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# Risk Factors of Stunting among Children in Rural Area of Jember, Indonesia

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## ABSTRACT

**Background:** The stunting prevalence in Jember has seen a mark escalation, reaching 34.9% by the year 2023. The impact of stunting can be significant as it may reduce the quality of human resources. It is important to know the risk factors of stunting in order to modify these factors through prevention efforts. **Methods:** This research employed a cross-sectional design involving 163 mothers of children aged 12-59 months residing in Sukowono Village, Jember, Indonesia, who were selected using consecutive sampling. Independent variables included sociodemographic characteristics of families and children, collected using a demographic questionnaire. The dependent variable is stunting, determined by plotting the children's height on the WHO (World Health Organization) Z-score height-for-age growth curve in the mother and Child Health book. Data were analysed using Multiple Logistic Regression. **Results:** As many as 49 (30.1%) children were found to be stunted. Factors significantly associated with stunting were maternal height ($p$<0.001; OR = 8.495), father's education ($p$=0.012; OR=4.097), and family income ($p$<0.001; OR=6.144). **Conclusion:** Nurses have a crucial role in preventing stunting in rural areas by educating the community, ensuring that parents prioritise proper nutrition for women at every stage of life, from birth and adolescence to marriage, pregnancy, and breastfeeding. Providing adequate nutrition for women throughout their lives, especially during their productive years, should be a priority since maternal height is inherited by offspring. To reduce stunting in rural areas, the government should continue to promote 12 years compulsory education and establish various strategies to assist underprivileged families in rural areas in meeting their children's nutritional needs.

***Keywords: Risk Factors; Rural Area; Stunting***

## INTRODUCTION

Stunting remains a serious health problem for children on both global and national levels, and it has not been resolved to date. Indonesian government, in collaboration with regional counterparts and relevant agencies, has implemented diverse initiatives to eliminate stunting through specific nutrition and sensitive nutrition intervensions (Aria *et al*., 2022). While these programs have been generally effective, they encounter several challenges. Some of these challenges include insufficient exclusive breastfeeding, inadequate protein intake, heightened use of formula milk, and insufficient complementary foods (Afiah *et al*., 2020; Endrinikapoulos *et al*., 2023; Sufri *et al*., 2023). In countries with high stunting rates, it can be found in both urban and rural areas. However, several studies have demonstrated that the prevalence of stunting is higher in rural areas than in urban areas (Anik *et al*., 2021; Nemerimana & Gbadamosi, 2025; Sserwanja *et al*., 2021).

Stunting refers to impaired growth and development in children caused by prolonged malnutrition and frequent infections. It is identified when a child's length or height falls below the standard, specifically under -2SD (standard deviations) (WHO, 2015). According to UNICEF, as of 2020, there were 149.2 million children under five worldwide suffering from stunting, with over 50% of them residing in Asia. The prevalence of stunting in Indonesia currently ranks as the second highest in Southeast Asia. In 2019, the incidence of stunting in Indonesia was 30.8%, which decreased by 3.1% in 2020 to reach 27.67%. It further decreased to 24.4% in 2021 and 21.6% in 2022. Although there has been a significant decrease, this prevalence rate still exceeds the WHO standard value, which should be below 20% (Ministry of Health, 2022;

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WHO, 2017). Despite the declining trend in the national prevalence, the stunting rate in Jember Regency has increased drastically, reaching 34.9%, or approximately 35,000 children (Ministry of Health, 2023a). This condition makes Jember the district with the highest stunting cases in East Java, Indonesia. According to the weight measurements taken in February 2023, Sukowono District is one of the ten districts with the highest prevalence of stunting in Jember (Public Health Office of Jember, 2023).

The impact of stunting on children is quite serious as it can diminish the quality of human resources and pose a threat to Indonesia's future generations if not addressed promptly. Stunting has detrimental short-term and long-term effects, such as increased morbidity and mortality rates, reduced learning capacity, and an elevated risk of infections and non-communicable diseases in children (Soliman *et al*., 2021). Ekholuenetale *et al*. (2020) demonstrated that children with stunting experience a 7% reduction in optimal cognitive development compared to non-stunted children. Stunting also has negative economic consequences as it can impede economic growth in a country. Indonesia has experienced a 2-3% decline in Gross Domestic Product (GDP) due to stunting (The World Bank, 2016).

The factors contributing to stunting are multidimensional and can have interrelated influences. Maternal height stands out as the most crucial factor associated with stunting in children under five in poor and developing countries, followed by low maternal education, low family income, low maternal BMI, and father's height (Amaha & Woldeamanuel, 2021; Zhihui *et al*., 2020). The incidence of stunting in rural areas is also closely linked to factors such as non-exclusive breastfeeding, low household socioeconomic status, lack of adequate sanitation facilities, maternal age under 20 years, unhygienic drinking water, limited access to healthcare services, incomplete immunisation, and poor environmental sanitation (Fitri *et al.*, 2024; Kustanto *et al.*, 2025; Shinsugi & Mizumoto, 2022). By identifying these factors that can potentially increase the incidence of stunting, especially in rural areas, nurses can actively participate in prevention efforts focused on modifying the associated risk factors.

## METHODOLOGY

This study was conducted using a cross-sectional design. The study population consisted of all mothers and children residing in Sukosari Village and registered in eights Posyandu (Integrated Health Service Posts), totalling 658 individuals.

To determine the sample size for this study, the G-power 3.1.9.4 application was utilised, which incorporates statistical correlation tests. Four parameters needed to be determined, including the significance level, power, effect size, and tailedness (Kang, 2021). In this study, the significance level, power, and effect size were set at 0.05, 0.8, and 0.3, respectively. The effect size of 0.3 than a power of 80% were chosen based on similar previous study which revealed that several maternal factors such as maternal height, preceding birth interval, and ANC (Active Noise Cancellation) clinic visits had a significant correlation with stunting in vulnerable children (Kiik & Nuwa, 2021). The effect size of 0.3 is considered as medium effect size according to Cohen's classification which indicates that the relationships between variables is meaningful (Cohen, 1988). For the reasons mentioned above, the researcher selected an effect size of 0.3. Since this research involved correlation, a two-tailed test was employed. Considering these parameters, the minimum sample size required for this study was determined to be 135 respondents. To account for a potential dropout rate of 20%, the total sample size in this study was set at 163 respondents.

The inclusion criteria for this study were as follows: 1) mothers with children aged 12-59 months who were permanent residents of Sukosari Village; 2) mothers willing to participate as respondents; 3) mothers capable of reading and writing. The age selection was based on the fact that, in Indonesia, 1-year-old children generally begin eating snacks, and the type of snacks consumed was one of the variables tested in this study. Meanwhile, the exclusion criteria included: 1) children with physical disabilities; 2) children not cared for by their mothers. Mothers and children meeting the inclusion criteria and visiting the Posyandu during June-July 2023 were selected using consecutive sampling to meet the required sample size for the study.

The researcher explained the aims and objectives of the research to mothers who brought their children to

Posyandu and addressed any questions raised by the mothers regarding the research. Following this, the researcher provided an informed consent form to the mothers for their signature if they agreed and were willing to participate as respondents. The researchers emphasised that participation in this research was voluntary and entirely without coercion, allowing mothers and children to cease their participation as respondents at any time without facing any sanctions. Mothers who gave consents to participate in the research received a written invitation to attend the research with their children on the specified date. Furthermore, the researcher assured that all data obtained from the mothers would remain confidential and solely used for research purposes.

The dependent variable in this research was whether the child was stunted or not. The height of children who were not yet able to stand was measured using a baby length board, while children who could stand independently had their height measured using a stature meter installed on the wall at a height of 2m from the floor, with an accuracy of 0.1cm. The classification of a child's height according to age, as per WHO guidelines (WHO, 2017) and its use in Indonesia have been determined by the Indonesian Ministry of Health. This classification includes very short (<-3SD), short (<-2SD), normal (≥-2SD), and tall (>2SD). In this study, children were classified as stunted if they fell into the short or very short category (Ministry of Health, 2023b; WHO, 2017).

The dependent variables in this research encompass the sociodemographic characteristics of the family and the characteristics of children. Monthly family income was categorised based on Jember's District Minimum Wage (DMW). As of August 2023, Jember's DMW stands at IDR (Indonesian Rupiah) 2,555,663. Children were categorised as having received complete immunisation if they had received all five required types of immunisations in Indonesia for babies aged 0-12 months, including Hepatitis-B, BCG, DPT, Polio, and Measles. Eating frequency referred to the daily consumption of staple foods such as rice by children and was categorised as <3x and ≥3x per day. Children's snacks were classified as healthy if they included vegetables, fruit, bread, green beans, or other nutritious foods, and as unhealthy if they consisted of candy, noodles, chocolate, or other non-nutritious foods.

The mother's height was measured using a stature meter. Two categories of mother's height were determined: short stature (<150cm) and normal stature (≥150). These maternal categories were derived from previous studies in various middle income countries in Asia and Africa with similar sociodemographic characteristics (Amaha & Woldeamanuel, 2021; Qurani *et al*., 2022). Data on independent variables other than maternal height were collected by completing a demographic questionnaire developed by the researchers. In this research, to determine the most significant variable associated with stunting, where the independent variables are categorical, and the dependent variable is dichotomous, multiple logistic regression with enter method was used as the statistical test. The enter type logistic regression in this study was used because in this method all predictor variables are entered into the model at once, without considering statistical significance one by one. This technique is appropriate when all variables are considered relevant in explaining the outcome or dependent variable, or when there is a theoretical reason to include each variable. Variables were considered significant factors if their $p$-value was <0.05.

**Ethical Consideration**

The researchers obtained ethical clearance from the National Political and Society Protection Board of Universitas Dr. Soebandi, Indonesia, with reference number 161/KEPK/UDS/V/2023 on 9th May, 2023.

**RESULTS**

Table 1 shows that the majority of mothers were ≥150 cm, aged 20-30 years, not employed, had a low level of education, and had 1-2 children. The number of mothers with family incomes <DMW and ≥DMW was nearly equal. Among the children in this study, the majority were aged 31-59 months, had received complete immunisations, were exclusively breastfed, were born full-term (not premature), rarely experienced acute respiratory infections, had an eating frequency of ≥3 times a day, and consumed healthy snacks. The number of male and female children in this study was also almost equal.

*Table 1: Demographic Characteristics of Children and Families*

| Demographic Characteristics | Frequency (%) n=163 |
|---|---|
| **Parent** | |
| **Maternal Height (cm)** | |
| <150 | 71 (43.6) |
| ≥150 | 92 (56.4) |
| **Maternal Age (year)** | |
| 20-30 | 104 (63.8) |
| <20 or >30 | 59 (36.2) |
| **Maternal Employment** | |
| Working | 22 (13.5) |
| Not working | 141 (86.5) |
| **Maternal Education** | |
| Low (elementary school-junior high school) | 116 (71.2) |
| High (senior high school-university) | 47 (28.8) |
| **Paternal Education** | |
| Low (elementary school-junior high school) | 118 (72.4) |
| High (senior high school-university) | 45 (27.6) |
| **Family Income** | |
| <District Minimum Wage (DMW) | 82 (50.3) |
| ≥District Minimum Wage (DMW) | 81 (49.7) |
| **Number of Children (Person)** | |
| 1-2 | 133 (81.6) |
| >2 | 30 (18.4) |
| **Child** | |
| **Age (Month)** | |
| 12-30 | 51 (31.3) |
| 31-59 | 112 (68.7) |
| **Sex** | |
| Male | 81 (49.7) |
| Female | 82 (50.3) |
| **Height-for-age** | |
| Stunted (< -2SD) | 49 (30.1) |
| Non-stunted (≥ -2SD) | 114 (69.9) |
| **Basic Immunisation History** | |
| Complete | 158 (96.9) |
| Not complete | 5 (3.1) |
| **Birth Gestational Age (Months)** | |
| <37 | 2 (1.2) |
| ≥37 | 161 (98.8) |
| **Breastfeeding** | |
| Exclusive | 151 (92.6) |
| Non-exclusive | 12 (7.4) |
| **History of Acute Respiration Infection** | |
| Frequent (every week or every two week) | 4 (2.5) |
| Rare | 159 (97.5) |
| **Frequency of Eating(Per day)** | |
| <3x | 14 |
| ≥3x | 146 |
| **Type of Snacks** | |
| Healthy snacks | 88 (53.9) |
| Unhealthy snacks | 75 (46.1) |

*Table 2: Association for Risk Factors of Stunting among Children in Rural Area of Jember, Indonesia*

| Variables | Child's Height-for-Age | | OR | 95%CI | *p* Value |
|---|---|---|---|---|---|
| **Maternal Height (cm)** | **Stunted (n=49)** | **Non-Stunted (n=114)** | 8.48 | 3.87-18.57 | <0.001* |
| <150 | 38 (53.5) | 33 (46.5) | | | |
| ≥150 | 11 (11.9) | 81 (88.1) | | | |
| **Maternal Age (year)** | | | 0.72 | 0.46-1.62 | 0.367 |
| 20-30 | 30 (27.8) | 78 (72.2) | | | |
| <20 or >30 | 19 (35.2) | 36 (64.8) | | | |
| **Maternal Employment** | | | 1.10 | 0.42-2.89 | 0.847 |
| Working | 7 (31.8) | 15 (68.2) | | | |
| Not working | 42 (29.8) | 99 (70.2) | | | |
| **Maternal Education** | | | 4.02 | 1.58-10.26 | 0.002* |
| Low (elementary school-junior high school) | 43 (37.1) | 73 (62.9) | | | |
| High (senior high school-university) | 6 (12.8) | 41 (87.2) | | | |
| **Paternal Education** | | | 3.72 | 1.46-9.51 | 0.004* |
| Low | 40 (34.8) | 75 (65.2) | | | |
| High | 9 (18.7) | 39 (81.3 | | | |
| **Monthly Family Income** | | | 6.44 | 2.91-14.2 | <0.001* |
| <District Minimum Wage | 39 (47.5) | 43 (52.5) | | | |
| ≥District Minimum Wage | 10 (12.3) | 71 (87.7) | | | |
| **Number of Children (person)** | | | 1.04 | 0.42-2.38 | 0.994 |
| 1-2 | 40 (30.1) | 93 (69.9) | | | |
| >2 | 9 (30) | 21 (70) | | | |
| **Child's Age (year)** | | | 2.26 | 1.42-8.12 | 0.197* |
| 12-30 | 11 (21.6) | 40 (78.4) | | | |
| 31-59 | 38 (33.9) | 74 (66.1) | | | |
| **Child's sex** | | | 0.67 | 0.34-1.32 | 0.252 |
| Male | 21(25.9) | 60 (74.1) | | | |
| Female | 28 (34.1) | 54 (65.9) | | | |
| **Basic Immunisation History** | | | 1.74 | 0.19-16.0 | 0.618 |
| Complete | 48 (30.4) | 110 (69.6) | | | |
| Incomplete | 1 (20) | 4 (80) | | | |
| **Birth Gestational Age (Months)** | | | 0.00 | - | 0.351 |
| <37 | 0 (0) | 2 (100) | | | |
| ≥37 | 49 (43.7) | 112 (46.3) | | | |
| **Breastfeeding** | | | 1.31 | 0.34-5.07 | 0.691 |
| Exclusive | 46 (30.5) | 105 (69.5) | | | |
| Non-exclusive | 3 (25) | 9 (75) | | | |
| **History of Acute Respiration Infection** | | | 0.77 | 0.08-7.60 | 0.823 |
| Frequent (every week or every two week) | 1 (250 | 3 (75) | | | |
| Rare (at most once a week) | 48 (30.2) | 111 (69.8) | | | |
| **Frequency of Eating (Per day)** | | | 0.36 | 0.08-1.68 | 0.524 |
| <3x | 2 | 12 | | | |
| ≥3x | 47 | 102 | | | |
| **Type of Snacks** | | | 0.67 | 0.34-1.30 | 0.236* |
| Healthy snacks | 23 (26.1) | 65 (73.9) | | | |
| Unhealthy snacks | 26 (34.7) | 49 (65.3) | | | |

*<0.25 = included into multiple logistic regression analysis (Variables with a p-value of less than 0.25 were included in the multiple logistic regression analysis)

To determine the variables most significantly associated with stunting, an initial test using bivariate analysis, specifically the Chi-Square test, is needed. Variables with a *p*-value <0.25 in the Chi-Square test then qualify for inclusion in the multivariate model. Based on the table 2, there are several variables related to stunting which are shown with a *p* value <0.25 which include maternal height ($p<0.001$), maternal education ($p=0.002$), paternal education ($p=0.004$), monthly family income ($p<0.001$), child's age ($p=0.197$), and type of snacks ($p=0.236$). These six variables were then analysed using the Logistic Regression test Step 1.

***Table 3: Logistic Regression Step 1***

| Variables | B | S.E. | Wald | *df* | *p* value | OR | 95% CI for EXP B | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Lower | Upper |
| Maternal height | 2.069 | 0.457 | 20.501 | 1 | 0.001 | 7.914 | 3.232 | 19.378 |
| Father's education | 1.398 | 0.653 | 4.577 | 1 | 0.032 | 4.046 | 1.124 | 14.563 |
| Family income | 1.784 | 0.465 | 14.696 | 1 | 0.001 | 5.955 | 2.392 | 14.826 |
| Child's age | 0.353 | 0.475 | 0.553 | 1 | 0.457 | 1.424 | 0.561 | 3.612 |
| Mother's education | 0.052 | 0.648 | 0.007 | 1 | 0.936 | 1.054 | 0.296 | 3.755 |
| Type of snacks | 0.449 | 0.428 | 1.100 | 1 | 0.294 | 1.567 | 0.677 | 3.629 |

This study includes several logistic regression test parameters, such as B (regression coefficient), standard error (SE), Wald, Odds Ratio, and Confidence Interval for Exp(B). A smaller standard error (SE) indicates a more precise estimate of the population parameter. The SE values for the six variables mentioned are close to zero which means that the sample in this study is accurately represent the existing population. The B coefficient represents both the direction and strength of the independent variable's effect on the dependent variable (Ostir *et al*., 2000). In this study, three variables—maternal height, father's education, and family income—have the highest and most positive B coefficients, indicating a positive relationship with stunting incidence.

Wald shows the extent to which each independent variable partially influences the dependent variable (Umar, 2009). The Wald statistic for the top three variables in Table 3 are significant, as each has a *p*-value of less than 0.05. This indicates that maternal height, father's education, and family income have a significant association with stunting. The Odds Ratio (OR) quantifies the likelihood of an event occurring within a particular group. In this study, maternal height has the highest odds ratio (OR) of 7.914, indicating that it contributes 7.914 times to the likelihood of stunting in children.

The 95% Confidence Interval (CI) for Exp (B) is a crucial tool in logistic regression analysis to understand and interpret the effect of independent variables on dependent variables, by providing a range of values where 95% sure that the true odds ratio value is located (Karnowahadi, 2011). For the maternal height variable, the lower bound of the Common Odds Ratio, represented by the 95.0% CI for EXP(B) at 3.232, suggests that maternal height has at least 3.232 times the potential to influence stunting. Meanwhile, the upper bound of 19.378 indicates that maternal height may have up to 19.378 times the potential impact on stunting compared to other variables.

In the initial stage of multiple logistic regression analysis, all variables with a *p*-value <0.25 are included in the calculation. Table 3 shows that variables with a *p*-value greater than 0.05 include children' age, mother's education, and type of snack. Therefore, a second multiple logistic regression analysis is needed by removing these variables.

***Tabel 4: Logistic Regression Step 2***

| Variables | B | S.E. | Wald | *p* value | OR | 95% CI for EXP B | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower | Upper |
| Maternal Height | 2.139 | 0.443 | 23.286 | 0.001 | 8.495 | 3.563 | 20.257 |
| Father's Education | 1.410 | 0.563 | 6.274 | 0.012 | 4.097 | 1.359 | 12.353 |
| Family Income | 1.816 | 0.457 | 15.809 | 0.001 | 6.144 | 2.511 | 15.037 |

In the second multiple logistic regression analysis as shown in Table 4, the results indicate that only three variables had significance values of <0.05, suggesting that maternal height, father's education, and family income had an impact on the incidence of stunting in children. Based on the odds ratio value, it can be concluded that maternal height (OR=8.495) is the most influential factor compared to other factors in the incidence of stunting among children in this study. The 95.0% confidence interval (CI) for EXP(B) on maternal height, with a lower bound of 3.563, suggests that maternal height has a minimum of 3.563 times greater potential to influence stunting incidence. Meanwhile, the upper bound of 20.257 indicates that maternal height may have up to 20.257 times greater potential in affecting stunting incidence compared to other variables.

## DISCUSSION

In this study, 49 out of 163 children in Sukowono Village were classified as stunted (30.1%). The prevalence of stunting in Sukowono Village is quite high, significantly above the minimum limit set by WHO. Both maternal height and father's height play crucial roles in predicting a child's height, as genetic factors are known to primarily influence human height differences (Jelenkovic *et al*., 2020). Maternal height is the most significant variable in this study regarding the incidence of stunting. These findings align with previous research which demonstrated that maternal height is the most robust predictor of stunting in middle-income countries (Islam *et al.*, 2025; Khaliq *et al*., 2024; Ndagijimana *et al*., 2025). Gupta *et al.* (2021) found that maternal height ≤147 cm had the most substantial impact with Adjusted Odd Ratio (AOR) of 2.85 on the occurrence of stunting in India, followed by father's height ≤157 cm with AOR =1.97. The substantial influence of maternal height on stunting, surpassing the impact of father's height, can be elucidated through the intrauterine effect mechanism. Mothers with shorter stature often have narrower pelvises, potentially leading to suboptimal foetal growth during gestation (Gonete *et al*., 2021; Wells, 2017). Additionally, mothers with shorter stature may lack sufficient nutritional reserves, resulting in limited nutrition availability for the developing foetus (Wells, 2017).

Shorter-statured mothers may be prone to metabolic issues, such as low blood glucose and inadequate protein-energy levels in their bodies (Susyani *et al*., 2022). These factors collectively contribute to reduced foetal height during pregnancy. The findings of this study highlight the importance of early intervention to combat stunting. It is crucial for girls to achieve adequate height because maternal height is hereditary. Ensuring proper nutrition throughout a woman's life, well before pregnancy, is vital. Optimal nutritional status for women before conception serves as an asset, enabling them to meet their nutritional requirements during pregnancy and breastfeeding. This, in turn, positively impacts foetal and child development. Initiating interventions in the form of nutritional improvement programs for women prior to and during pregnancy can promote optimal foetal growth (Marshall *et al*., 2022). In the long term, guaranteeing lifelong access to adequate nutrition for women can reduce the prevalence of stunting. Nurses should educate families on the importance of ensuring adequate nutrition for girls not only during pregnancy and breastfeeding but throughout their lives until marriage, as proper nutrition is essential for their future role in pregnancy and childbirth.

Jelenkovic *et al*. (2020) have stated that an individual's height results from the interplay of genetic and environmental factors. Many earlier studies have established a significant relationship between maternal education and stunting, with stunting being more prevalent among mothers with lower educational levels (Addo *et al*., 2023; Ashar *et al.*, 2024; Laksono *et al*., 2022). It is widely recognised that mothers have a crucial role in preventing stunting, as they are the primary providers of nutrition for children, particularly during the first thousand days of a child's life from prenatal development to the first two years of breastfeeding. Mothers influence children's dietary habits by determining and supplying their food (Saleh *et al*., 2021). Moreover, mothers typically assume the primary caregiving role for children within the family, spending more time with them than fathers. However, in this study, maternal education was not found to be associated with stunting, which contradicts previous research findings. Instead, this research discovered that low paternal education, specifically completion of junior high school, increases the risk of stunting when compared to fathers who have graduated from senior high school. This finding aligns with the results of Nugraheni *et al*. (2023), which proves that fathers who complete secondary education or higher have a lower risk of having stunted children.

In Indonesia, the majority of people adhere to a patriarchal culture where the father figure within the family holds significant dominance over the mother. In Sukosari Village, like other residents of Jember Regency, the community follows the Pandalungan cultural identity, which emerged as a result of the amalgamation of two dominant cultures: Javanese and Madurese. Among the Pandalungan people, the role of a father is perceived as central, with fathers assuming the position of family leaders and wielding substantial decision-making power within the family. Consequently, the father's level of education significantly influences various decisions related to family matters, especially those concerning family health. Fathers can exert both positive and negative influences on the family's well-being, as they are often the ones making decisions regarding financial expenditures or food choices.

Educated fathers typically possess a better understanding of their children's health conditions and nutritional status. Fathers with higher education levels contribute to elevating the family's socioeconomic status, directly impacting the family's ability to access healthcare facilities and provide nutritious food for their children (Chowdhury *et al*., 2021; Kassie & Asgedom, 2025). The government should continue to promote the 12-year compulsory education program for all Indonesian citizens, extending education up to high school completion, as part of the campaign to eradicate stunting in Indonesia. This is especially important given that the majority of Indonesian citizens, particularly in underdeveloped areas, have typically only completed elementary school.

It is evident from this study that families with stunted children outnumber those with monthly incomes <IDR 2.555.663. The risk of stunting is 1.8 times higher in families with income <DMW. An increase in family income is closely associated with an increase in the diversity of food available at home and greater consumption of eggs and meat by children (Ahmed & Khalid, 2023; Botorie *et al*., 2025; Singh *et al*., 2020). Conversely, a study reveals that families in rural areas with lower incomes consume fewer dairy products and livestock meat (Haq *et al*., 2020). According to the FAO (2020), individuals in low and middle-income countries tend to favour flour-based foods due to their affordability and filling nature. Insufficient family income hampers parents' ability to provide adequate, nutrient-rich foods containing animal proteins such as eggs, meat, fish, and milk, which are crucial for children's growth (Wiliyanarti *et al*., 2025). The Indonesian government has implemented several programs to combat stunting, including the Village Fund. The Village Fund Program is a government initiative aimed at empowering rural areas and enhancing their development. Among the forms of assistance provided to impoverished communities under the Village Fund program is cash aid to help meet their daily needs. While the Village Fund program has been shown to reduce stunting in Indonesia (Indra & Khoirunurrofik, 2022), it does not guarantee that families will utilise the funds to purchase nutritious foods for their children. The findings of this research emphasise the necessity for government programs that offer direct assistance such as providing high-protein foods to disadvantaged family, especially in rural areas. The government can also implement programs to impart entrepreneurship skills to uplift the income of underprivileged families. In this context, nurses can play a role by encouraging and motivating parents to always prioritise fulfilling the need for nutritious food intake for children. This can be achieved by providing diverse and nutritious foods that align with the family's financial capacity, such as local food ingredients that are widely available in each region so that the price is more affordable.

### Limitation

This study provides valuable insights into risk factors contributing to stunting; however, expanding the sample beyond a single village in Jember Regency would enhance the generalisability of the findings. Future research should incorporate larger and more diverse populations, including urban communities, to provide a more comprehensive perspective. Additionally, while this study focused on children's eating frequency and snack consumption, future research could explore a broader range of dietary factors, such as the intake of animal protein and milk. A more detailed analysis of dietary patterns would offer deeper insights into their role in stunting prevention and nutritional well-being.

## CONCLUSION

This research emphasises the importance of ensuring adequate nutrition for women throughout their lives, as women's height has intergenerational implications. Therefore, community nurses must consistently educate families and communities about nutrition to ensure that parents prioritise the nutritional needs of girls, not just during early childhood but throughout their lives. From birth through pregnancy and breastfeeding, girls must receive adequate nutrition to support the health of future generations and prevent stunting. Nurses should collaborate with families to support girls in achieving optimal height by consistently monitoring growth. It is hoped that the government will vigorously promote the significance of 12 years of compulsory education in Indonesia. This educational emphasis will empower future parents with knowledge and decision-making abilities that benefit children's health and ensure they receive optimal nutrition. In this context, nurses should play a key role in future premarital counselling, actively educating couples about the vital impact of fathers' education in preventing stunting and encouraging them to secure sufficient income to

meet their children's nutritional needs. Additionally, this research suggests the need for government strategies aimed at assisting underprivileged communities in rural areas to meet their children's nutritional requirements. In future Posyandu (Integrated Health Service Posts) activities, it is important to implement programs for monitoring parental feeding practices to ensure that children receive adequate protein intake.

**Conflict of Interest**

The authors declare that they have no conflict of interest.

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