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Maternal Risk Factor on Incidence of Stunting in South Sumatera

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Abstract

BACKGROUND: Stunting is an adverse result condition of unfulfilled nutritional intake during pregnancy and early childhood, which affects the children's maximum height and optimal cognitive potential. Stunting is influenced by numerous factors, both from the mother and children. Research has proven that factors related to mothers of children under 5 have essential roles in the incidence of stunting.

AIM: This study intends to analyze the influence of maternal risk factors on the incidence of stunting in children under 5 in districts/cities in South Sumatra.

METHODS: This study is quantitative research with a cross-sectional design, with secondary data sources from Basic Health Research 2018, carried out in 17 districts/cities in South Sumatra.

RESULTS: The mothers' characteristics most significantly related to stunting in children under 5 in the South Sumatra region are the mother's height and mother's education. Mothers with a height <150 cm have a 1.547 times higher risk of having stunting children (95% CI: 1.281–1.868), and mothers with low education have a 1.521 times higher risk of having stunting children (95% CI: 1.094–2.116). Moreover, mothers with secondary education are at 1.473 times higher risk of having stunting children (95% CI: 1.073–2.020).

CONCLUSION: The maternal risk factors most associated with stunting in children under five in South Sumatra are maternal height and mother's education.

Introduction

Stunting is an adverse result condition of unfulfilled nutritional intake during pregnancy and early childhood, which affects the maximum height and optimal cognitive potential. The impact of stunting may continue for a lifetime and even affect the next generation [1]. A child is said to have stunted growth if his height compared to his age is below 2 standard deviations (–2 SD), below the median of the World Health Organization (WHO) growth charts [2]. Stunting is a global malnutrition problem associated with chronic malnutrition, especially in poor and developing countries. Children with stunting are prone to have pathological changes, such as physical decline, cognitive performance, neurodevelopment, and an increased risk of metabolic diseases into adulthood [3], [4], [5], [6].

About 21.3% or around 144 million children under 5 were experiencing stunting in 2019. This figure decreased in 2020 to 22% or around 149.2 million children under 5 [1]. The first goal of the WHO in the Global Nutrition Targets 2025 is to reduce the number of stunting by 40% [7].

In Indonesia, the stunting rate for children under 5 from 2005 to 2017 was 36.4% and tended to be static yearly [8]. The results of Basic Health Research show that the prevalence of stunting in Indonesia in 2013 was 37.2%. It is a high increase from 2010 (35.6%) and 2007 (36.8%). The prevalence of stunting children under 5 in 2018 fell to 30.8%, consisting of 11.5% very short kids and 19.3% short kids [9], [10].

The prevalence of stunting of children under 5 in South Sumatra in 2018 was 32%, above the national prevalence of 30.8% [10]. Meanwhile, the Indonesia Nutrition Status Study (SSGI) in 2021 shows that the prevalence of stunting of children under 5 in Indonesia is 24.4%, and the province of South Sumatra has a higher figure, which is 24.8% [11].

Children under 5 with stunting conditions can potentially have a level of intelligence that is not optimal and lower immune function, so they are more prone to disease and have a high risk of declining productivity levels in the future [12]. Early investment in the health and nutrition of children under 5 plays a key role in children's cognitive performance. Providing a balanced diet and health services is the key to achieving the fulfillment of children's nutrition [5].

Stunting is influenced by various factors from both mother and children [3]. The previous research has proven factors related to mothers of children under 5 that plays an important role in stunting, including maternal education, mother's occupation, age at pregnancy, socioeconomic conditions, nutritional status of pregnant women, infectious diseases during pregnancy, and other factors [13], [14], [15], [16], [17], [18]. Mothers with low education and knowledge, early delivery age, infectious diseases, and low body weight during preconception are closely related to the incidence of stunting in children [13], [14], [15], [16], [17], [18].

This study was intended to analyze the influence of maternal risk factors on the incidence of stunting in children under 5 in the province of South Sumatra.

Methods

This study is a quantitative study using a cross-sectional design, with secondary data sources coming from Basic Health Research 2018 data, carried out in 17 districts/cities in the province of South Sumatra.

The population in this study were mothers who had children under 5, aged 0–59 months, in 17 districts/cities in the province of South Sumatra. The sample is part of the population, which in this study were mothers of children under 5 in households selected in the 2018 Basic Health Research. The sample determination in this study was carried out using probability proportional to size for secondary data derived from Basic Health Research data in 2018. Total, the initial sample of this study was 2346 toddlers minus toddlers whose body length/height was not measured (61 children under 5) and missing data for the variables of toddler stool disposal and types of drinking water facilities (10 children under 5) and mother's height (3 people) so that the sample used was used for the analysis amounted to 2272 children under five.

The data from individual mother data consist of height, frequency of antenatal care (ANC), maternal age, maternal education, and mother's occupation obtained from the 2018 Basic Health Research data. Data processing uses Stata. The stages of data processing include editing, coding, and tabulating.

The data were then analyzed using the logistic regression test to determine the determinants of stunting in children based on maternal risk factors in South Sumatra.

Results

Univariate analysis

Univariate analysis of the data obtained was conducted to determine the frequency distribution of all research variables. The total sample in this study was 2272 mothers and 2272 children under 5. The following data on stunting in toddlers and maternal characteristics are shown in Table 1.

Based on the frequency distribution of the characteristics of mothers and children under 5 (Table 1), it was found that in this study, there were more children under 5 with stunting than those without stunting or 68.8%, and most of the sample mothers had a height of more than 150 cm (68.6%), the frequency of complete ANC (62.9%), maternal age 20–35 years (75.5%), secondary education (54.8%), and not working (50.7%).

Table 1: Distribution of the frequency of stunting children and maternal characteristics in South Sumatra

Characteristics	Total, *n* (%)
Stunting children	
Yes	708 (31.2)
No	1564 (68.8)
Maternal height (cm)	
< 150	714 (31.4)
≥ 150	1558 (68.6)
ANC frequency	
Incomplete	842 (37.1)
Complete	1430 (62.9)
Maternal age at childbirth (years)	
< 20	204 (9.0)
20–35	1715 (75.5)
> 35	353 (15.5)
Maternal education	
Low	772 (34.0)
Middle	1245 (54.8)
High	255 (11.2)
Maternal employment	
Employed	1119 (49.3)
Unemployed	1153 (50.7)

ANC: Antenatal care.

Bivariate analysis

Bivariate analysis was conducted to determine the relationship between the dependent variable (stunting) and the independent variables of maternal height, frequency of ANC, maternal age, maternal education, and maternal occupation. The results of the bivariate analysis are shown in Table 2.

Based on the result in Table 2, it is known that three variables show results related to stunting, namely, maternal height, namely, with $p < 0.0001$ and PR 1.361 (1,204–1.539), low level of maternal education, namely, with $p= 0.003$ and PR is 1.639 (1.181–2.273), and the mother's education is at the secondary level, with $p= 0.007$ and PR is 1.538 (1.123–2.107).

Multivariate analysis

After obtaining the results of the bivariate analysis, a selection of candidates for multivariate

Table 2: Bivariate analysis of mother's characteristics on the incidence of stunting toddlers

Variable	Stunting		p	PR (95% CI)
	Yes, *n* (%)	No, *n* (%)		
Maternal height (cm)				
< 150	272 (38.1)	442 (61.9)	<0.0001*	1.361 (1.204–1.539)
≥ 150	436 (28.0)	1.122 (72.0)		
ANC frequency				
Incomplete	254 (30.2)	588 (69.8)	0.460	0.950 (0.836–1.080)
Complete	454 (31.7)	976 (68.3)		
Maternal age at childbirth (years)				
< 20	71 (34.8)	133 (65.2)	0.303	1.174 (0.865–1.594)
20–35	536 (31.3)	1.179 (68.7)	-	Reference
> 35	101 (28.6)	252 (71.4)	0.328	0.882 (0.685–1.135)
Maternal education				
Low	255 (33.0)	517 (67.0)	0.003*	1.639 (1.181–2.273)
Middle	394 (31.6)	851 (68.4)	0.007*	1.538 (1.123–2.107)
High	59 (23.1)	196 (76.9)	-	Reference
Maternal employment				
Employed	362 (32.4)	757 (67.6)	0.246	1.078 (0.954–1.218)
Unemployed	346 (30.0)	807 (70.0)		

ANC: Antenatal care, CI: Confidence interval, PR: Prevalence ratio, * Significant p value < 0.05

analysis was carried out, which aims to determine the predictive model of several maternal characteristic variables that are related to or have an effect on the incidence of stunting in the province of South Sumatra using a simple logistic regression test.

After analyzing these variables, it can be seen on Table 3 that only two variables have p < 0.25, namely, the mother's height variable and the mother's education variable, divided into two groups, namely, low maternal education and middle maternal education.

The variables of maternal height, low maternal education, and secondary maternal education were included in the multivariate analysis model. The variable that has the most significant p-value is removed gradually. The multivariate analysis modeling is shown in Table 4.

Based on model I of multivariate analysis, the variable of maternal age, having the most significant p value, is excluded from the model. Furthermore, in model II of multivariate analysis, the ANC frequency variable having the most significant p-value is excluded from the model. In model III of multivariate analysis, the maternal employment variable has the most significant p-value, so it is excluded from the model. There is no more p-value in model IV < 0.05. Then, It is proceeded to the final modeling and it is known that there is no change in value. Therefore, it does not continue to the subsequent modeling.

By this result, it can be concluded that maternal height and mother's education are most related to the incidence of stunting in children under 5 in the South Sumatra region.

It is known that the maternal height variable has the highest correlation with the incidence of stunting in children under 5. A maternal height of <150 cm has a

Table 3: Selection of candidates for multivariate analysis

Variable	p	Category
Maternal height	0.000	Candidate
ANC frequency	0.132	Not candidate
Maternal age at childbirth	0.220	Not candidate
Maternal education	0.012	Candidate
Maternal employment	0.056	Not candidate

ANC: Antenatal care.

Table 4: Multivariate analysis modeling

Variable	p	OR	95% CI
Model I			
Maternal height	0.000	1.571	1.300
ANC frequency	0.132	0.864	0.714
Maternal age at childbirth			
< 20 years old	0.387	1.147	0.841
> 35 years old	0.166	0.834	0.645
Maternal education			
Low	0.003	1.667	1.186
Middle	0.008	1.559	1.125
Maternal employment	0.056	1.196	0.996
Model II			
Maternal height	0.000	1.555	1.287
ANC frequency	0.125	0.862	0.713
Maternal education			
Low	0.003	1.667	1.188
Middle	0.005	1.595	1.153
Maternal employment	0.063	1.189	0.990
Model III			
Maternal height	0.000	1.545	1.279
Maternal education			
Low	0.006	1.600	1.144
Middle	0.007	1.563	1.131
Maternal employment	0.074	1.181	0.984
Model IV			
Maternal height	0.000	1.547	1.281
Maternal education			
Low	0.013	1.521	1.094
Middle	0.016	1.473	1.073
Final model			
Maternal height	0.000	1.547	1.281
Maternal education			
Low	0.013	1.521	1.094
Middle	0.016	1.473	1.073

OR: Odds ratio, ANC: Antenatal care, CI: Confidence interval.

1.547 times higher risk of having stunting children than a maternal height of 150 cm after being controlled by maternal education (95% CI: 1.281–1.868).

Mothers with low education are at 1.521 times higher risk of having stunting children than mothers with high education after controlling for maternal height (95% CI: 1.094–2.116). Mothers with middle education are 1.473 times higher risk of having stunting children than mothers with higher education after controlling for maternal height (95% CI: 1.073–2.020).

Discussion

The relation between maternal height and the incidence of stunting

Maternal height is an intergenerational indicator related to maternal and child health nutrition. The study results show that maternal height is related to the occurrence of stunting in children. It is in line with previous studies which showed a positive relationship between mothers' height and stunting children [19], [20], [21], [22], [23].

Several mechanisms might explain the relationship between parental height and stunted children, such as an intergenerational relationship that may reflect genetic mechanisms passed on to children [22]. In short stature women, physical mechanisms such as the development of the anatomical system of pregnancy and metabolic mechanisms are not optimal, also having low maternal glucose levels and reduced protein and energy storage. These

factors lead to impaired intrauterine development and delayed linear growth of infants [23]. It suggests that short maternal stature indicates cumulative nutritional deficiency during growth. Poor nutritional status in pregnant women affects the growth of the placenta and results in an inadequate transfer of nutrients to the fetus. Malnutrition *in utero* causes epigenetic changes (i.e., DNA methylation) to alter the fetal program resulting in abnormal fetal growth, and eventually, the baby is born with low birth weight (LBW). LBW infants have an immature immune system which makes the baby more susceptible to infection, while infection increases the risk of acute malnutrition due to mucosal damage, impaired absorption of essential nutrients, and weight loss [22].

The relation between ANC frequency and the incidence of stunting

The logistic regression test result showed that the frequency of ANC did not affect the incidence of stunting in children under 5. It is in line with the previous studies, which showed that the frequency of ANC was negatively related to the prevalence of stunting [24], [25]. Compared to the frequency of ANC, the quality of ANC determines the nutritional status of children [25]. However, these results are contradictory, with several studies showing that higher complete ANC coverage affects stunting in children [26], [27], [28]. Mothers who do not meet ANC standards have a 2.3 times risk of having stunting toddlers. Routine ANC care visits are four visits during pregnancy [28].

ANC is a pregnancy examination done by a health worker on pregnant women during pregnancy with at least four visits [29]. ANC is important because it aims to monitor the health of mothers and babies. ANC provides intervention and focused antenatal care according to the mother's instructions and complaints. ANC can promote healthy skills and behaviors of mothers during newborn, such as breastfeeding, early postnatal care, and planning for future pregnancies [30].

The relation between maternal age at childbirth and the incidence of stunting

The results showed that the age of the maternal age at childbirth was not associated with the incidence of stunting. The previous research has also shown no significant relationship between maternal age and the incidence of stunting [31]. The age of the mother at high risk in pregnancy is >20 or <35 years [9], and the relatively young age of the mother is closely related to failure to thrive in infants aged 0–11 months [32]. There is a significant relationship between stunting and maternal age at risk (<20 years or >35 years) [33].

Based on Stephenson and Schiff (2018), pregnant mothers in their teens will cause competition between their bodies and fetuses to get the nutrients they need because mothers are still physically growing. It will cause the mother to risk carrying an intrauterine growth restriction (IUGR) fetus and giving birth to a child who is LBW and short. In addition, young mothers are also psychologically immature in their mindset, which causes healthy parenting for children to be not as good as older mothers [34], [35].

The relation between maternal education and the incidence of stunting

The results of research on maternal education related to stunting are in line with the previous studies, which showed that parental education was a significant determinant of stunting in children under 5 [36], [37], [38], [39]. Parents with low education tend to exhibit stunting in toddlers [36], [40]. The incidence of stunting is related to the level of parental education, which is more likely to occur in parents with low education. It is related to limited family income and results in inadequate care and a lack of attention to children's health [37].

Mothers with higher education are more likely to be able to make decisions about improving children's health and nutrition. This decision also includes providing children with proper and good formal and informal education to break the chain of ignorance, trying their best to provide sufficient breast milk, giving complete immunizations, and so on so that maternal education becomes an essential factor in reducing stunting [41].

The relation between maternal employment and the incidence of stunting

This study's results indicate no relationship between the mother's occupation and the incidence of stunting. It is in line with several previous studies, which also showed no relationship between maternal employment status and the incidence of stunting in children [35], [42]. Research conducted by Rashad and Sharaf (2018) found that maternal occupation was unrelated to child nutrition or did not contribute to the incidence of child stunting in Egypt. Compared to working mothers, non-working mothers in Ethiopia are 23% less likely to have a stunted child [43], [44]. Studies have analyzed the type of mother's occupation associated with the likelihood of children being stunted. For example, a higher likelihood of stunting was reported in children whose mothers worked in agriculture or manual work than in mothers who worked in professional occupations in Uganda [14].

Conclusion

The mothers' characteristics most related to the incidence of stunting in toddlers in the South

Sumatra region are maternal height and mother's education. Mothers with a height <150 cm have a 1.547 times higher risk of having stunting toddlers (95% CI: 1.281–1.868), and mothers with low education have a 1.521 times higher risk of having stunting toddlers (95% CI: 1.094–2.116). Furthermore, mothers with secondary education are at 1.473 times higher risk of having stunting under 5 (95% CI: 1.073–2.020).

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