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Nutritional Factors Affecting Stunting Among Toddlers

Faktor Gizi yang Mempengaruhi Stunting Pada Balita

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ABSTRACT

Background: Stunting is one of the most severe nutritional challenges in Indonesia. In 2020, Malang Regency recorded a stunting prevalence of 12%, with the Gondanglegi sub-district having 942 stunted toddlers. To address this issue and promote optimal toddler nutrition, the administration of colostrum, exclusive breastfeeding, and complementary feeding has been recommended. However, inappropriate colostrum administration, exclusive breastfeeding, and complementary feeding practices may exacerbate the risk of stunting in toddlers.
Objectives: This study aimed to identify the factors that cause stunting in toddlers based on the behavior of meeting nutritional needs in the Gondanglegi sub-district, Malang Regency.
Methods: A total of 136 toddlers aged 6 to 59 months were divided into two equal groups for the case-control analysis at Ketawang and Gondanglegi Primary Health Centers in the Gondanglegi sub-district. The study gathered weight and height measurements, conducted a questionnaire-based interview, and recorded a 24-hour food recall to collect relevant data. To ascertain the factors that influence stunting, the Chi-square analysis was used, employing a significance level of 0.05. To perform multivariate analysis, logistic regression was applied to the data.
Results: Colostrum administration, exclusive breastfeeding, and complementary feeding were linked to stunting in bivariate analysis ($p<0.05$). According to a multivariate analysis, exclusive breastfeeding (OR=4.8) is strongly associated with stunting among toddlers in the Gondanglegi sub-district, Malang Regency, Indonesia.
Conclusions: Breast milk contains many nutrients and antibodies protecting babies from infection by reducing the duration and severity of illness that can lead to chronic malnutrition and stunting.

INTRODUCTION

Stunting is a growth issue that affects toddlers aged 0 to 59 months and is determined by height/length-for-age, as defined by the World Health Organization's (WHO) anthropometric standard of -2 SD (Standard Deviation). It has consequences for toddlers, impacting cognitive, motor, and verbal development in the short term while increasing the risk of non-communicable diseases and decreasing work capacity, performance, and productivity in the long term[1]. The percentage of stunted toddlers under five in the 2022 Indonesian Ministry of Health Performance Report is 24.4% of the target of 21.1% with the highest in Bogor, Bandung, Cirebon, Jember, and East Lombok.

According to the 2022 Indonesian Ministry of Health Performance Report, 24.4% of toddlers under the age of five are stunted, exceeding the target rate of 21.1%. This figure is still below the President's target of 3-3.5%, with the under-five prevalence rate in 2021 set at 14%[2]. Toddler factors include birth weight and length, examination age, and gender[3,4]. Adequate nutritional intake is crucial to optimize toddler growth and development, and inadequate feeding practices such as not giving breastmilk exclusively or throwing away colostrum can put toddlers at risk of stunting[5–7].

According to the Malang Regency Basic Health Study in 2018 and 2020, 27.1% and 12% of toddlers are stunted. Meanwhile, the Gondanglegi subdistrict has the highest prevalence, with 932 stunted toddlers reported in Gondanglegi Health Center and Ketawang Health Center [8–10]. This study determines which factors of toddlers and nutritional intake influence the incidence of stunting among toddlers in the Gondanglegi sub-district. Hopefully, it will be useful in making decisions about stunting in the Malang regency.

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METHODS

This study entailed an observational analysis using a quantitative approach and a case-control design. It was conducted between October and November 2021 at two Community Health Centers (*Puskesmas*) situated in Gondanglegi District, namely Gondanglegi and Ketawang Health Centers. The study targeted toddlers aged 6-59 months, with a total sample of 136 divided into the case (stunting) and control (normal) groups. Furthermore, the respondents were selected purposively from three villages, namely Gondanglegi Kulon, Putat Lor, and Ganjaran, following certain inclusion and exclusion criteria. The inclusion criteria were toddlers aged 6-59 months, owning Maternal and Child health books, and caregivers willing to participate in the study. On the other hand, toddlers who did not live in the study area were unwell or undergoing treatment, or had a physical or congenital handicap were excluded.

The dependent variable was the practice of giving colostrum, exclusive breastfeeding, and complementary foods. The data collection involved measuring the toddlers' height and weight, conducting questionnaire-based interviews, collecting 24-hour food recall questionnaires, and obtaining information on birth weight, length, and date of birth from Maternal and Child Health Books. The questionnaire was based on the 2018 Indonesian basic health study individual and household, which was subsequently modified to enhance comprehensibility for the subjects. Table 1 presents the questionnaire items used, which included 13 parenting style assessments. Before the questionnaire was employed as a data-gathering tool, it was examined for reliability and validity on 25 caregivers of stunting toddlers and 25 normal caregivers in the Bululawang District area. The validity test findings were r = 0.815, indicating that the questionnaire was valid, while the results of the reliability test ranged from 0.432 to 0.769.

Table 1. Matrix of study instruments

Parenting Style Lead to Stunting	Number of questions
Colostrum administration	2
Exclusive breastfeeding	3
Complementary feeding	8
Total of Questions	13

The history of complementary feeding contains eight questions designed to elicit information about the child's feeding pattern from the introduction of food until becoming a respondent. Questions about complementary feeding history include: complementary food introduction is classified as either appropriate or inappropriate based on the timing of its administration. The appropriate time for administration is at six months of age, while administration at a younger or older age is considered inappropriate. The complementary food supplied to toddlers when they first eat is categorized into two categories, namely appropriate when 1) the entire menu is crushed, 2) quick porridge sold in the market, and not appropriate, when the first item supplied is food that does not meet standards, such as scraped banana. The amount of complementary food is divided into two categories, namely 1) appropriate, when the amount given is according to standards, a) 2-3 tablespoons per meal given to 6-8 months, b) 125 ml given to 9-12 months, c) 185 ml given to 1- 2 years and 2) not appropriate, when the amount given is not according to standards. The frequency of giving complementary food is divided into two categories, namely 1) Appropriate, when the amount of MP ASI is according to the standard, a) Age 6-8 months 2-3 times crushed food and 1-2 snacks, b) Age 9-11 months when given 3-4 times mashed food and 1-2 times snacks, c) 12-24 months given 3-4 times family food and 1-2 times snacks, 2. Not appropriate, when the child's feeding frequency is not up to standard.

Food supplied to toddlers above the age of one year is divided into two categories, namely 1) appropriate when the toddler is given family food, 2) not appropriate when the toddler is still given mashed food or snacks only. The frequency of eating toddlers over the age of one year is classified into two categories, namely 1) appropriate when toddlers over the age of one year are given 3-4 times family meals and 1-2 times snacks, 2) not appropriate when the frequency is not up to standard. Parental behavior when toddlers refuse certain types of food is divided into two categories, namely 1) good, when parents serve food differently, and 2) not good when toddlers are allowed to refuse certain types of food. The type of family food given is divided into two categories, namely 1) appropriate when the toddler receives a source of carbohydrates, fiber, protein, vitamins, and minerals, and 2) not appropriate when the toddler does not receive the type of food specified.

The acquired data were subjected to a descriptive analysis to examine all variables, followed by bivariate to assess the distribution of stunting among toddlers. Subsequently, the logistic regression analysis was employed to estimate the effect of independent variables on the dependent while controlling for other factors. The selection of variables for early logistic regression analysis was based on a p-value of 0.25 in multivariate modeling. Multiple logistic regression analysis was conducted to identify factors associated with stunting, using a significance level of 0.05. Furthermore, SPSS 21.0 was used to perform the statistical analysis, and before completing the questionnaire, respondents were informed of the study's objective and benefits. Participants were required to complete an informed consent form, and the study was authorized by the Ethics Commission of the Faculty of Medicine, University of Brawijaya (No. 286/EC/KEPK-S2/09/2021).

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RESULTS AND DISCUSSION

Subject Characteristics

Among 136 stunted toddlers in the Gondanglegi sub-district, 91.2% were born with normal birth weight (>2500 grams), 88.2% were born with normal length birth (>48 cm), and 63.2% were boys. Based on nutritional fulfillment practices, 89.7%, 86.8%, and 86.8% of stunted toddlers have a history of not receiving colostrum early in life, not receiving exclusive breastfeeding, and not receiving proper solids food, as shown in Table 2.

Table 2. Frequency distribution of respondents in Gondanglegi, 2021

Variables	Variable				Bivariate Analysis		
	Stunting		Normal		OR	(95% CI)	p-value
	n	%	n	%			
Birth weight							
< 2500 grams	6	8.8	21	30.9	4.617	(1.727 – 12.342)	0.001
≥ 2500 grams	62	91.2	47	69.1			
Birth length							
< 48 cm	8	11.8	21	30.9	3.351	(1.363 – 8.237)	0.006
≥ 48 cm	60	88.2	47	69.1			
Ages							
6 – 35 months	34	50	47	69.1	2.238	(1.111 – 4.509)	0.023
36 – 59 months	34	50	21	30.9			
Sex							
Boy	43	63.2	35	51.5	0.617	(0.311 – 1.223)	0.165
Girl	25	36.8	33	48.5			
History of receiving colostrum							
Not receiving	61	89.7	45	66.2	4.454	(1.758 – 11.284)	0.001
Receiving	7	10.3	23	33.8			
History of exclusive breastfed							
Not receiving	59	86.8	37	54.4	5.492	(2.351 – 12.829)	<0.001
Receiving	9	13.2	31	45.6			
History of complementary feeding							
Not appropriate	59	86.8	49	72.1	2.542	(1.055 – 6.122)	0.034
Appropriate	9	13.2	19	27.9			

OR, Odd Ratio; 95% CI, 95% Confident Interval

The height or age parameter is the optimum indication for measuring toddler welfare and is an accurate benchmark for human growth. However, this survey discovered 942 stunted toddlers in the Gondanglegi Region, the district with the greatest number of stunted toddlers in the Malang Regency in 2021. Toddlers who were deprived of colostrum during their early stages of life, did not exclusively breastfeed during the initial six months after birth and were born with a weight below 2500 grams, are highly susceptible to the development of stunting, as seen in Table 3. The data from Gondanglegi District in Malang Regency indicates that policymakers in Malang Regency should prioritize the development of evidence-based interventions aimed at reducing the incidence of stunting among toddlers.

Table 3. Factors related to stunting in toddlers in Gondanglegi, 2021

Variables	Multivariate		
	OR	(95% CI)	p-value
Birth weight			
< 2500 grams	4.418	(1.549 – 12.605)	0.005
≥ 2500 grams			
History of receiving colostrum			
Not receiving	3.755	(1.383 – 10.193)	0.009
Receiving			
History of exclusive breastfed			
Not receiving	4.558	(1.860 – 11.171)	0.001
Receiving			

OR, Odd Ratio; 95% CI, 95% Confident Interval

The multivariate analysis with multiple logistic regression included a total of six variables. Multiple logistic regression analysis showed that the factors associated with stunting in toddlers were colostrum feeding history (OR=3.755; 95% CI=1.383 – 10.193), exclusive breastfeeding history (OR=4.558; 95% CI=1.860 – 11.171) and history of birth weight (OR=4.418; 95% CI=1.549 – 12.605).

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The Effects of Colostrum and Exclusive Breastfeeding on Stunting

Colostrum, the initial liquid produced by the mother after delivery, is a crucial component in the early immune system of mammals. It contains high levels of immunological components such as secretory immunoglobulin A (IgA), lactoferrin, leukocytes, and developmental factors like epidermal growth factor (EGF), lactalbumin, and lactoprotein. Infants are born sterile in their mother's womb and after exposure to a bacteria-filled environment, ready-to-use vaccines become necessary. Colostrum serves as the initial maternal protection that newborns receive, making it an essential element of the immune system in every mammal[11–13]. Delayed early breastfeeding initiation or *inisiasi menyusui dini* (IMD) is associated with a 1.3-fold increased risk of stunting in infants, making early breastfeeding initiation a critical program[14].

Breast milk antibodies serve a critical function in newborn mucosal immunity by saturating the neonate's surfaces and providing the first line of defense for this sensitive area. Moreover, breastfeeding is linked to a lower risk of diarrheal disease, fewer respiratory infections, and a lower long-term risk of asthma, diabetes, and inflammatory bowel disease[15–18]. Toddlers who receive less than six months of nursing are at a higher risk of stunting in the Gondanglegi District, Malang Regency. Furthermore, those who do not receive exclusive breastfeeding are four times more likely to suffer from stunting. This finding is consistent with previous study indicating that toddlers who receive breast milk for fewer than six months are at risk of stunting due to the lack of immune protective impact. Stunting can be further exacerbated by poor hygiene combined with a lack of immune protection[19–23].

The Effects of Low Birth Weight on Stunting

The findings suggest that toddlers born in Gondanglegi District weighing less than 2500 grams have a fourfold increased risk of stunting. This observation is consistent with numerous studies conducted in low and middle-income countries, including Indonesia. Malnutrition begins in the womb and persists through the first year of life, leaving infants with low birth weight (LBW) lacking essential minerals such as vitamin A, zinc, and iron necessary for proper internal growth. Therefore, LBW infants are heavily reliant on breast milk to meet their nutritional needs[5,6,23,24] .

To mitigate the prevalence of stunting, particularly in Gondanglegi District, Malang Regency, and Indonesia as a whole, stakeholders and communities can collaborate to develop targeted strategies, particularly given the challenges posed by the COVID-19 pandemic. Nutrition is an issue that is continuously discussed by national and regional governments. Consequently, multi-sectoral partnerships should be established to address stunting effectively. LBW is often exacerbated by a lack of access to healthcare and a history of infections such as acute respiratory infection (ARI) and recurrent diarrhea, which places toddlers at a higher risk of stunting[3,22]. A recent study indicated that stunting was influenced by multiple factors, including child, parental, socioeconomic, and environmental factors. Child factors such as low birth weight, and incomplete immunization also affected stunting among toddlers[25]. Therefore, various stakeholders and the community should collaborate to develop policies that can effectively minimize the prevalence of stunting in Indonesia, particularly in the aftermath of the COVID-19 pandemic in 2022. Multi-sectoral collaboration and targeted interventions are necessary to address the persistent issue of malnutrition and stunting.

CONCLUSIONS

In conclusion, the findings suggest that integrated interventions are required across various sectors, including government and non-governmental organizations, to reduce the prevalence of stunting. The prevention can begin at the pre-conception stage, reducing the number of toddlers born with low birth weight. As a preventive measure, early initiation of breastfeeding or *inisiasi menyusui dini* (IMD) should be implemented after delivery to increase the secretion of colostrum, which has a protective effect on the digestive tract. Furthermore, exclusive breastfeeding is critical in terms of providing newborns with the energy and micronutrients needed for growth and development. It is critical to ensure the availability of food and health services to prevent and treat stunting in toddlers. The limitation of this study is the small population, which may limit the recognition of stunting causes in toddlers in the Malang Regency.

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Conflict of Interest and Funding Disclosure

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