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Research Article
Characteristics of Mother as Predictors of Stunting in Toddler

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Abstract

Background and Objective: Indonesia is a developing country with the third highest prevalence of stunting in the South-East Asian region. The present study analyzed characteristics of mothers as predictors of stunting in children under 5 years-old in Indonesia. **Materials and Methods:** Data from the 2017 Indonesian Nutritional Status Monitoring Survey was used. Using multi-stage cluster random sampling, 149,571 toddlers aged 0-59 months and their mothers were examined. Stunting as an indicator of nutritional status was assessed based on height per age. Characteristics of mothers included age, marital status, educational level, work status and residence were studied. Data were analyzed using multinomial logistic regression. **Results:** Age of mothers was a significant predictor of stunting risk in toddlers. Toddlers with married mothers had 0.862 and 0.771-times higher risk of stunting and severe stunting, respectively, compared to toddlers of divorced mothers. Toddlers of mothers with only a primary school education had 2.248-times higher risk of severe stunting compared to toddlers of college-educated mothers. Toddlers of non working mothers had 0.951-times higher risk of severe stunting compared to toddlers of working mothers. **Conclusion:** Age, marital status, educational level, work status and residence of mothers were predictors of stunting of toddlers in Indonesia.

INTRODUCTION

Stunting in children under the age of 5 years is largely a problem related to chronic malnutrition in developing countries that impacts growth quality, development and increases morbidity from noncommunicable diseases. Stunting is characterized by a height according to age under -2 standard deviations (SD) compared to World Health Organization (WHO) standards and is an important indicator of toddler health. Children with stunting caused by malnutrition during the intrauterine period are closely related to the presence of intrauterine growth retardation[1-3]. Stunting has been shown to impact cognitive development and lead to a greater risk of obesity related to permanent metabolic and endocrine maladaptation starting in utero. Such maladaptation, even with excess nutritional intake in toddlers who were initially malnourished, can increase the risk of metabolic disorders with age, such as glucose intolerance[4-7].

Data collected by the WHO on stunting revealed that Indonesia has the third highest prevalence in the South-East Asian region, with an average prevalence of stunted toddlers from 2005-2017 of 36.4%[8]. While the Indonesia Basic Health Survey in 2007, 2013 and 2018 showed the prevalence of stunting in toddlers nationally has decreased (36.8, 37.1 and 30.1%, respectively), the prevalence of obesity and noncommunicable diseases has increased from year to year[9]. This data shows a double burden in public health nutrition problems that requires more serious handling[2,3,10,11]. The existence of an epidemiological transition in the form of high rates of malnutrition in vulnerable groups and the increasing prevalence of degenerative diseases requires a comprehensive approach because these issues are interrelated[12,13]. Appropriate, effective and efficient interventions are needed to break the chain of recurring health problems and avoid causing further issues in the future. In the life cycle of nutrition theory, stunted toddlers will grow into stunted adults that are at risk of giving birth to children who are malnourished. This suggests the incidence of stunting in children is closely related to the presence of parental malnutrition, especially in the mother. Adequate maternal nutrition is extremely important in breaking the cycle of stunting. In addition, good parenting practices will ensure that children get the care and nutrition they need according to their age[14,15]. The present study was conducted to analyze the characteristics of Indonesian mothers as predictors of stunting in toddlers.

MATERIALS AND METHODS

Raw data from the 2017 Indonesian Nutritional Status Monitoring Survey were used for this study. This national-scale survey was conducted by the Indonesian Ministry of Health employed multistage cluster random sampling[16]. The unit of analysis was toddlers aged 0-59 months. The total sample size analyzed in the current study was 149,571 toddlers. The 2017 Indonesian Nutrition Status Monitoring Survey ethical license was approved by the national ethics committee (ethics no. LB.02.01/2/KE.244/2017). In this survey, informed consent was obtained during data collection which considers aspects of procedures for data collection, voluntary participation and confidentiality.

Stunting as an indicator of nutritional status was assessed based on height per age. The height indicator was determined based on the z-score, which is the deviation from normal height according to WHO growth standards. The limits for the category of nutritional status of children under 5 years-old according to WHO's height index per age are as follows[16]:

- Severely stunted: < -3.0 SD
- Stunted: -3.0 to -2.0 SD
- Normal: ≥ -2 SD

Variable selection was done using the Chi-square test to assess the dichotomous variable, while a Student's t-test was used for continuous variables. A Student's t-test was used to assess whether there was a statistically significant relationship between nutritional status (height per age) as the dependent variable and the independent variable. There were 6 variables in 3 groups of independent variables that will be tested as predictors of stunting events, namely toddler age, regional context (urban versus rural) and characteristics of toddlers' mothers (age, marital status, education level and work status). Multinomial logistic regression testing was used in the final stage to determine variables that were predictors of stunting in toddlers.

RESULTS

Before conducting a multinomial logistic regression test, a colinearity test was carried out (Table 1). The results showed there was no colinearity between dependent and independent variables. Table 1 shows that the tolerance value of all variables was greater than 0.10, while the variance inflation factor value for all variables was less than 10.00. Therefore, it was concluded that there were no symptoms of multicollinearity in the regression model.

Statistical descriptions of toddler and mother characteristics are shown in Table 2. The average age of stunted toddlers was older than that of toddlers with a normal nutritional status. The nutritional status of stunted toddlers was significantly different between urban and rural areas. The average age of mothers of stunted toddlers was slightly older than that of mothers of toddlers with normal nutritional status. Toddlers in all nutritional status are dominated by married mothers. The educational status of mothers of stunted toddlers was predominantly primary schooling and below and stunted toddlers also predominantly had mothers who do not work outside the home.

Multivariate analysis: Table 3 shows multinomial logistic regression test results determining the characteristics of

mothers of toddlers as a predictor of the incidence of children under 5 years-old in Indonesia. In this test, normal nutritional status in toddler was used as a reference. Table 3 shows that

Table 1: Results for collinearity test

Variables	Collinearity statistics	
	Tolerance	VIF
Toddler's characteristic		
Toddler's age (in months; mean)	0.983	1.017
Area context		
Area	0.955	1.047
Mother's characteristics		
Mother's age (in years; mean)	0.971	1.029
Mother's marital status	0.995	1.005
Mother's education level	0.936	1.069
Mother's work status	0.961	1.040

*Dependent variable: Nutritional status of toddler

Table 2: Descriptive statistic of nutritional status of toddler and related variables

Variables	Nutritional status of toddler				p-value
	Severe stunted	Stunted	Normal	All	
Toddler's characteristic					
Toddler's age (in months; mean)	16814 (30.63)	30769 (31.72)	101988 (24.03)	149571 (26.35)	***0.000
Area context					
Area					***0.000
• Urban	3524 (20.96%)	7497 (24.37%)	28639 (28.08%)	39660 (26.51%)	
• Rural (Ref.)	13290 (79.04%)	23272 (75.63%)	73349 (71.92%)	109911 (73.48%)	
Mother's characteristics					
Mother's age (in years; mean)	16814 (30.24)	30769 (30.37)	101988 (30.10)	149571 (30.17)	***0.000
Mother's marital status					***0.000
• Single	117 (0.70%)	154 (0.50%)	461 (0.45%)	732 (0.49%)	
• Married	16428 (97.70%)	30190 (98.12%)	100404 (98.45%)	147022 (98.30%)	
• Divorce (Ref.)	269 (1.60%)	425 (1.38%)	1123 (1.10%)	1817 (1.21%)	
Mother's education level					***0.000
• Primary school and Under	6384 (37.97%)	10257 (33.34%)	27949 (27.40%)	44590 (29.91%)	
• Junior high school	4390 (26.11%)	8053 (26.17%)	25079 (24.59%)	37522 (25.09%)	
• Senior high school	4930 (29.32%)	10121 (32.89%)	37536 (36.80%)	52587 (35.16%)	
• College (Ref.)	1110 (6.60%)	2338 (7.60%)	11424 (11.20%)	14872 (9.94%)	
Mother's work status					***0.000
• No work	11746 (69.86%)	22219 (72.21%)	71535 (70.14%)	105500 (70.54%)	
• Work	5068 (30.14%)	8550 (27.79%)	30453 (29.86%)	44071 (29.46%)	

Chi-square used for dichotomous variables and t-test used for continuous variables. Significant at the 95% level, p<0.05, p<0.01, p<0.001

Table 3: Multinomial logistic regression of nutritional status of toddler

Predictors	Severe stunted			Stunted		
	OR	Lower bound	Upper bound	OR	Lower bound	Upper bound
Toddler's characteristic						
Age	1.026*	1.025	1.027	1.030*	1.029	1.030
Area context						
Area: Urban	0.733*	0.704	0.763	0.839*	0.813	0.865
Mother's characteristics						
Age	0.994*	0.991	0.996	0.997*	0.995	0.999
Marital status: single	1.207	0.943	1.545	0.991	0.797	1.233
Marital status: married	0.771*	0.672	0.883	0.862*	0.768	0.967
Education: under primary school	2.248*	2.096	2.410	1.669*	1.583	1.759
Education: junior high school	1.754*	1.632	1.885	1.473*	1.396	1.555
Education: senior high school	1.363*	1.270	1.463	1.267*	1.203	1.334
Work status: no work	0.951*	0.916	0.987	1.081*	1.049	1.114

Reference category was "normal"; confidence interval of 95% for OR; *significant at 95% level

toddlers living in urban areas had 0.839-times greater risk of stunting (OR: 0.839; 95% CI: 0.813-0.865) and 0.733-times more likely to be severely stunted (OR: 0.733; 95% CI: 0.704-0.763) compared to toddlers living in rural areas.

With respect to characteristics of mothers (Table 3), age was found to be a significant predictor of stunting risk in toddlers. Toddlers with married mothers were at 0.862-times risk of stunting (OR: 0.862; 95% CI: 0.768-0.967) and 0.771-times risk of becoming severely stunted (OR: 0.771; 95% CI: 0.672-0.883) compared to toddlers with divorced mothers. These results indicate that toddlers with married mothers have a lower risk of being stunted. Toddlers of mothers with only a primary school education were at 1.669-times more risk of stunting (OR: 1.669; 95% CI: 1.583-1.759) and 2.248-times greater risk of severe stunting (OR: 2.248; 95% CI: 2.096-2.410) compared to toddlers of college-educated mothers. Toddlers of mothers with up to a junior high school education had 1.473-times greater risk of stunting (OR: 1.473; 95% CI: 1.396-1.555) and 1.754-times higher risk of severe stunting (OR: 1.754; 95% CI: 1.632-1.885) compared to toddlers of college-educated mothers. Moreover, toddlers of high school-educated mothers were at 1.267-times higher risk of stunting (OR: 1.267; 95% CI: 1.203-1.334) and 1.363-times more risk of severe stunting (OR: 1.363; 95% CI: 1.270-1.463) compared to toddlers of college-educated mothers. Finally, Table 3 shows that toddlers of mothers who do not work had 1.081-times (OR: 1.081; 95% CI: 1.049-1.114) higher risk of stunting and 0.951-times greater risk of severe stunting (OR: 0.951; 95% CI: 0.916-0.987) compared to toddlers of working mothers.

DISCUSSION

The results of the present study showed five characteristics were predictors for stunting of toddlers in Indonesia, including place of residence (urban versus rural) and the mothers age, marital status, work status and education level. The results also indirectly indicate that growth of children is closely related to family care resources. Childcare involves provision of enough time, attention and support in order to meet the physical, mental and social needs required for proper growth and development of children[17-19] and begins even before birth[20].

Here, the results showed that toddlers of mothers with a higher level of education had a lower risk of stunting. Parental education is related to parenting resources and illustrates the capacity of caregivers to provide care[21,22]. These findings are in line with research conducted in several countries, including Ethiopia[23,24], Pakistan[25], Uganda[26], Tanzania[27] and Bangladesh[28]. Mothers with a higher level of education will

have more knowledge enabling them to better provide all needs of children, both physical and socio-emotional. This is also because the practice of parenting itself is also influenced by the mental health of the caregiver[18,29,30].

The WHO states that differences between rural and urban areas have an effect on the health status of the population. This is related to the accessibility and availability of healthcare, economic and information facilities[31]. Indonesia's current constraints are the lack of distribution of healthcare workers in rural areas, thereby restricting access to health services. The impact of this problem is an increase in healthcare costs and underutilization of healthcare workers in urban areas[32]. Research in Malawi has shown differences in the characteristics of children suffering from stunting in rural versus urban areas. More precisely, 90 and 89% of the stunting and underweight gaps, respectively, would be eliminated if there were no urban children with characteristics that positively influenced their nutrition that remained entirely unmatched by rural children[33].

Based on work status, the current results showed two different things. Mother who do not work has a lower risk for severely stunted child, as well as a higher risk for stunted child. Supposedly, mothers who do not work tend to have more time to care for their children compared to working mothers, thereby reducing the risk of stunting. This is consistent with the results of research conducted in India regarding workload and availability of parental time for childcare[34]. Furthermore, the present study indicates that children who live with married mothers are better protected against stunting. In the Indonesian context, men play a main role as breadwinners, while women are responsible for domestic household affairs[35,36]. Divorce makes sources of income chaotic and disrupts consistent food availability and quality.

Limitation of the study: A limitation of this study is that there are no variables directly related to stunting that can describe the quality of care, such as adequate nutrition, supplementary feeding and a history of infection.

CONCLUSION

Based on the results of the present study, it can be concluded that all variables tested were predictors of stunting in toddlers in Indonesia. There are five characteristics that can be used to predict risk of stunting in toddlers, namely the mothers age, marital status, education level, work status and area of residence. The current study demonstrates that stunting is a multidimensional factor that is highly related to the domestic environment in which toddlers live.

Strengthening the education sector and family resilience are keys to successfully reducing the prevalence of stunting in developing countries.

SIGNIFICANCE STATEMENT

This study explores the mothers' characteristics that are predictors of stunting in children under five in the Indonesian context. The results of this study are important for policymakers to determine the target of an accelerated intervention program to reduce the prevalence of stunting in children under five appropriately in Indonesia.

ACKNOWLEDGMENTS

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