

## Education Role of Stunted Under Two among Teenage Mothers in Indonesia

### ABSTRACT

**Aims** Teenage mothers face unique vulnerabilities due to their lack of physical readiness and limited knowledge in child-rearing. This study investigated how maternal education influences stunting in children under two among teenage mothers in Indonesia.

**Materials & Methods** A cross-sectional analysis was conducted using data from the 2022 Indonesian National Nutritional Status Survey, covering 2,254 children under two. Seven variables were assessed: place of residence, marital status, employment, antenatal care, child age, gender, and early initiation of breastfeeding. A binary logistic regression analysis was employed for the final analysis.

**Findings** The study indicate that 19.6% of children with teenage mothers were stunted. Mothers with primary school education were 1.308 times more likely to have stunted children compared to those with a senior high school education (AOR 1.308; 95% CI 1.250-1.369). Additionally, mothers with a junior high school education had a 1.103 times higher likelihood of having stunted children than those with senior high school education (AOR 1.103; 95% CI 1.054-1.154).

**Conclusion** Mothers with lower education levels had higher chances of having stunted children. These results underscore the importance of improving maternal education as a strategy to reduce stunting in children under two, particularly among teenage mothers in Indonesia.

**Key words** Stunting; Maternal Education; Nutritional Status; Public Health nutrition

### Introduction

Stunting, defined as a child's height or length falling below minus two standard deviations from the World Health Organization (WHO) Child Growth Standards, is a critical global public health concern, particularly in low- and middle-income countries <sup>[1-3]</sup>. The first 1,000 days of life, from conception to a child's second birthday, are recognized as a critical window for growth and development <sup>[4,5]</sup>. During this period, rapid physical growth and brain development take place, requiring adequate nutritional intake and supportive care. Failure to meet these needs results in irreversible impairments in linear growth and cognitive potential <sup>[6-8]</sup>.

Children who experience stunting face long-term consequences, including compromised immune function, delayed motor and cognitive development, poor academic performance, and reduced economic productivity in adulthood <sup>[9,10]</sup>. These impacts extend beyond the individual, contributing to intergenerational cycles of poverty and poor health. For instance, women who were stunted in childhood are more likely to have low-birth-weight babies, perpetuating the cycle of undernutrition and development disadvantage <sup>[11]</sup>.

Multiple determinants, contribute to stunting, including poor maternal nutrition, limited access to healthcare, inadequate sanitation, and low household income. Among these, maternal education has been consistently identified as a critical factor <sup>[12-17]</sup>. Higher educational attainment among mothers is strongly associated with improved child feeding practices, better health-seeking behaviour, and lower rates of child stunting. IN contrast, children born to mothers with only primary education or less face significantly higher

risks of stunted growth. In Indonesia, for example, mothers with primary or lower education levels are 1,587 times more likely to have stunted children under two years of age compared to those with higher education<sup>[4]</sup>.

Adolescent motherhood significantly intensifies this problem. Early childbearing is associated with a range of adverse reproductive and nutritional outcomes, including inadequate prenatal care, poor maternal nutritional status, and limited autonomy in health-related decision-making<sup>[18-20]</sup>. These factors place children born to teenage mothers at greater risk of stunting.

Given the dual vulnerability posed by low maternal education and adolescent motherhood, it is essential to investigate their combined effect on early childhood stunting. This study aims to examine the role of maternal education in influencing stunting among children under two years born to teenage mothers in Indonesia.

## **Materials and Methods**

### **Study design**

The study uses additional data from the 2022 Indonesian National Nutritional Status Survey, which was conducted by the Indonesian Ministry of Health through a nationwide cross-sectional study.

### **Participants**

The survey included all infants aged 23 months or younger with adolescent mothers aged 19 years or younger living in Indonesia. While the survey targeted mothers, the study focused on children under two years old. A sample of 2,254 individuals was selected through a multi-stage cluster random sampling method, with the sample being weighted. The survey achieved a response rate of 91.4%.

### **Data collection**

The study uses nutritional status, specifically stunting, as the outcome variable. Stunting was classified into two categories: normal ( $\geq -2.0$  standard deviation) and stunted ( $< -2.0$  standard deviation). The height indicator, also known as the z-score or deviation from the average height, is derived from the WHO growth standards and is used to assess a child's nutritional status based on their age or height at a particular time. Maternal education was considered as the exposure variable and categorized into four levels: elementary, junior high, and senior high.

The study examined seven control variables: residence, maternal marital status, employment status, prenatal care during pregnancy, children's age, gender, and early initiation of breastfeeding. Residences were categorized as urban or rural, while marital status was divided into two groups: married and divorced/widowed. Maternal employment status was classified into labor and unemployment.

Economic status was assessed based on the wealth quintiles of household possessions, including items like televisions, bicycles, and cars. The survey also evaluated the availability of clean water, sanitation facilities, and structural features of the home. Principal component analysis was used to calculate the wealth score. A sample of 20% of the population was selected for the study, and national wealth quintiles were determined by combining household scores. These quintiles were further divided into five categories: Quintile 1 (poorest), Quintile 2 (lower socioeconomic status), Quintile 3 (middle socioeconomic status), Quintile 4 (higher socioeconomic status), and Quintile 5 (wealthiest).

Additionally, prenatal care during pregnancy was classified into complete and incomplete antenatal services. In the study, children were grouped into two age categories: 0-11

months and 12-23 months. The study also identified a clear distinction between male and female children. Furthermore, early initiation of breastfeeding was categorized as either yes or no.

### **Statistical analysis**

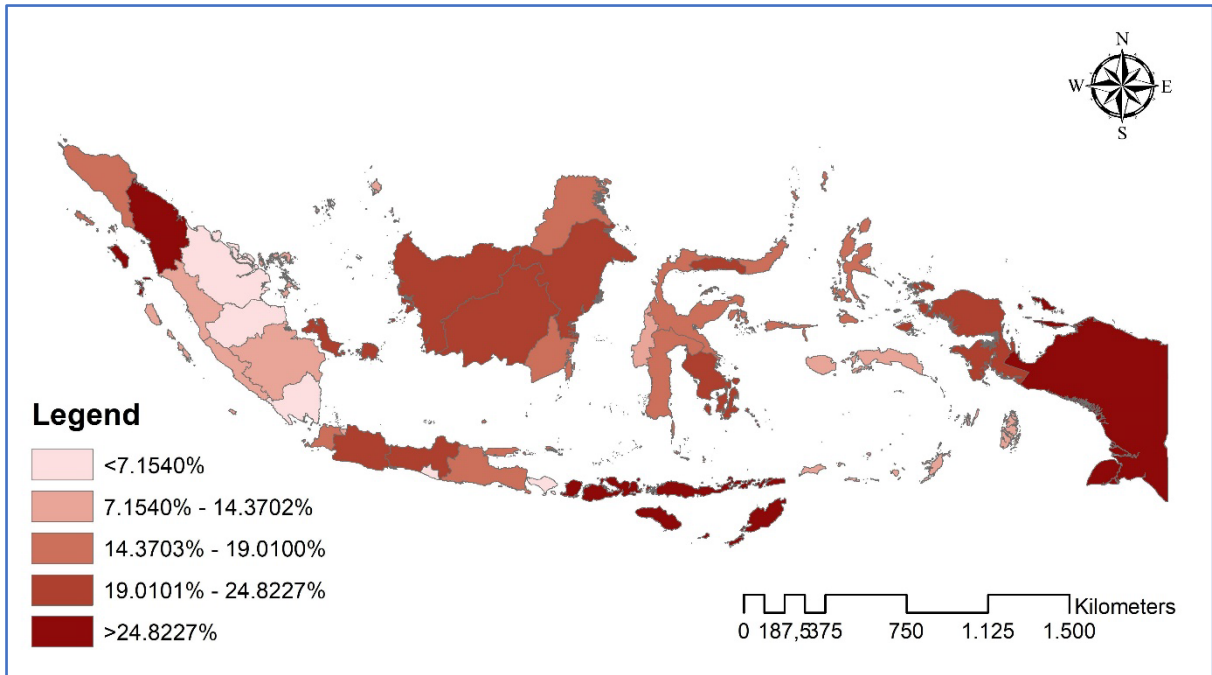
In this study, a Chi-Square test was used for bivariate analysis, followed by a co-linearity test to examine the presence of statistically significant relationships among the independent variables. Additionally, a linearity test was performed to assess the connections between the variables before conducting a binary logistic regression analysis for multivariate analysis. Following this, a binary logistic regression analysis was performed for multivariate analysis. The data were processed using the Statistical Package for Social Science (SPSS, version 26). Additionally, ArcGIS 10.3 (ESRI Inc., Redlands, CA, USA) was utilized to generate a distribution map showing the prevalence of stunted children born to teenage mothers across various provinces in Indonesia. The Indonesian Statistics provided a shapefile containing polygons representing the administrative boundaries for the analysis.

### **Ethical Consideration**

The study used secondary data obtained from the 2022 Indonesian National Nutritional Status Survey. The National Ethics Commission classified the study as "exempt," as indicated in the provided notification letter. Data for the survey was collected by the Indonesian Ministry of Health, with participants providing signed informed consent. These consent forms emphasized that participation was voluntary and confidential. The Indonesian Ministry of Health also made the data available to researchers through an online platform, which can be accessed at <https://layanandata.kemkes.go.id/>.

### **Findings**

The results showed that 19.6% of children under two in Indonesia with teenage mothers suffered from stunted growth. Figure 1 presents a geographical map illustrating the prevalence of stunting in children under two across different provinces in Indonesia. However, the map does not reveal any clear spatial trends. The prevalence of stunted children was spread randomly across various areas in Indonesia's eastern, central, and western regions.



**Figure 1:** Indonesian Province-by-Province Stunted Under Two with Teenage Mothers

Figure 1 presents a map showing the prevalence of stunted children under two years old with teenage mothers across Indonesian provinces, as visualized by the authors. Table 1 provides descriptive statistics on the educational background and nutritional status of Indonesian children under two with teenage mothers. The results indicated that higher maternal education was associated with a lower percentage of stunted children. In terms of residence, rural areas had the highest proportion of stunted children across all maternal education levels. Additionally, married mothers were the majority in all education categories, and unemployed mothers predominated across all levels of maternal education.

**Table 1.** Descriptive Statistic of Maternal Education and Nutritional Status Indonesian Under Two with Teenage Mothers ( $n = 2,254$ )

Variables	Maternal Education			High p-value
	Primary School (n=840)	Junior School (n=950)	HighSenior School (n=464)	
Nutritional Status				< 0.001
Normal	78.0%	81.2%	84.1%	
Stunted	22.0%	18.8%	15.9%	
Type of Residence				< 0.001
Urban	37.9%	37.5%	49.4%	
Rural	62.1%	62.5%	50.6%	
Maternal Marital Status				< 0.001
Married	92.3%	93.2%	90.3%	
Divorced/Widowed	7.7%	6.8%	9.7%	
Maternal Employment				< 0.001
Unemployed	86.7%	85.8%	83.6%	
Employed	13.3%	14.2%	16.4%	
Wealth Status				< 0.001
Poorest	33.1%	30.0%	17.0%	

Variables	Maternal Education			p-value
	Primary School (n=840)	Junior School (n=950)	HighSenior School (n=464)	
Poorer	39.0%	35.9%	35.1%	< 0.001
Middle	15.3%	17.4%	13.5%	
Richer	10.1%	13.1%	26.0%	
Richest	2.4%	3.7%	8.4%	
Antenatal care during Pregnancy				< 0.001
No	7.4%	6.3%	6.7%	
Yes	92.6%	93.7%	93.3%	< 0.001
Kid's age (in months)				
0 – 11	57.0%	58.7%	69.4%	
12 – 23	43.0%	41.3%	30.6%	< 0.001
Kid's gender				
Boy	51.5%	48.0%	50.4%	
Girl	48.5%	52.0%	49.6%	< 0.001
Early Initiation of Breastfeeding				
No	47.4%	48.9%	50.8%	
Yes	52.6%	51.1%	49.2%	

Table 1 reveals that lower wealth status was more prevalent across all maternal education levels. In terms of antenatal care, teenage mothers who received antenatal care were the majority in all education categories. Regarding children's age, mothers with infants aged 0-11 months were more common across all education levels. In terms of gender, mothers with male children were more prevalent in the senior high education group. Additionally, mothers who did not initiate breastfeeding early tended to have a slightly higher proportion of stunted children compared to those who began breastfeeding early.

The study then conducted co-linearity tests, which showed no correlation between the independent variables. The results revealed that the variance inflation factor (VIF) values for all variables were below 10.00, while the average tolerance values for all variables were above 0.10. The multicollinearity test, which guided decisions in the regression model, confirmed that there were no significant relationships between any of the independent variables.

Table 2 presents the results of the binary logistic regression analysis. The findings indicate that mothers with primary school education were 1.308 times more likely to have stunted children compared to those with senior high school education (AOR 1.308; 95% CI 1.250-1.369). Additionally, mothers with junior high school education were 1.103 times more likely to have stunted children than those with senior high school education (AOR 1.103; 95% CI 1.054-1.154).

**Table 2.** Binary Logistic Regression of Nutritional Status of Indonesian Under Two with Teenage Mothers ( $n = 2,254$ )

Predictors	Stunting			
	p-value	AOR	95% CI Lower Bound	Upper Bound
Maternal Education: Primary school	**<0.001	1.308	1.250	1.369
Maternal Education: Junior high school	**<0.001	1.103	1.054	1.154
Maternal Education: Senior high school (ref.)	-	-	-	-
Residence: Urban (ref.)	-	-	-	-
Residence: Rural	**<0.001	1.198	1.162	1.236
Maternal marital: Married (ref.)	-	-	-	-
Maternal marital: Divorced/widowed	**<0.001	1.450	1.376	1.527
Maternal employment: Unemployed (ref.)	-	-	-	-
Maternal employment: Employed	**<0.001	1.091	1.046	1.138
Wealth: Poorest (ref.)	-	-	-	-
Wealth: Poorer	**<0.001	.930	.897	.964
Wealth: Middle	**<0.001	.803	.765	.842
Wealth: Richer	**<0.001	.830	.789	.873
Wealth: Richest	*0.009	1.109	1.026	1.198
Antenatal care: No	**<0.001	1.947	1.850	2.049
Antenatal care: Yes (ref.)	-	-	-	-
Kid's age: 0 - 11 (ref.)	-	-	-	-
Kid's age: 12 – 23	**<0.001	2.506	2.432	2.582
Kid's Gender: Boy	**<0.001	1.138	1.104	1.172
Kid's Gender: Girl (ref.)	-	-	-	-
EIBF: No	**<0.001	1.382	1.341	1.424
EIBF: Yes (ref.)	-	-	-	-

Note: AOR: Adjusted Odds Ratio; CI: Confidence Interval; \*p<0.010; \*\*p<0.001

Additionally, Table 2 shows that all control variables were associated with stunting in children under two among teenage mothers in Indonesia. Regarding residence type, children with adolescent mothers in rural areas were 1.198 times more likely to be stunted compared to those in urban areas (AOR 1.198; 95% CI 1.162-1.236). The study also identified three maternal characteristics (marital status, employment, and wealth) that were linked to stunted children.

According to antenatal care data, Table 2 reveals that teenage mothers who did not receive antenatal care are 1.947 times more likely to have stunted children under two compared to those who received antenatal care (AOR 1.947; 95% CI 1.850-2.049). The study also identified two child characteristics (age and gender), that were associated with stunting. Additionally, the results showed that mothers who did not initiate breastfeeding early were 1.382 times more likely to have stunted children compared to those who initiated breastfeeding early (AOR 1.382; 95% CI 1.341-1.424).

## Discussion

The study emphasized the relationship between the educational level of adolescent mothers in Indonesia and the increased risk of stunting in their children under two years old. In Indonesia, early marriages among adolescent girls often result in malnutrition and



pregnancy complications. These challenges increase the likelihood of maternal and child mortality, particularly among girls aged 15-19 <sup>[21, 22]</sup>. Adolescent mothers who are malnourished are more prone to having malnourished children, perpetuating a cycle of inadequate nutrition <sup>[23, 24]</sup>. Breaking this cycle requires ensuring that adolescent girls experience proper growth and improved nutrition, which can lead to healthier behaviors in the future <sup>[25, 26]</sup>.

The study also revealed that lower levels of maternal education are strongly associated with an increased likelihood of stunting in children. Mothers with less education are more likely to have stunted children than those with higher educational attainment <sup>[27]</sup>. A mother's education level is essential in breaking the cycle of poverty and enhancing the future opportunities for their children. Previous studies have shown that lower maternal education raises the likelihood of stunting in children <sup>[28-30]</sup>.

The study also found that children born to adolescent mothers in rural areas are at a higher risk of stunting compared to those living in urban areas. Previous studies have highlighted rural residency as a key factor contributing to stunting in Indonesia <sup>[13, 31]</sup>. Although there has been progress in addressing child health disparities, children in rural, peripheral, or remote areas continue to experience poorer health outcomes compared to those in urban areas <sup>[32]</sup>. Inadequate sanitation and restricted access to healthcare services are major contributors to the high rates of stunting in these areas <sup>[33, 34]</sup>.

The study also explored maternal characteristics and found that marital status, employment, and wealth were strongly linked to stunting in children. Divorced or widowed mothers were more likely to have stunted children, a finding consistent with previous studies. In Indonesia, where men typically manage economic responsibilities and women handle domestic duties, divorced or widowed mothers face additional pressures that can adversely impact their children's nutrition <sup>[35]</sup>.

Surprisingly, the study revealed that employed mothers had a higher likelihood of having children with stunted growth. <sup>[36]</sup> This finding contrasts with some prior research conducted in Indonesia, but aligns with results from other regions <sup>[37]</sup>. The findings imply that employment type and income level could be contributing factors. Mothers in low-wage jobs may face difficulties providing adequate nutritious food for their children, potentially contributing to malnutrition <sup>[38, 39]</sup>. Additionally, younger working mothers may lack proper parenting knowledge, which could further elevate the risk of stunting <sup>[40]</sup>.

The research also revealed that teenage mothers from higher socioeconomic backgrounds had a greater likelihood of having stunted children. This finding contrasts with certain earlier studies that associated greater household wealth with improved child nutrition <sup>[38, 41]</sup>. One potential explanation is that, despite their improved economic status, the long-term impacts of early childhood poverty could continue to affect their children's growth <sup>[42]</sup>. Earlier studies indicate that the prevalence of stunting in newborns does not significantly differ between low- and high-income households <sup>[43]</sup>.

Regarding healthcare access, the study found that insufficient prenatal care was associated with a higher likelihood of child stunting. Adequate antenatal care plays a vital role in monitoring maternal and fetal wellbeing, and its absence may elevate the risk of impaired growth in children <sup>[44]</sup>. Multiple studies have demonstrated that consistent antenatal care attendance significantly lowers the probability of childhood stunting <sup>[45, 46]</sup>. Enhanced healthcare accessibility, particularly antenatal services, may mitigate stunting risks, especially among mothers in geographically isolated regions <sup>[47]</sup>.

The study also explored the role of child age and gender in stunting. Children between the ages of 12 and 23 months are more likely to experience stunting compared to younger children<sup>[48]</sup>. Stunting is also more common in boys than girls, with male children having a higher likelihood of experiencing growth failure<sup>[49]</sup>. This may be related to differences in body composition and nutritional needs between boys and girls<sup>[50]</sup>.

In line with Regulation 72/2021 from the President of the Republic of Indonesia, the achievement of the 2030 Sustainable Development Goals is driven by five key pillars outlined in the National Strategy for Accelerating Decline. One of the primary elements of stunting prevention is ensuring strong leadership commitment and a clear vision from ministries, agencies, provincial governments, regional governments, districts, cities, and village governments. Another critical component involves enhancing communication and empowering communities through behavioral changes. The strategy also emphasizes the integration of targeted and sensitive interventions across various government levels and sectors. Furthermore, it seeks to improve food and nutritional security at the individual, family, and community levels while focusing on strengthening systems for data collection, research, and innovation.

The study further revealed that timely initiation of breastfeeding served as a protective factor against stunting, with mothers practicing early breastfeeding demonstrating lower rates of child stunting. This finding aligns with existing literature documenting the preventive effect of early breastfeeding on stunting risk<sup>[51, 52]</sup>. The study findings indicate that early breastfeeding delivers crucial nutritional components, particularly colostrum, which enhances neonatal immune function and provides protective effects against infectious diseases<sup>[53]</sup>.

While this study provides significant contributions to the understanding of child stunting, several limitations should be acknowledged. The research was predominantly based on survey data, which may not capture all relevant variables. Notably, the analysis did not account for several potentially influential factors that have been demonstrated as significant in other studies, including maternal anthropometric measurements (height and weight), maternal anemia status, and agricultural productivity during the gestational period<sup>[4, 54-55]</sup>. Furthermore, the investigation did not comprehensively account for the potential influence of cultural determinants on Indonesian parenting styles, dietary preferences, and nutritional behaviors, a factor that may have introduced limitations to the interpretability and generalizability of the study's conclusions<sup>[56]</sup>.

## **Conclusion**

The findings of this study indicated a significant inverse relationship between maternal education levels and the prevalence of stunting in children under two years of age born to adolescent mothers in Indonesia. Specifically, lower educational attainment in teenage mothers was associated with a higher likelihood of their children experiencing stunted growth. Consequently, based on these analytical outcomes, it is recommended that governmental interventions prioritize adolescent mothers with limited educational backgrounds. Policy initiatives aimed at promoting antenatal care engagement among this demographic are warranted. These prenatal healthcare interactions offer a valuable opportunity to enhance their understanding of stunting and other crucial aspects of childcare.