (%)					
Low	53 (93)	4 (7)	5.96	(2.01 to 17.73)	<0.001*
High	80 (69)	36 (31)			
Parity, n (%)					
≤ 2	55 (57)	40 (42.1)	0.58	(0.48 to 0.69)	<0.001*
>2	78 (100)	0 (0)			
Maternal age, n (%)					
≤35	87 (68.5)	40 (31.5)	0.68	(0.61 to 0.77)	<0.001*
>35	46 (100)	0 (0)			
Gestational age, n (%)					

Preterm (<37 weeks)	21 (91.3)	2 (8.7)	3.56	(0.79 to 15.91)	0.078
Full term (≥37 weeks)	112 (74.7)	38 (25.3)			
Child sex, n (%)					
Male	67 (75.3)	22 (24.7)	0.83	(0.41 to 1.67)	0.608
Female	66 (78.6)	18 (21.4)			
Birth order, n (%)					
First	9 (20)	36 (80)	4.01	(1.85 to 10.05)	<0.001*
Not First	124 (98.4)	4 (29.6)			
Birth weight, n (%)					
Low (< 2,500 grams)	22 (95.7)	1 (4.3)	7.73	(1.01 to 59.27)	0.022*
Normal (≥ 2,500 grams)	111 (74)	39 (26)			
Birth length, n (%)					
Low (< 48 cm)	31 (67.4)	15 (32.6)	0.51	(0.24 to 1.08)	0.075
Normal (≥ 48 cm)	102 (80.3)	25 (19.7)			
Exclusive breastfeeding, n (%)					
No	73 (94.8)	4 (5.2)	10.95	(3.69 to 32.5)	<0.001*
Yes	60 (62.5)	36 37.5)			

*Statistically significant; P value is based on bivariate analysis using Chi-square test

The significant risk factors in the bivariate analysis were analyzed further with multivariate logistic regression model analysis, as shown in **Table 3**. Low maternal education (AOR 2.88; 95%CI 1.10 to 7.55; P=0.013), birth order more than 1 (AOR 3.08; 95%CI 1.24 to 7.55; P<0.001), non- exclusive breastfeeding (AOR 9.92; 95%CI 1.89 to 52.51; P=0.041), and low birth weight (AOR 6.25; 95%CI 1.04 to 46.84; P=0.032) were the main determinants for stunting.

Table 2 Multivariate analysis of determinants of stunting

Variables	Adjusted OR	95% CI	P value
Maternal education	8.40	1.02 to 53.56	0.013*
Parity of mother	0.84	0.27 to 2.27	0.996
Maternal age	0.54	0.42 to 5.31	0.525
Birth Order	3.08	1.24 to 7.55	<0.001*
Birth weight	6.25	1.04 to 46.84	0.032*
Exclusive Breastfeeding	9.92	1.89 to 52.51	0.041*

* Statistically significant; P value is based on multivariate analysis model using logistic regression

4. Discussion

Our current study was a substantial cross-sectional study, in contrast to the majority of studies conducted in West Java, Indonesia, focusing on children under five years of age. This research stands out by offering insights into stunting and its factors at the community level. Numerous socio-demographic traits of both the child and the family are linked to the occurrence of stunting. We take into account the child's gender, birth weight, order of birth, mother's parity, gestational age, exclusive breastfeeding status, mother's age, and educational background, among other factors. In this study, we evaluated most of these factors, especially those deemed most critical.

In this research, males were found to have a 0.6 times lower risk of being stunted compared to females. A prior study utilizing data from Indonesia indicates results that align with ours (Aryastami, 2017). Surveys indicated that stunting was more common among preschool boys than girls. In Indonesia, the rates of stunting among boys in 2020 and 2021 were 47.0% and 46.6%, whereas for girls, the prevalence varied from 41.9% to 45.5% (Indriasari et al, 2020). In Kolkata, India, the relative risk of stunting in boys was 1.65 when compared to girls. (Pal et al, 2021). While the precise cause remains unclear, it could be attributed to the established understanding that male children are more impacted by environmental stress than female children. In contrast to this finding, a study from South West Rajasthan indicated that the prevalence of stunting was 1.48 times higher in female children compared to male children (OR = 1.48; Cl = 1.00–2.47) (Sharma et al, 2016).

The nutritional condition during the first 1,000 days of life influences the quality of life in the future (Pulungan, 2016). Intrauterine growth restriction (IUGR) indicates maternal malnutrition (Prendergast, 2014). IUGR can lead to shorter birth lengths and place the child at a higher risk of additional stunting. A research study conducted in Bogor, West Java, indicated that a birth length of less than 48 cm is a risk factor for stunting (Indriani et al, 2018). In line with their results, we observed that 67.4% (OR 0.51, 95%CI 0.24 to 1.08) of the stunted individuals had experienced a short birth length.

We found that low birth weight is significantly associated with stunting (AOR= 6.35, P<0.05). Low birth weight is connected to premature birth, intrauterine growth restriction (IUGR), or a combination of both. In developing nations such as Indonesia, the associated risks are more frequently linked to IUGR (Johnson et al, 2020). Numerous studies indicate that a majority of infants with low birth weight in Indonesia experienced IUGR (Malhotra et al, 2014) (Madanijah et al, 2016). A prior study conducted by Tyagi et al. demonstrated a notable connection between a mother's nutritional health, weight gained during pregnancy, iron consumption, and the gestational age with the occurrence of low birth weight (Tyagi et al, 2017).

Research indicates that inadequate early growth may be linked to less-than-ideal cognitive development, and the restricted growth of internal organs can lead to lower cognitive abilities and

higher risks for chronic diseases in the future (Wells et al, 2019). A study conducted in Zambia revealed that the growth of low birth weight (LBW) infants lags significantly behind that of babies with normal weight, with notable differences in length observed by the age of 12 months (Bwalya et al, 2015). Intrauterine growth restriction and erratic growth during the initial two years of life can result in diminished economic productivity in adulthood. Victora states that inadequate fetal growth or stunting within the first two years of life causes permanent harm, which includes lower adult height, reduced educational attainment, decreased adult income, and lower birth weight in their children (Victora et al, 2021).

Breastfeeding offers numerous advantages for babies during their initial six months, including a reduction in the occurrence of diarrhea and other digestive issues, along with enhanced immune function (Murarkar et al, 2020). Such benefits have been associated with breastmilk composition including lactoferrin, immunoglobulin, and other secretory products not found in cow's milk (Lyons et al, 2020) Breastfeeding exclusively for the first six months serves as a safeguard against infections due to its high content of anti-infective substances that help avert respiratory infections and diarrhea. It enhances the immunity of the child. However, it should be accompanied by timely weaning (Granger et al, 2021). Continuing exclusive breastfeeding beyond 6 months implies the child is getting inadequate nutrition and become malnourished (Rautava et al, 2016). Non-exclusive breastfeeding was correlated to the proportion of stunting in Sri Lanka and East Java (Sujendran et al, 2015) (Barir et al, 2019). This finding was in agreement with ours: 94.8% (OR 9.92; 95%CI 1.89 to 52.51; P=0.041 of stunted subjects were not exclusively breastfed.

Parents with a lower level of education often possess insufficient knowledge about supporting their children's growth and development, particularly concerning their nutritional requirements. Our research indicated that a low level of maternal education raised the likelihood of stunting, similar to findings in another study (Rahman et al, 2016) (Nurlaili et al, 2024). Additionally, a prior investigation observed that enhancing maternal awareness decreased the rate of stunting (Hall et al, 2018)

Birth order has consistently been a significant factor in stunting. In contrast to children with a birth order of two or more, those with a birth order of less than two had a higher likelihood of being stunted (Adj OR = 3.08, $p < 0.05$). This outcome contradicts findings from other studies conducted in India and Indonesia (Dhingra et al, 2021) (Hamdani et al, 2024) In Maharashtra, marriage among teenagers is frequent. This often leads to early pregnancies and low birthweight infants, contributing to long-term undernutrition in children (Kumar et al, 2021)

Another key element influencing underweight status was the level of maternal education. It was found that low maternal education significantly increased the risk of stunting (Adj OR = 8.40, $p < 0.05$). The

incidence of stunting declines as mothers attain higher educational qualifications. This observation aligns with findings from other research studies (Laksono et al, 2022). Mothers are typically the primary caregivers for their children, making their education crucial. Educated mothers tend to have a greater understanding of available health services and are more likely to use them. As the initial educators of their children, mothers and their offspring are often viewed as a single unit. Moreover, girls with higher education usually marry at a later age compared to those with less education, resulting in delayed childbirth and having fewer children overall (Emamian et al, 2014).

The period from birth to age five is crucial for cognitive and physical development; the progress and growth during this time will lay the groundwork for future development (Vaivada et al, 2020). Stunted or malnourished children can have a detrimental effect on the economy, affecting productivity, employment opportunities, and income (Casale et al, 2014). While stunted toddlers may seem typical in social situations, they actually experience growth impairment from an early age (Manggala et al, 2018). Stunting can weaken the immune system and raise the likelihood of developing infections (Febriani et al, 2020). Children who experience stunting are more likely to develop hypertension, diabetes, and obesity in adulthood, and their average IQ is 11 points lower than that of children who do not experience stunting (Fikadu, 2014). Stunting has also been linked to delayed motor and cognitive development, as well as an increased risk of morbidity and mortality (de Onis et al, 2016) Thus, stunting serves as sensitive marker of the lack of socioeconomic development as well as a predictor for long term morbidity and mortality (TNPPK, 2024).

Limitations of our study were the lack of data on parental income, history of ARI and chronic diarrhea, family nutritional status and parasite infection in children, so we did not include those risk factors in the study. We suggest that a multicenter study with a larger sample size should be carried out in the future.

Conclusion

In conclusion, the dominant main risk factors of stunting in Jamanis District of Tasikmalaya, West Java are maternal education, birth order more than one, non- exclusive breastfeeding, and low birth weight. Among the variables, non-exclusive breastfeeding was the most important and dominant determinant of childhood stunting.

Acknowledgement

Acknowledgement to the Jamanis District Health Service, University of Swadaya Gunung Jati, and all parties who supported this research.

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