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Influence of the First Thousand Days of Life on Stunting Incidence

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ABSTRACT

Introduction: The golden period is the first 1000 days of a child's life. Stunting is one of the consequences of long-term malnutrition occurring in the first two years of a child's life. Stunting is widely known as a condition of failure in a child's growth so that the child becomes short or shorter than average for his age and experiences delays in cognitive development.

Objective: This study aimed to analyze the effect of the first 1000 days of life (1000 HPK) as a risk factor for stunting in West Nusa Tenggara Province, Indonesia, in 2018.

Materials and Methods: This study was an analytical observational study with a cross-sectional design that was conducted from March to July 2022. The study population included all toddlers aged 0-59 months, as recorded in the 2018 Riskesdas survey in West Nusa Tenggara Province, Indonesia. A total sample of 1119 toddlers met the inclusion criteria. The data used were secondary data obtained from the Data and Information Agency for Health Development Policy, Ministry of the Republic of Indonesia. The collected data were sorted out using descriptive statistical analysis (frequency distribution) and analyzed by bivariate analysis with the chi-square test. Moreover, we used multivariate analysis using the logistic regression test.

Results: Most toddlers aged 0–59 months did not experience stunting (72.7%). The mothers data were as follows: Majority of mothers were too young ≥20 years (66.7%) or too old ≤35 years (99.2%), with pregnancy interval ≥2 years (71.6%), and number of living children ≤2 (71.1%), antenatal care (ANC) (99.7%), hemoglobin (Hb) examination (87%), and consumed ≥90 iron tablets (62.4%). Also, 50.8% of mothers did not breastfeed their children. The variables of pregnancy interval (P=0.047), number of living children (P=0.039), and breastfeeding (P=0.0001) affected stunting. At the same time, the mother's age (too young or too old), antenatal care, provision of iron tablets, and Hb examination had no effect. The dominant factor influencing stunting is breastfeeding (odds ratio=2.063; 95% CI, 1.590, 2.740; P=0.0001).

Conclusion: Breastfeeding is the most dominant variable affecting the incidence of stunting.

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Highlights

- The first 1000 days of life (270 days of gestation and 730 days during the 2-year duration after birth) is a period of growth and development of all organs and body systems.

- Maternal health and nutritional conditions before and during pregnancy and after delivery affect fetal growth and the risk of stunting.

- Based on the results, breastfeeding is the most dominant variable affecting the incidence of stunting.

Plain Language Summary

The golden period is a child's first 1000 days of life (270 days of gestation and 730 days during the 2-year duration after birth). The best intervention to ensure well-being in infancy, childhood, and beyond is primary prevention of the risk factors of stunting and other congenital disease conditions. Maternal health and nutritional conditions before and during pregnancy and after delivery affect fetal growth and the risk of stunting. Other factors in mothers are as follows: The mother's posture (short), too close pregnancy intervals, adolescence mother, and inadequate nutritional intake during pregnancy. Stunting prevention efforts start from the preconception and pregnancy period through reproductive health promotion and pregnancy planning. This study showed that breastfeeding is the most dominant variable affecting the incidence of stunting.

Introduction

Stunting is still a severe public health problem in Indonesia. This condition not only inhibits children's physical growth but also has an impact on children's cognitive development, immunity, and productivity in the future. Data from the 2022 Indonesian Nutritional Status Study (SSGI) shows that the national prevalence of stunting is 21.6%, while West Nusa Tenggara (NTB) Province is ranked as one of 12 priority provinces with the highest prevalence nationally, namely 31.4% [1]. This figure shows that the intervention efforts that have been carried out have not effectively addressed the factors that play a role in stunting in the area. One of the most crucial periods in preventing stunting is the first 1000 days of life (1000 HPK), namely from pregnancy to the age of two years. During this period, organs and body systems grow rapidly, so nutritional imbalances or health disorders can have permanent impacts. Various studies have shown that suboptimal breastfeeding practices, mothers who are too young when pregnant, pregnancies that are too close together, and too many children are significant risk factors for stunting [2-4].

Although these factors have been extensively studied, most studies are still unspecific and have not presented a quantitative analysis based on regional aggregate data with a comprehensive approach. In West Nusa Tenggara, local data on the relationship between the 1000 HPK component and stunting incidence is still limited, especially when several variables of mothers and parenting patterns are involved simultaneously. Therefore, this study is here to answer these gaps by leveraging the Riskesdas 2018 data, which allows for multivariate analysis by region, while providing an evidence-based policy basis [5]. This is also in line with the study of Laksono et al. (2020) which shows the existence of regional stunting disparities, as well as the importance of Riskesdas data in supporting the formulation of national strategies [6].

This research is here to provide a more detailed and contextual picture of the stunting problem in West Nusa Tenggara, Indonesia, by utilizing Riskesdas 2018 data [5]. This study aims to analyze the influence of the first 1000 days of life on the incidence of stunting in West Nusa Tenggara Province, Indonesia. The findings of this study are expected to be the basis for formulating specific and evidence-based interventions to support the program in accelerating stunting reduction in high-risk areas.

Materials and Methods

This study is an analytical observational study with a cross-sectional design. The data were archived secondary data from the 2018 Basic Health Research Survey (Riskesdas) organized by the Health Research and Development Agency (Balitbangkes), Ministry of Health of the Republic of Indonesia.

This study's population comprised all toddlers aged 0–59 months registered in the 2018 Riskesdas data in West Nusa Tenggara Province, with an initial total of 1197 samples. After selecting according to the inclusion and exclusion criteria, a final sample of 1119 samples with complete data eligible for analysis was obtained.

The inclusion criteria in this study included complete toddler data (age, gender, birth weight, body length, weight at the time of measurement), as well as maternal data (maternal age, gestational age at that time, number of living children, pregnancy spacing, breastfeeding status, Antenatal Care (ANC) service visits, consumption of iron tablets, and Hemoglobin (Hb) level examination results during pregnancy. The exclusion criteria were incomplete data on the main variables, such as birth weight, maternal age during pregnancy, pregnancy spacing, breastfeeding practices, and nutritional status data based on height according to age. In addition, children outside the age range of 0–59 months at the time of data collection were not included because this study only focused on the toddler group. Also, we excluded children with a history of chronic diseases, congenital abnormalities, or major congenital disabilities that can significantly affect growth, such as Down syndrome or genetic metabolic diseases, based on information recorded in the child health variables in Riskesdas 2018. Likewise, the final sample did not include mothers who did not have complete information regarding pregnancy (age at pregnancy, number of living children, or pregnancy spacing)—respondents who did not follow the Riskesdas questionnaire filling protocol validly. For example, if the interview was incomplete or there was a coding discrepancy by the enumerator, they were also excluded from the analysis to maintain data validity.

In this study, the dependent variable is the incidence of stunting in toddlers, which is measured based on the standard indicator of height for age (height-for-age Z-score) with a threshold of < -2 SD, according to the World Health Organization (WHO). The independent variables include components in 1000 HPK: Maternal age during pregnancy, distance between pregnancies, number of living children, breastfeeding, ANC visits, consumption of iron tablets, and Hb examination during pregnancy.

This study was conducted from March to July 2022. Data were collected through an official application submission to the Data and Information Center of the Indonesian Ministry of Health via the official email address datin.bkpk@kemkes.go.id. After the application was approved, the researcher Paid Non-tax State Revenue (PNBP), signed a statement of data use (informed consent), and received a data set in digital format and a variable codebook as a reference in data processing. The data received had been archived and verified by government agencies as a valid source of information.

Data were analyzed using the IBM SPSS software, version 25 (IBM Corp., Armonk, NY, USA). The analysis stages include univariate analysis to describe the characteristics of respondents in the form of frequency distribution and bivariate analysis with the chi squared test to determine the relationship between independent variables and the incidence of stunting. Also, we used a multivariate analysis using logistic regression to identify the variables that have the most influence on the incidence of stunting.

Results

Based on the characteristics of the research subjects, of the 1119 toddlers (aged 0-59 months, 814(72.7%) did not experience stunting. The characteristics of the mothers showed that most were aged ≥20 years (66.7%) and aged ≤35 years (99.2%). Only 33.3% of mothers were <20 years old, and 0.8% were aged >35 years. The pregnancy interval was mostly ≥2 years (71.6%), and most mothers had ≤2 living children (71.1%). Most pregnant mothers also showed involvement in pregnancy services, with 99.7% making ANC visits, 87% undergoing Hb level checks, and 62.4% consuming ≥90 iron tablets. However, more than half of the mothers (50.8%) did not provide breast milk to their children. These data describe sociodemographic conditions during pregnancy, which are potential factors for stunting in toddlers, as detailed in Table 1.

Table 2 shows the frequency distribution of factors in the first 1000 days of life (1000 HPK) related to the incidence of stunting in West Nusa Tenggara Province, Indonesia. Based on the bivariate test with the chi-square test, several variables were obtained that had a significant relationship to the incidence of stunting (P≤0.05), but several others were not significant. The pregnancy spacing variable showed a statistically significant relationship to the incidence of stunting (P=0.047). Children of mothers with a pregnancy spacing of <2 years were more likely to experience stunting (86.7%) compared to mothers with a pregnancy spacing of ≥2 years (67.2%). This finding shows that pregnancies that are too close together can increase the risk of stunting in children. Likewise, the number of living children showed a significant relationship (P=0.039), where mothers with >2 living children had a higher propor-

Table 1. Sociodemographic characteristics of mothers in relation to stunting (n=1119)

Variables		No. (%)
Stunting	Yes	305(27.3)
	No	814(72.7)
Mother's age: Too young (y)	<20	373(33.3)
	≥20	746(66.7)
Mother's age: Too old (y)	≤35	1110(99.2)
	>35	9(0.8)
Pregnancy interval: Too close (y)	<2	318(28.4)
	≥2	801(71.6)
Number of living children	≤2	796(71.1)
	>2	323(28.9)
Aantenatal care	Yes	1116(99.7)
	No	3(3)
Administration of iron supplement tablets	≥90 tablet	698(62.4)
	<90 tablet	421(37.6)
Hb examination	Yes	973(87)
	No	146(13)
Breastfeeding	Yes	551(49.2)
	No	568(50.8)

tion of stunted children (33.4%) compared to mothers who had ≤2 children (27.1%). The most significant variable was breastfeeding (P=0.0001). Children who were not breastfed had a much higher proportion of stunting (63.6%) compared to children who were breastfed (36.4%). This finding confirms that breastfeeding is an important protective factor in preventing stunting. In contrast, other variables such as maternal age being too young (<20 years), maternal age being too old (>35 years), ANC visits, number of iron tablets consumed, and Hb examination did not show a statistically significant relationship with stunting (Table 2).

After that, we included variables with P<0.25 in the logistic regression model. Based on the binary logistic regression model (Table 3), the dominant factors in the incidence of stunting show that of the four variables entered into the model, only breastfeeding has a statistically significant effect on the incidence of stunting (P<0.05). The breastfeeding variable shows a statistically significant relationship to the incidence of stunting (OR=2.087, 95% CI; 1.590, 2.740, P=0.0001). This finding shows that toddlers who do not get breast milk are 2.08 times more likely to experience stunting than toddlers given breast milk after being controlled with other variables in the model. Meanwhile, the variable of too-close pregnancy spacing (<2 years) shows that it is not statistically significant in the model. Similarly, the number of living children >2 also indicated that it was not significant.

Discussion

The results of this study confirm that the HPK period is a critical phase in determining the nutritional status and growth of children, especially related to the incidence of stunting in West Nusa Tenggara Province, Indonesia. Maternal factors such as gestational age, spacing between pregnancies, and breastfeeding practices have been shown to contribute significantly to the risk of stunting.

Table 2. Distribution of the first 1000 days of life in relation to stunting (n=1119)

Variables		No. (%)		P*
		Not Stunting	Stunting	
Mother's age: Too young (y)	<20 ≥20	260(31.9) 554(68.1)	113(37) 192(63)	0.107
Mother's age: Too old (y)	≤35 >35	806(99) 8(1)	304(99.7) 1(0.3)	0.275
Pregnancy interval: Too close (y)	<2 ≥2	218(26.8) 596(73.2)	100(86.7) 205(67.2)	0.047
Number of living children	≤2 >2	593(72.9) 221(27.1)	203(66.6) 102(33.4)	0.039
ANC	No Yes	2(0.2) 812(99.8)	1(0.3) 304(99.7)	0.813
Administration of iron supplement tablets	≥90 tablet <90 tablet	508(62.4) 306(37.6)	190(62.3) 115(37.7)	0.972
Hb examination	No Yes	111(13.6) 703(86.4)	35(11.5) 270(88.5)	0.339
Breastfeeding	No Yes	374(45.9) 440(54.1)	194(63.6) 111(36.4)	0.0001

*The chi-square test.

Maternal age at the time of pregnancy was found to be a crucial factor, especially pregnancy at the age of <20 years and >35 years. Adolescent girls who marry and become pregnant too early are at risk or tend to face reproductive health, psychosocial, and economic challenges that impact the health of the fetus and the child they give birth [7]. This finding aligns with another study, which found that adolescent gestational age correlates with low birth weight and infant length, which does not meet WHO standards [8].

Meanwhile, a pregnancy spacing of <24 months increases the risk of stunting due to insufficient maternal nutritional recovery time. Pregnancy that occurs too soon after a previous birth does not give the mother's body enough time to restore its nutritional reserves, thereby increasing the risk of chronic energy deficiency and growth complications in subsequent children. Several studies have linked short birth intervals to low birth weight and stunting in developing countries [9-11]. Data from other developing countries also support these findings. A multilevel study in Cambodia concluded that short birth intervals significantly determined poor nutritional status, recurrent infections, and limited maternal and child health services [12]. There-

Table 3. Predicting variables for stunting based on Logistic regression model

Variables	P	Exp ß (OR)	SE	95% CI	
				Lower	Upper
Mother's age (too young)	0.575	0.993	0.013	0.967	1.019
Pregnancy interval (too close)	0.147	0.696	0.25	0.426	1.136
Number of living children (too many)	0.808	0.975	0.103	0.797	1.194
Breastfeeding	0.0001	2.087	0.139	1.59	2.74

OR: Odds ratio

fore, postnatal contraceptive practices and family planning education are essential to prevent stunting in the context of the first 1000 days of life program.

Although the coverage of ANC visits and consumption of iron tablets ≥90 tablets have shown an increasing trend, the effectiveness of this program in reducing stunting rates has not been optimal, probably due to the low quality of counseling provided during ANC. Nutritional counseling during ANC has been shown to improve maternal compliance in consuming iron supplements, prevent anemia and low birth weight babies, and ultimately prevent fetal growth disorders [13, 14].

The most dominant factor in this study was the low coverage of exclusive breastfeeding. Breast milk is the primary source of nutrition that not only meets the needs of infants but also provides immunological protection. Exclusive breastfeeding has been proven effective in reducing the risk of stunting globally [15]. On the other hand, giving complementary foods too early increases the risk of digestive infections and disrupts child growth [16, 17].

Infants with a history of low birth weight who do not receive exclusive breastfeeding have a greater risk of stunting [18]. In addition, the lack of maternal knowledge about nutrition and low consumption of animal protein, especially in coastal and remote areas, are also factors that worsen children's nutritional conditions during the HPK period [19, 20]. Therefore, community-based intervention models such as family assistance based on local culture have been proven effective in reducing stunting rates [21].

Analytically, the findings in this study strengthen the theory that stunting is not only a matter of acute malnutrition but is the result of the accumulation of various structural, social, and biological determinants that occur before pregnancy. Low coverage of exclusive breastfeeding, pregnancy at an inappropriate age, and unpreparedness in early care are the main interrelated risk factors. In other words, preventing stunting requires a multi-sector and multi-system approach from the household level, health services, and cross-sector policies emphasizing maternal education and empowerment.

This study has several limitations, such as using 2018 Riskesdas data, which may not reflect current conditions, and limited variables such as sanitation or maternal employment status. In addition, the study was only conducted in one province, so the results cannot be generalized widely. However, these findings reinforce the importance of interventions during the first 1000 days of life in preventing stunting.

Specific findings indicate that most children do not experience stunting, and exclusive breastfeeding emerged as a dominant factor influencing the incidence of stunting during the 1000 HPK period.

Based on these findings, we recommend strengthening cultural and community-based exclusive breastfeeding education and promotion programs, for example, through pregnancy classes or peer groups for breastfeeding mothers, and the need to strengthen the social system so that breastfeeding practices become part of the community norm. For example, mothers feel ashamed if they do not provide exclusive breastfeeding or are motivated to breastfeed because of awareness, not coercion. Improving the quality of ANC services, monitoring child nutrition, and utilizing information technology are also expected to accelerate the achievement of national stunting reduction targets. A cross-sectoral approach starting from the village is critical to build collective awareness in preventing stunting in infants aged 0-6 months, from family planning to household-based nutrition interventions, which is crucial to ensure the first 1000 days of life. This strategy is expected to strengthen breastfeeding culture as part of sustainable nutrition interventions..

Ethical Considerations

Compliance with ethical guidelines

Ethical approval for this study was obtained from the Health Research Ethics Committee, Faculty of Medicine, University of Mataram, Mataram, Indonesia (Code: 138/UN18.F7/ETIK/2022). The chief researcher signed informed consent for secondary data from the Datin BKPK of the Indonesian Ministry of Health.

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Authors' contributions

Conceptualization, study design, data analysis, interpretation, and writing: Linda Meliati; Obtaining funds, collection, and assembly of statistical data expertise: Sudarmi Sudarmi; Administrative, technical, or logistical support: St. Halimatusyaadiah; Final approval: All authors.

Conflict of interest

The authors declared no conflict of interest.

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