



Education Role of Stunted Under Two in Teenage Mothers in Indonesia



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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 years old among teenage mothers in Indonesia.

Instrument & Methods This cross-sectional analysis was conducted using data from the 2022 Indonesian National Nutritional Status Survey, covering 2,254 children under two years old. Place of residence, marital status, employment, antenatal care, child age, gender, and early initiation of breastfeeding were assessed among the subjects. A binary logistic regression analysis was employed for the final analysis.

Findings The proportion of children with teenage mothers who were stunted was 19.6%. Mothers with primary school education were 1.308 times more likely to have stunted children compared to those with senior high school education (adjusted odds ratio: 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 (adjusted odds ratio: 1.103; 95% CI: 1.054-1.154).

Conclusion Mothers with lower education levels have higher chances of having stunted children.

Keywords Mothers; Education; Nutritional Status; Indonesia

CITATION LINKS

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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 [1-3]. The first 1,000 days of life, from conception to a child's second birthday, are recognized as a crucial window for growth and development [4, 5]. During this period, rapid physical growth and brain development occur, requiring adequate nutritional intake and supportive care. Failure to meet these needs results in irreversible impairments in linear growth and cognitive potential [6-8].

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 [9, 10]. 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 developmental disadvantage [11].

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 [12-17]. Higher educational attainment among mothers is strongly associated with improved child feeding practices, better health-seeking behavior, 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 [4].

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 [18-20]. These factors place children born to teenage mothers at a 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 aimed to examine the role of maternal education in influencing stunting among children under two years old born to teenage mothers in Indonesia.

Instrument and Methods

Study design

This cross-sectional study utilized 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 specifically focused on children under two years old. A sample of 2,254 individuals was selected using a multi-stage cluster random sampling method, and the sample was weighted. The survey achieved a response rate of 91.4%.

Data collection

The outcome measure was nutritional status. Stunting was classified into normal (≥ -2.0 standard deviations) and stunted (< -2.0 standard deviations) categories. The height indicator, also known as the z-score or deviation from the average height, was derived from the WHO growth standards and was used to assess a child's nutritional status based on their age or height at a particular time. Maternal education was categorized into elementary, junior high, and senior high levels.

Residence, maternal marital status, employment status, prenatal care during pregnancy, children's age, gender, and early initiation of breastfeeding were assessed among the subjects. Residences were categorized as urban or rural, while marital status was divided into two married and divorced/widowed. Maternal employment status was classified as employed or unemployed.

Economic status was assessed based on the wealth quintiles of household possessions, including items such as 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, 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 as complete or incomplete antenatal services. Children were grouped into two age categories of 0-11 months and 12-23 months. We also identified a clear distinction between male and female children. Furthermore, early initiation of breastfeeding was categorized as either "yes" or "no."

Statistical analysis

A Chi-square test was used for bivariate analysis, followed by a collinearity test to examine the presence of statistically significant relationships among the independent parameters. Additionally, a

linearity test was performed to assess the connections between the parameters before conducting a binary logistic regression analysis for multivariate analysis. Then, a binary logistic regression analysis was conducted for multivariate analysis. The data were processed using SPSS 26. Furthermore, 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.

Findings

The proportion of children with teenage mothers who were stunted was 19.6%. The prevalence of stunting in children under two across different provinces in Indonesia showed no clear spatial trends. The prevalence of stunted children was distributed randomly across various areas in Indonesia's eastern, central, and western regions (Figure 1).

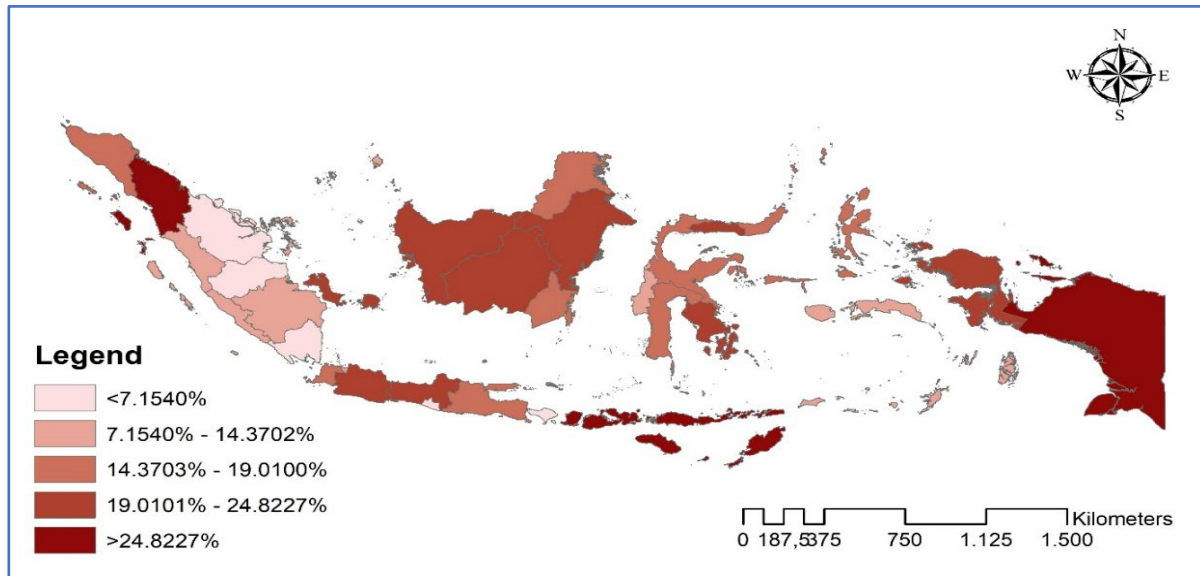


Figure 1. Indonesian province-by-province prevalence of stunting in children under two with teenage mothers.

Table 1. Frequency of demographic characteristics of Indonesian children under two with teenage mothers (n=2,254; p<0,001)

| Parameter | Maternal education | | |
|--|------------------------|----------------------------|----------------------------|
| | Primary school (n=840) | Junior high school (n=950) | Senior high school (n=464) |
| Nutritional Status | | | |
| Normal | 655 (78.0) | 771 (81.2) | 390 (84.1) |
| Stunted | 185 (22.0) | 179 (18.8) | 74 (15.9) |
| Residence | | | |
| Urban | 318 (37.9) | 356 (37.5) | 229 (49.4) |
| Rural | 522 (62.1) | 594 (62.5) | 235 (50.6) |
| Maternal marital status | | | |
| Married | 755 (92.3) | 855 (93.2) | 419 (90.3) |
| Divorced/Widowed | 65 (7.7) | 65 (6.8) | 45 (9.7) |
| Maternal employment | | | |
| Unemployed | 728 (86.7) | 815 (85.8) | 388 (83.6) |
| Employed | 112 (13.3) | 135 (14.2) | 76 (16.4) |
| Wealth status | | | |
| Poorest | 278 (33.1) | 285 (30.0) | 79 (17.0) |
| Poorer | 328 (39.0) | 341 (35.9) | 163 (35.1) |
| Middle | 129 (15.3) | 165 (17.4) | 63 (13.5) |
| Richer | 85 (10.1) | 124 (13.1) | 121 (26.0) |
| Richest | 20 (2.4) | 35 (3.7) | 39 (8.4) |
| Antenatal care during pregnancy | | | |
| No | 62 (7.4) | 60 (6.3) | 31 (6.7) |
| Yes | 778 (92.6) | 890 (93.7) | 433 (93.3) |
| Child's age (months) | | | |
| 0-11 | 479 (57.0) | 588 (58.7) | 322 (69.4) |
| 12-23 | 361 (43.0) | 392 (41.3) | 142 (30.6) |
| Child's gender | | | |
| Male | 433 (51.5) | 456 (48.0) | 234 (50.4) |
| Female | 407 (48.5) | 494 (52.0) | 230 (49.6) |
| Early initiation of breastfeeding | | | |
| No | 398 (47.4) | 465 (48.9) | 236 (50.8) |
| Yes | 442 (52.6) | 485 (51.1) | 228 (49.2) |

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 comprised the majority in all education categories, and unemployed mothers predominated across all levels of maternal education.

Lower wealth status was more prevalent across all maternal education levels. In terms of antenatal care, teenage mothers who received antenatal care comprised 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 (Table 1).

The variance inflation factor (VIF) values for all parameters were below 10.00, while the average tolerance values for all parameters were above 0.10.

Mothers with primary school education were 1.308 times more likely to have stunted children compared to those with senior high school education (adjusted odds ratio (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).

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). Marital status, employment, and wealth were linked to stunted children.

Teenage mothers who did not receive antenatal care were 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). Two child characteristics (age and gender) were associated with stunting. Additionally, 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; Table 2).

Table 2. Comparative analysis of nutritional status of Indonesian children under two with teenage mothers using binary logistic regression (n=2,254)

| Predictor | Levels | Stunting p-value | Adjusted odds ratio | 95% confidence interval | |
|-----------------------------------|---------------------------|------------------|---------------------|-------------------------|-------------|
| | | | | Lower bound | Upper bound |
| Maternal education | Senior high school (ref.) | - | - | - | - |
| | Primary school | <0.001 | 1.308 | 1.250 | 1.369 |
| | Junior high school | <0.001 | 1.103 | 1.054 | 1.154 |
| Residence | Urban (ref.) | - | - | - | - |
| | Rural | <0.001 | 1.198 | 1.162 | 1.236 |
| Maternal marital | Married (ref.) | - | - | - | - |
| | Divorced/widowed | <0.001 | 1.450 | 1.376 | 1.527 |
| Maternal employment | Unemployed (ref.) | - | - | - | - |
| | Employed | <0.001 | 1.091 | 1.046 | 1.138 |
| Wealth | Poorest (ref.) | - | - | - | - |
| | Poorer | <0.001 | 0.930 | 0.897 | 0.964 |
| | Middle | <0.001 | 0.803 | 0.765 | 0.842 |
| | Richer | <0.001 | 0.830 | 0.789 | 0.873 |
| Antenatal care | Richest | 0.009 | 1.109 | 1.026 | 1.198 |
| | Yes (ref.) | - | - | - | - |
| Child's age | No | <0.001 | 1.947 | 1.850 | 2.049 |
| | 0-11 months (ref.) | - | - | - | - |
| Child's gender | 12-23 | <0.001 | 2.506 | 2.432 | 2.582 |
| | Female (ref.) | - | - | - | - |
| Early initiation of breastfeeding | Male | <0.001 | 1.138 | 1.104 | 1.172 |
| | Yes (ref.) | - | - | - | - |
| | No | <0.001 | 1.382 | 1.341 | 1.424 |

Discussion

This study examined the role of maternal education in influencing stunting among children under two years old born to teenage mothers in Indonesia. 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 [21, 22].

Adolescent mothers who are malnourished are more prone to having malnourished children, perpetuating a cycle of inadequate nutrition [23, 24]. Breaking this cycle requires ensuring that adolescent girls experience proper growth and improved nutrition, which can lead to healthier behaviors in the future [25, 26].

Lower levels of maternal education were 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 [27]. A mother's education

level is essential for breaking the cycle of poverty and enhancing future opportunities for their children. Previous studies have shown that lower maternal education raises the likelihood of stunting in children [28-30].

Children born to adolescent mothers in rural areas were 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 [13, 31]. 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 [32]. Inadequate sanitation and limited access to healthcare services are major contributors to the high rates of stunting in these areas [33, 34].

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 that is 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 [35].

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

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 [38, 41]. 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 [42]. Earlier studies indicate that the prevalence of stunting in newborns does not significantly differ between low- and high-income households [43].

Insufficient prenatal care was associated with a higher likelihood of child stunting. Adequate antenatal care plays a vital role in monitoring maternal and fetal well-being, and its absence may elevate the risk of impaired growth in children [44]. Multiple studies have demonstrated that consistent antenatal care attendance significantly lowers the probability of childhood stunting [45, 46]. Enhanced healthcare accessibility, particularly antenatal

services, may mitigate stunting risks, especially among mothers in geographically isolated regions [47].

Children between the ages of 12 and 23 months were more likely to experience stunting compared to younger children [48]. Stunting is also more common in boys than in girls, with male children having a higher likelihood of experiencing growth failure [49]. This may be related to differences in body composition and nutritional needs between boys and girls [50].

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.

Timely initiation of breastfeeding served as a protective factor against stunting, with mothers who practiced early breastfeeding demonstrating lower rates of child stunting. This finding aligns with existing literature documenting the preventive effect of early breastfeeding on stunting risk [51, 52]. Early breastfeeding delivers crucial nutritional components, particularly colostrum, which enhances neonatal immune function and provides protective effects against infectious diseases [53].

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 to be significant in other studies, including maternal anthropometric measurements (height and weight), maternal anemia status, and agricultural productivity during the gestational period [4, 54, 55]. Furthermore, the investigation did not comprehensively account for the potential influence of cultural determinants on Indonesian parenting styles, dietary preferences, and nutritional behaviors, factors that may have introduced limitations to the interpretability and generalizability of the study's conclusions [56].

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.

Conclusion

Mothers with lower education levels have higher chances of having stunted children.

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Ethical Permissions: 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 were 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/>.

Conflicts of Interests: The authors declared that they have no competing interests.

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