Stunting Among Wealthy Indonesian Families: A Cross-Sectional Study of Children Under the Age of Two

Agung Dwi Laksono[1], Ratna Dwi Wulandari[2]*, Novia Susianti[1], Mohamad Samsudin[1], and Muhamad Arif Musoddaq[1]

[1] National Research and Innovation Agency Republic of Indonesia, Jakarta, Indonesia
[2] Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia
* Ratna Dwi Wulandari, corresponding author. Email: ratna-d-w@fkm.unair.ac.id
Submitted: 23 June 2023. Accepted: 11 November 2023. Published: 12 January 2024
Volume 32, 2024. pp. 384–398. http://doi.org/10.25133/JPSSv322024.023

Abstract

Previous studies globally report that poverty was a determinant of stunting. However, studies also showed that stunting can be found in wealthy families. To analyze factors related to stunting among wealthy families, we examined the 2021 Indonesian National Nutritional Status Survey. This cross-sectional study included 23,957 children under the age of two years old. In addition to stature, the study analyzed eight independent variables (e.g., residence, maternal age, marital, education, employment, children's age, gender, and early initiation breastfeeding). By employing a binary logistic regression test in the last analysis, this study found that children in rural areas were 1.160 times more likely to be stunted than those in urban areas (95% CI [1.152, 1.168], $p < .001$). The characteristics of mothers were also found to be related to stunting, including age, marital status, education, and employment. Additionally, 12–13-month-old children were 3.033 times more likely to be stunted than < 12 months (95% CI [3.011, 3.055], $p < .001$). Boys were 1.320 times more likely to be stunted than girls (95% CI [1.311, 1.328], $p < .001$). Children with early breastfeeding initiation were 1.025 times more likely to be stunted than those without (95% CI [1.018, 1.031], $p < .001$). Lastly, eight significant factors related to stunting among wealthy families in Indonesia were found: residence, maternal age, marital, education, employment, children's age, gender, and early breastfeeding initiation. The government must focus on the specific targets produced in this study to accelerate reducing the prevalence of stunting in wealthy Indonesian families.

Keywords

Nutritional status; public health nutrition; stunted; wealthy family

Introduction

Stunting indicates that a child's growth potential has been restricted and is determined by their height-for-age z-score that falls more than two standard deviations below the length/height set by the World Health Organization (WHO) Child Growth Standards. Stunting in early life—particularly within the first 1,000 days from conception until age two—can impede growth and negatively affect a child's well-being (Laksono, Wulandari, et al., 2022; World Health Organization, 2014). Stunting is an irreversible outcome of a child's life, and stunting has long-term effects on individuals and societies. The consequences include poor cognition and educational performance, low adult wages, lost productivity, and, when accompanied by excessive weight gain later in childhood, an increased risk of nutrition-related degenerative diseases such as diabetes in adult life (World Health Organization, 2015). Stunting reduces total lifetime income by 10% and causes intergenerational poverty (National Team for the Acceleration of Poverty Reduction, 2017). Moreover, stunting can cause annual economic losses of 2–3% of gross domestic product (GDP) (Galasso & Wagstaff, 2016).

Malnutrition persists at unacceptably high levels globally, and as a consequence, stunting has increased from 2020 to 2021. According to the 2021 Global Nutrition Report, among children under five years of age, 149.2 million were stunted (around 22%), 45.4 million were wasted, and 38.9 million were overweight. In contrast, in 2020, there were 149 million stunted, 49.5 million were wasted, and 40.1 million were overweight (Development Initiatives, 2021; Ipa et al., 2023). There is a difference between those countries with the highest prevalence and vast numbers of people affected by stunting. The urban prevalence of stunting is 19.2% less than those in rural areas, reaching 26.8%. Stunting is, on average, 25.6% among boys and 22.6% among girls, while wasting is 6.8% among boys and 5.7% among girls (Development Initiatives, 2021).

Stunting is related to various factors, including socioeconomic status, maternal and child nutrition, as well as access to clean water and sanitation (Budiarto et al., 2021; Wulandari, Laksono, Kusrini, et al., 2022). Poor nutrition during pregnancy and early childhood, including insufficient protein, vitamins, and minerals, can also contribute to stunting. Child factors include low birth weight, poor nutrition, frequent infections such as diarrhea, pneumonia, and malaria, and inadequate breastfeeding (Laksono et al., 2021). Furthermore, the environment and living conditions, such as exposure to air pollution and poor hygiene practices, can also impact a child's growth and development (Mutasa et al., 2022; Raj et al., 2022). Cultural and behavioral factors such as food taboos, feeding practices, and beliefs about child growth and environmental conditions are crucial in reducing the prevalence of stunting and promoting healthy growth and development in children (Januarti & Hidayathillah, 2020; Kusrini et al., 2019).

Socioeconomic status is usually measured by education, income, and job position at an individual level. It can also be measured by revenue based on the place of residence (e.g., urban, rural, coastal, and neighborhood income) or country development at an aggregate level (Castro-Bedriñana et al., 2021; Ridwanah et al., 2021). The socioeconomic status of families affects the nutrition of children. Mothers who received lower levels of education are at a higher risk of having children who experience stunting and may have restricted access to detailed information on child stunting. Moreover, mothers with lower income and education levels may encounter difficulties in purchasing sufficient food to provide a healthy and varied diet for their children, low access to health care, unhealthy environments, and a high risk of

infection (Nankinga et al., 2019). A previous study investigated the socioeconomic determinants of stunting and wasting in children under two years old in Bangladesh, which had a high prevalence of undernutrition. The study identified that 33% of 7,230 children were stunted, and 11% were wasted. Female children had significantly lower odds of stunting and wasting than male children. Children from wealthier families were at lower risk of stunting and wasting than those from poorer households (Chowdhury et al., 2020).

Based on data from various sources, the trend of stunting in Indonesia has declined in recent years but is still relatively high. The 2021 Global Nutrition Report showed that the prevalence of stunting in children in Indonesia had decreased over the past two decades from 32.6% in 2000 to 24.8% in 2020 (Development Initiatives, 2021). Based on the Indonesia Nutrition Status Survey report, the Ministry of Health of Indonesia (MOH) stated that in 2020, the proportion of stunting in Indonesia was 24.4%. There was a decrease in the percentage of stunting from 2018 by 27.8%, but the prevalence of stunting in Indonesia was still relatively high. The Indonesian government, therefore, set a target to reduce the stunting rate below 20% in 2024 (Agency for Health Research and Development, 2019; Health Development Policy Agency, 2021).

Previous studies reported maternal education, employment, household wealth, and access to improved water sources were protective factors against stunting and poor linear growth. Low birth weight, short maternal stature, and inadequate complementary feeding were risk factors (Ayelign & Zerfu, 2021; Laksono, Wulandari, et al., 2022). Risk factors with childhood stunting include individual child household-level characteristics and province- and subdistrict-level characteristics. Stunting is associated with child-level features and family and community-level characteristics (Laksono, Sukoco, et al., 2022; Yoto et al., 2020).

Previous studies indicated that stunted children are mainly from low-income families, as low-income families generally have long-term limited household food availability (Kartasurya et al., 2023; Suratri et al., 2023). However, the 2021 Indonesian National Status Survey report revealed that the prevalence of stunting for children under two years is around 16.4%. Of this amount, nationally, there were 12.5% of children under two years old from wealthy families (Health Development Policy Agency, 2021). This condition indicates that children from affluent families may not lack food availability but are still experiencing stunting. Although it would appear that wealthy families should be able to prevent stunting, there is still an ever-present issue of stunting within Indonesia. Based on the context, the study analyzed factors related to stunting among wealthy families in Indonesia.

Materials and methods

Data source

This study utilized secondary data from the 2021 Indonesian National Nutritional Status Survey, a national cross-sectional survey by the Indonesian Ministry of Health. The survey provided an overview of the nutritional status of children under five, including stunting, wasting, underweight, and overweight, and its determinants, including indicators for specific and sensitive nutritional interventions, using a two-stage stratified sampling method. This study's population consisted of all Indonesian children from wealthy families who represented the analysis unit who were under two years or about 23 months, while mothers

were the respondents. The selection of respondents implemented a multi-stage cluster random sampling approach, which resulted in a weighted sample of 23,957 children.

Setting

This study used data from wealthy families in Indonesia taken from the 2021 Indonesian National Nutritional Status Survey, as the survey used the wealth quintile of a household's goods to determine wealth status. The number and variety of objects owned by households, such as televisions, bicycles, or cars, and home pieces of equipment, such as drinking water sources, bathroom facilities, and the primary building materials used for the floor, were considered in determining the grades of households. National wealth quintiles were created by assigning a score to each household member, then calculated by principal component analysis. The score was divided into five categories, representing 20% of the population. The wealth classes include the poorest (Quintile 1), poorer (Quintile 2), middle (Quintile 3), richer (Quintile 4), and richest (Quintile 5). Wealthy families were among the richer and richest quintiles (Wulandari, Laksono, Prasetyo, et al., 2022).

Dependent variable

The dependent variable in this study was stunted children. Stunting is a nutritional status indicator based on height-for-age or a child's height at a certain age. The height indicator for a period is determined using WHO growth standards and the z-score or height deviation from average height. There are two types of stunted children under two years of age: normal and stunted. The nutritional status category limit was based on height index/age: Stunted (< -2.0 SD) and Normal (≥ -2.0 SD) (Laksono, Wulandari, et al., 2022).

Independent variables

In this analysis, eight independent variables were analyzed. The factors were maternal age, maternal marital status, maternal education level, maternal employment status, children's age, children's gender, and early breastfeeding initiation. There were two types of residence: urban and rural.

We divided the mothers' ages into seven categories: < 20, 20–24, 25–29, 30–34, 35–39, 40–44, and > 44. Maternal marital status included married and divorced/widowed mothers. Meanwhile, the survey calculated maternal education based on the most recent educational certificate held by mothers with children under two years of age. This study divided maternal education into four levels: no formal education, primary, secondary, and higher education. Furthermore, maternal employment status included both unemployed and employed mothers.

A child's age was determined by the last birthday (in months). The children's ages ranged from 12 to 23 months. The study also separated children into two categories: boys and girls. Furthermore, early breastfeeding initiation, when the baby was placed on the mother's chest immediately after birth, and the baby and mother had skin-to-skin contact following delivery, was separated into two categories: No and Yes.

Data analysis

Data gathered were analyzed using the Chi-square test in the early stages of analysis. Then, a co-linearity test was performed to ensure no strong relationship between the independent variables. A binary logistic regression test was applied in the final phase, which was carried out using IBM SPSS Statistics 26 with the equation $y = f(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots \beta_8 x_8)$. Furthermore, the study used ArcGIS 10.3 (ESRI Inc., Redlands, CA, USA) to create a map of stunted children in wealthy families in Indonesia. The Indonesian Bureau of Statistics provided a shapefile of administrative boundary polygons for the task.

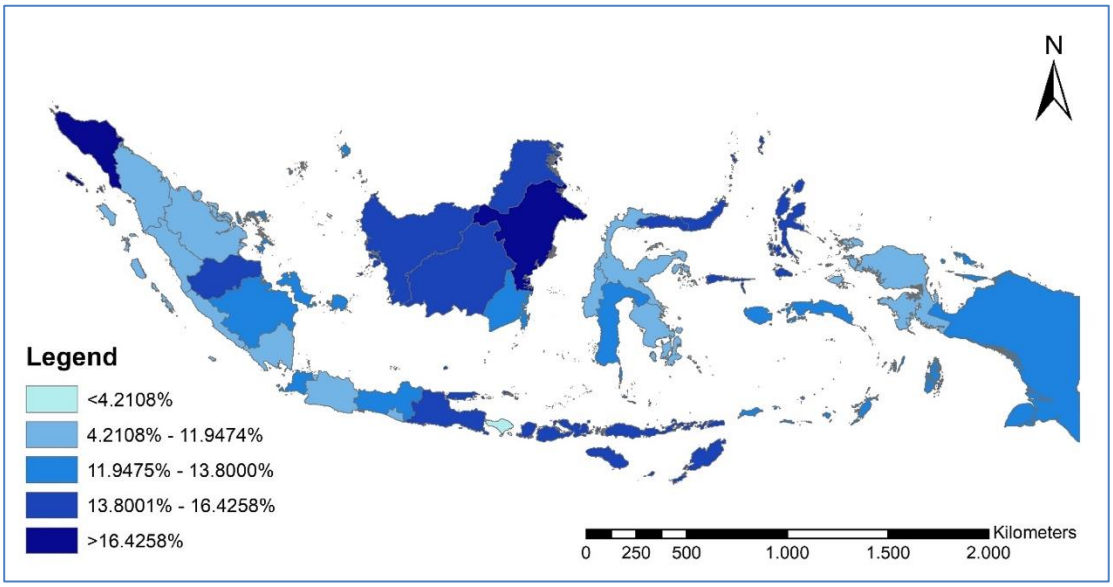
Ethical approval

The national ethics committee approved the ethical license for the 2021 Indonesian National Nutritional Status Survey (No.: LB.02.01/2/KE.248/2021). During data collection, the survey used informed consent, which accounted for the voluntary and confidential aspects of the data collection procedure, and respondents provided written informed consent.

Results

According to the study's findings, in 2021, the ratio of stunted children under two years of age in wealthy families in Indonesia was 12.5%. Figure 1 depicts the distribution map of stunted children among wealthy families in Indonesia by province. The figure indicates no spatial pattern or trend appears on the map.

Figure 1: Distribution Map of Stunted Children Under Two Years of Age Among Wealthy Families by the Province in Indonesia



Note: Created by the author

Table 1 provides a statistical breakdown of the characteristics of children under two from wealthy families in Indonesia. Based on the residence type, the proportion of stunted children in rural areas was higher than in urban areas. Stunted children with mothers aged 20 to 24

years were the highest percentage among other maternal ages. Moreover, stunted children with divorced/widowed mothers had a slightly higher proportion than married mothers.

Stunting was highest among those whose mothers had no formal education. Maternal employment status was related to children's nutritional status. The percentage of stunting was higher among the children with unemployed mothers than those with employed mothers. As such, 12–23-month-old stunted children were more than twice as typical as younger children. In the meanwhile, there were more males than girls who were stunted. In addition, those with early breastfeeding initiation had a slightly higher percentage of stunted children than those without.

Table 1: Percentage of Normal and Stunted Children Aged Under Two Years From Wealthy Families in Indonesia Based on Several Characteristics (n = 23,957)

Variable	Nutritional Status		p value
	Normal (n = 20,851)	Stunting (n = 3,106)	
Residence			< .001
Urban	88.1%	11.9%	
Rural	86.0%	14.0%	
Maternal age group			< .001
< 20	88.3%	11.7%	
20–24	85.6%	14.4%	
25–29	88.3%	11.7%	
30–34	88.4%	11.6%	
35–39	86.3%	13.7%	
40–44	85.9%	14.1%	
> 44	87.8%	12.2%	
Maternal Marital status			< .001
Divorced/widowed	86.4%	13.6%	
Married	87.5%	12.5%	
Maternal education level			< .001
No formal education	81.7%	18.3%	
Primary	84.5%	15.5%	
Secondary	87.6%	12.4%	
Higher	90.7%	9.3%	
Maternal employment status			< .001
Unemployed	86.9%	13.1%	
Employed	88.3%	11.7%	
Age of under two years			< .001
< 12 months	93.3%	6.7%	
12–23 months	82.5%	17.5%	
Gender of under two years			< .001
Boy	86.0%	14.0%	
Girl	89.0%	11.0%	
Early initiation of breastfeeding			< .001
No	87.8%	12.2%	
Yes	87.1%	12.9%	

Regarding the collinearity test, the results showed that the tolerance values for all variables were more significant at .10 on average, and the variance inflation factor for all variables was less than 10.00 simultaneously. By referring to the basis of decision-making in the multicollinearity test, the study concluded that there were no signs of a strong association between two or more independent variables in the regression model.

Table 2 displays the outcomes of the binary regression logistics. We utilized the nutritional status 'normal' category as a benchmark for this investigation. Based on the type of residence, children in rural areas were 1.160 times more likely to be stunted than those in urban areas (AOR = 1.160, 95% CI [1.152, 1.168], $p < .001$). According to maternal age, the probability of stunted children was from mothers aged less than 44 years. Moreover, children from divorced/widowed mothers were 1.154 times more likely to be stunted than those from married mothers (AOR = 1.154, 95% CI [1.119, 1.191], $p < .001$).

Table 2: The Result of Binary Logistic Regression for Nutritional Status of Children Under Two Years From Wealthy Families in Indonesia (n = 23,957)

Predictors	*p* value	Stunting		
		AOR	95% CI	
			Lower bound	Upper bound
Residence: Urban	-	-	-	-
Residence: Rural	**< .001	1.160	1.152	1.168
Maternal age: < 20	*.011	1.059	1.013	1.107
Maternal age: 20–24	**< .001	1.498	1.446	1.551
Maternal age: 25–29	**< .001	1.224	1.182	1.267
Maternal age: 30–34	**< .001	1.166	1.127	1.207
Maternal age: 35–39	**< .001	1.373	1.326	1.422
Maternal age: 40–44	**< .001	1.323	1.276	1.372
Maternal age: > 44	-	-	-	-
Marital status: Married	-	-	-	-
Marital status: Divorced/widowed	**< .001	1.154	1.119	1.191
Education: No formal education	**< .001	1.963	1.879	2.050
Education: Primary	**< .001	1.720	1.704	1.737
Education: Secondary	**< .001	1.368	1.356	1.380
Education: Higher	-	-	-	-
Employment status: Unemployed	**< .001	1.024	1.017	1.032
Employment status: Employed	-	-	-	-
Age of under two years: < 12 months	-	-	-	-
Age of under two years: 12–23 months	**< .001	3.033	3.011	3.055
Gender of under two years: Boy	**< .001	1.320	1.311	1.328
Gender of under two years: Girl	-	-	-	-
Early initiation of breastfeeding: No	-	-	-	-
Early initiation of breastfeeding: Yes	**< .001	1.025	1.018	1.031

*Note: AOR = adjusted odds ratio; **p < .001; *p < .050*

Regarding maternal education level, Table 2 indicates that the lower the education level, the higher the possibility of having stunted children. Meanwhile, based on maternal employment, children with unemployed mothers were 1.024 times more likely than those with employed mothers to be stunted (AOR = 1.024, 95% CI [1.017, 1.032], $p < .001$). Moreover, according to the age of the children, 12–13 months were 3.033 times more likely to be stunted than < 12 months (AOR = 3.033, 95% CI [3.011, 3.055], $p < .001$).

Table 2 also indicates that, based on the gender of the children, boys were 1.320 times more likely to be stunted than girls (AOR = 1.320, 95% CI [1.311, 1.328], $p < .001$). Furthermore, regarding early initiation of breastfeeding, children with early initiation of breastfeeding were 1.025 times more likely than those without to be stunted (AOR = 1.025, 95% CI [1.018, 1.031], $p < .001$).

Discussion

Based on the results, this study indicates the most potent factor related to under-two stunting among wealthy families in Indonesia is the age of the children, followed by maternal education. Children 12 to 23 months are more likely to be stunted than those < 12 months. These results indicate that stunting due to parenting and intake patterns is more robust as a cause than stunting as congenital. In children aged < 12 months, genetic factors are considered to have more influence compared to children aged 12–23 months (Beal et al., 2018). This prediction is strengthened by the second strong determinant found in this study, namely maternal education level. This condition further emphasizes that maternal care and intake factors strongly cause stunting among wealthy families in Indonesia (National Team for the Acceleration of Poverty Reduction, 2017).

The result shows that children at 12–23 months have more stunting risk than the younger ones. It is compatible with the previous study in Indonesia that reported that a higher risk of stunting could be suffered by 12–23-month-old children than the younger ones (Titaley et al., 2019). Moreover, it is also in line with the earlier study stated that in children under two years old, there arose more in the older ones. The results from several studies explained the distinction between low birth weight and length to the normal ones visibly seen after 12 months until two years old (Ngandu et al., 2020). Furthermore, complementary feeding and infection significantly distinguish the body's length and weight (Derso et al., 2017; Wulandari & Laksono, 2023).

The 2018 Indonesian Basic Health Survey results showed that 30% of children from wealthy families in Indonesia were stunted, and this figure dropped to 12.5% in 2021 (Agency for Health Research and Development, 2019; Health Development Policy Agency, 2021). A study in Nepal reported that stunting can be suffered by a wealthy family, even though the higher risk still occurs in low-income families (Budhathoki et al., 2020). A study in Bangladesh and Ethiopia also concluded the same. Stunting occurs in wealthy children because of incorrect parenting styles (Talukder et al., 2018; Tariku et al., 2017). It shows that parenting style and parental education are necessary for preventing stunting. Past studies have proven that parenting style is related to stunting (Situmeang et al., 2020; Utami et al., 2019). A proper maternal parenting style will affect her behavior and attitude toward feeding style to her children, including ensuring that children eat healthy fruit and vegetables, adequate nutritional intake from fertilization of the egg until the child is two years old, providing exclusive breast milk until the baby is six months old, and ensuring that children receive complete immunization. The better the maternal parenting style, the less the possibility of a child suffering from stunting.

Maternal education is also vital in resolving the child's nutrition status. Fulfillment of nutritional intake for the children will need the mother's ability to give parenting style to them. A study in Nepal found that a baby born from an uneducated mother has a higher risk than a baby born from an educated mother (Budhathoki et al., 2020). These inline findings are obtained from a survey of five Southeast countries: Bangladesh, India, Nepal, Maldives, and Pakistan (Wali et al., 2020). A higher-educated mother has better knowledge and insight about nutrition upbringing style where she has a greater chance to learn essential things in child-rearing. Parental education, mother and father, is a strong stunting predictor among children (Utami et al., 2019).

Based on the type of residence, the study found children in rural areas were more likely to be stunted than those in urban areas. It was in line with the previous research that stunting probably suffered more by countryside children than by cities in Indonesia (Laksono, Sukoco, et al., 2022; Paramita et al., 2022). Other studies in Indonesia also discovered a higher stunting proportion of children under two years old in the countryside than in the city (Kusrini & Laksono, 2020; Laksono et al., 2020). A systematic review and meta-analysis reported that stunting in Indonesian villages is strongly affected by maternal education, family income, maternal nutritional knowledge, exclusive breastfeeding, the age of complementary food, adequate zinc and iron, a record of infection, and genetic factors (Purwita et al., 2022).

The result showed that children with mothers of all ages were more likely than mothers > 44 to have stunted children. It is in line with research in Indonesia, where children with middle-aged or older mothers have less probability of stunting than younger mothers, which was also reported in a study in Uganda. This situation may be because the mother is considered more experienced in age and because she already had children before (Susyani et al., 2022). However, other studies show a contrary result or an inconsistency, which offers a relationship between mothers' age and their children from stunting (Laksono, Sukoco, et al., 2022; Titaley et al., 2019).

The research indicated children with divorced/widowed mothers were more likely than those with married mothers to be stunted. It is consistent with other research in Indonesia that also reports a higher risk of stunting children whose mothers are divorced or widows than those who have married mothers. It is possible that because mothers as single parents are not only responsible for domestic matters but are also responsible for earning a living, their attention to their children is reduced (Laksono, Sukoco, et al., 2022; Wulandari, Laksono, Kusrini, et al., 2022). A study in Cameroon and the Congo reported that economic resources and parental care significantly influenced the higher odds of stunting in single-mother households (Ntoimo & Odimegwu, 2014).

Meanwhile, we found that children with unemployed mothers were likelier than those with employed mothers to be stunted. The condition is in contrast with other studies. A study in Indonesia shows a higher possibility of a stunting child whose mother is working than those who are not, similar to research from an urban area in Ethiopia (Ketema et al., 2022). There is the possibility of the influence of extended family intervention in parenting, which, unfortunately, this information could not be obtained from both studies. Some researchers in Ethiopia have a similar result where the stunting prevalence is considered higher in children with jobless mothers than in working mothers (Ahmed et al., 2022; Zewdu & Halala Handiso, 2020).

Based on the gender of the children, boys were more likely to be stunted than girls. It aligns with research in Indonesia, which reported that sons have a higher stunting risk than daughters (Suratri et al., 2023). Moreover, a meta-analysis study about the determining gender of toddlers towards the lack of nutrition also reported having a higher tendency to sons than daughters (Thurstans et al., 2020). However, research in China states that there is no difference in stunting risk related to gender (Zhang et al., 2016). A higher tendency to stunt sons than daughters is probably associated with a higher susceptibility of a son toward an infection that causes weight loss and severe nutritional loss (Nshimyiryo et al., 2019).

Furthermore, regarding early initiation of breastfeeding, children with early initiation of breastfeeding were more likely than those without to be stunted. Early initiation of breastfeeding has been acknowledged to have several benefits for both mothers' and infants'

health. The reflection of the baby sipping on the mother's breast will stimulate breast milk production, and the more often the baby consumes the milk, the more milk will come out. The early winning process and no breastfeeding initiation can be the stunting factors among children. It has been proven that early initiation of breastfeeding at the infant's birth moment is one of the efforts that are conducted to prevent stunting. Several studies in Indonesia, Ethiopia, and the Congo stated that it has less probable stunting (Ayelign & Zerfu, 2021; Muldiasman et al., 2018; Simanjuntak et al., 2018).

Initiation of breastfeeding ensures that the baby can get colostrum to increase the child's immunity to infection. A baby that gets colostrum will not have a risk of stunting. In contrast, infection is a critical determinant of the baby's nutritional status, and it can affect the amount of food they consume and influence their worse nutrition conditions (Aryastami et al., 2017). Early initiation of breastfeeding is one of the entrances to successful breastfeeding and fulfillment of nutritional intake to decrease the risk of standing. A study from Rwanda also reported that breastfeeding initiation has no relation to stunting (Nsereko et al., 2018).

Another study found that a record of exclusive breastfeeding is a risk factor for stunting (Gibson et al., 2020). It may happen because there is no breast milk after birth or the inadequate amount, so it cannot fit the baby's needs. Several things can cause stunted growth and development in infants and children, including delayed initiation, non-exclusive breastfeeding, and early cessation of breastfeeding (Beal et al., 2018). If breast milk production is less in the earlier moment and the mother barely breastfeeds their children, then breast milk production will stop. To meet adequate and high-quality breast milk, nutritional status and intake should be balanced for the breast milk mother.

Study limitation

This study analyzed secondary data from the 2021 Indonesian National Nutrition Status Survey. In the analysis, the study only looked at variables provided by the survey. The study's findings cannot account for several additional factors that prior research has shown to influence stunting in young children. Antenatal care, mother height, BMI, diarrhea, anemia, and agri-food are a few examples (Castro-Bedriñana et al., 2021, 2020).

Besides, the study's quantitative methodology cannot account for the cultural influences that continue to impact Indonesia, particularly in rural areas. Other studies, such as those on the importance of children, prohibited foods, parenting, and dietary habits, influenced the conclusions (Kusrini et al., 2019; Laksono & Wulandari, 2019; Maghfiroh & Laksono, 2020; Pratita & Laksono, 2020).

Conclusions

Based on the research results, the ratio of stunted children under two in wealthy families in Indonesia was 12.5%. Meanwhile, eight variables were related to stunting among wealthy families in Indonesia. The eight were residence, maternal age, marital, maternal education, employment, children's age, gender, and early breastfeeding initiation.

Moreover, the most potent factor related to stunting among wealthy families in Indonesia is the age of the children, followed by maternal education. The results indicate that stunting due to parenting and intake patterns is more robust as a cause than stunting as congenital. The government must focus on the specific targets produced in this study to accelerate reducing the prevalence of stunting in wealthy Indonesian families. The government can include material about good parenting patterns in prenatal classes to increase mothers' knowledge.

Availability of data and materials

The author cannot publicly share the data because a third party and the Ministry of Health of the Republic of Indonesia, who owns the data, do not have permission to share it. The 2021 Indonesian National Nutrition Status Survey data set is available from http://www.bkpk.kemkes.go.id/layanan-permintaan-data-riset/ for researchers who meet the criteria for access to confidential data.

Acknowledgments

The author would like to thank the Ministry of Health of the Republic of Indonesia for processing the 2021 Indonesian National Nutrition Status Survey data.

References

Agency for Health Research and Development. (2019). *Laporan Nasional Riskesdas 2018 [Riskesdas National Report 2018]*. https://repository.badankebijakan.kemkes.go.id/id/eprint/3514/

Ahmed, M., Zepre, K., Lentero, K., Gebremariam, T., Jemal, Z., Wondimu, A., Bedewi, J., Melis, T., & Gebremeskel, A. (2022). The relationship between maternal employment and stunting among 6–59 months old children in Gurage Zone Southern Nation Nationality People's region, Ethiopia: A comparative cross-sectional study. *Frontiers in Nutrition*, *9*, Article 964124. https://doi.org/10.3389/fnut.2022.964124

Aryastami, N. K., Shankar, A., Kusumawardani, N., Besral, B., Jahari, A. B., & Achadi, E. (2017). Low birth weight was the most dominant predictor associated with stunting among children aged 12–23 months in Indonesia. *BMC Nutrition*, *3*(1), Article 16. https://doi.org/10.1186/s40795-017-0130-x

Ayelign, A., & Zerfu, T. (2021). Household, dietary and healthcare factors predicting childhood stunting in Ethiopia. *Heliyon*, *7*(4), Article e06733. https://doi.org/10.1016/j.heliyon.2021.e06733

Beal, T., Tumilowicz, A., Sutrisna, A., Izwardy, D., & Neufeld, L. M. (2018). A review of child stunting determinants in Indonesia. *Maternal and Child Nutrition*, *18*(4), Article e12617. https://doi.org/10.1111/mcn.12617

Budhathoki, S. S., Bhandari, A., Gurung, R., Gurung, A., & Kc, A. (2020). Stunting among under 5-year-olds in Nepal: Trends and risk factors. *Maternal and Child Health Journal*, *24*(s1), 39–47. https://doi.org/10.1007/s10995-019-02817-1

Budiarto, W., Wulandari, R. D., Rohmah, N., & Laksono, A. D. (2021). Ecological relationship between poverty and nutritional status of toddler in Indonesia in 2018. *Indian Journal of Forensic Medicine and Toxicology*, *15*(4), 2863–2869. https://doi.org/10.37506/ijfmt.v15i4.17135

Castro-Bedriñana, J., Chirinos-Peinado, D., & De La Cruz-Calderón, G. (2021). Predictive model of stunting in the Central Andean region of Peru based on socioeconomic and agri-food determinants. *Public Health in Practice*, *2*(21), Article 100112. https://doi.org/10.1016/j.puhip.2021.100112

Castro-Bedriñana, J., Chirinos-Peinado, D., & Ríos, E. R. (2020). Socioeconomic and productive disparity in child stunting in the central Andes of Peru, taking as a model the community of Tunanmarca, Jauja. *Advances in Science, Technology and Engineering Systems*, *5*(3), 135–141. https://doi.org/0.25046/aj050318

Chowdhury, T. R., Chakrabarty, S., Rakib, M., Afrin, S., Saltmarsh, S., & Winn, S. (2020). Factors associated with stunting and wasting in children under 2 years in Bangladesh. *Heliyon*, *6*(9), Article e04849. https://doi.org/10.1016/j.heliyon.2020.e04849

Derso, T., Tariku, A., Biks, G. A., & Wassie, M. M. (2017). Stunting, wasting and associated factors among children aged 6-24 months in Dabat health and demographic surveillance system site: A community based cross-sectional study in Ethiopia. *BMC Pediatrics*, *17*(1), Article 96. https://doi.org/10.1186/S12887-017-0848-2

Development Initiatives. (2021). *2021 Global Nutrition Report: The state of global nutrition*. Development Initiatives Poverty Research Ltd. https://globalnutritionreport.org/documents/851/2021_Global_Nutrition_Report_aUfTRv0.pdf

Galasso, E., & Wagstaff, A. (2016, October). *The economic costs of stunting and how to reduce them*. World Bank Group. https://documents1.worldbank.org/curated/en/099350307142324151/pdf/IDU0e883e26805fcd047b109a050c6013ce72703.pdf

Gibson, R. S., Rahmannia, S., Diana, A., Leong, C., Haszard, J. J., Hampel, D., Reid, M., Erhardt, J., Suryanto, A. H., Sofiah, W. N., Fathonah, A., Shahab-Ferdows, S., Allen, L. H., & Houghton, L. A. (2020). Association of maternal diet, micronutrient status, and milk volume with milk micronutrient concentrations in Indonesian mothers at 2 and 5 months postpartum. *American Journal of Clinical Nutrition*, *112*(4), 1039–1050. https://doi.org/10.1093/ajcn/nqaa200

Health Development Policy Agency (BKPK). (2021, December 21). *Buku Saku Hasil Survei Status Gizi Indonesia Tingkat Nasional, Provinsi, dan Kabupaten/Kota Tahun 2021 [Pocket Book of the Indonesian Nutrition Status Survey at the National, Provincial and District/City Levels in 2021]*. Ministry of Health. https://www.badankebijakan.kemkes.go.id/buku-saku-hasil-studi-status-gizi-indonesia-ssgi-tahun-2021/

Ipa, M., Yuliasih, Y., Astuti, E. P., Laksono, A. D., & Ridwan, W. (2023). Stakeholders' role in the implementation of stunting management policies in Garut Regency. *Indonesian Journal of Health Administration*, *11*(1), 26–35. https://doi.org/10.20473/jaki.v11i1.2023.26-35

Januarti, L. F., & Hidayathillah, A. P. (2020). Parenting culture on the role of father in prevention of stunting in toddler. *Babali Nursing Research*, *1*(2), 81–90. https://doi.org/https://doi.org/10.37363/bnr.2020.1211 Original

Kartasurya, M. I., Syauqy, A., Suyatno, S., Dewantiningrum, J., Nuryanto, N., Sunarto, S., Isnawati, M., Nurcahyani, Y. D., & Wati, E. K. (2023). Determinants of length for age Z scores among children aged–months in Central Java, Indonesia: A path analysis. *Frontiers in Nutrition*, *10*, Article 1031835. https://doi.org/10.3389/fnut.2023.1031835

Ketema, B., Bosha, T., & Feleke, F. W. (2022). Effect of maternal employment on child nutritional status in Bale Robe Town, Ethiopia: A comparative cross-sectional analysis. *Journal of Nutritional Science*, *11*, Article E28. https://doi.org/10.1017/jns.2022.26

Kusrini, I., Ipa, M., & Laksono, A. D. (2019). "Is It true that the child is king?": Qualitative study of factors related to nutritional status of children in West Lombok, Indonesia. *Indian Journal of Public Health Research and Development*, *10*(12), 1729–1733. https://doi.org/10.37506/v10/i12/2019/ijphrd/192113

Kusrini, I., & Laksono, A. D. (2020). Regional disparities of stunted toddler in Indonesia. *Indian Journal of Forensic Medicine and Toxicology*, *14*(3), 1685–1691. https://doi.org/10.37506/ijfmt.v14i3.10706

Laksono, A. D., Sukoco, N. E. W., Rachmawati, T., & Wulandari, R. D. (2022). Factors related to stunting incidence in toddlers with working mothers in Indonesia. *International Journal of Environmental Research and Public Health*, *19*(17), Article 10654. https://doi.org/10.3390/ijerph191710654

Laksono, A. D., & Wulandari, R. D. (2019). "Children are assets": Meta-synthesis of 'the value of children' in the Lani and Acehnese Tribes. *Journal of Reproductive Health*, *10*(1), 11–20. https://doi.org/10.22435/kespro.v10i1.933.11-20

Laksono, A. D., Wulandari, R. D., & Kusrini, I. (2020). Regional disparities of stunted toddler in Madura Island, Indonesia. *Journal of Critical Reviews*, *7*(19), 6115–6121.

https://doi.org/10.31838/jcr.07.19.708

Laksono, A. D., Wulandari, R. D., Kusrini, I., & Ibad, M. (2021). The effects of mother's education on achieving exclusive breastfeeding in Indonesia. *BMC Public Health*, *21*(1), Article 14. https://doi.org/10.1186/s12889-020-10018-7

Laksono, A. D., Wulandari, R. D., Wisnuwardani, R. W., & Amaliah, N. (2022). Stunting among children under two years in Indonesia: Does maternal education matter? *PLOS ONE*, *17*(7), Article e0271509. https://doi.org/10.1371/journal.pone.0271509

Maghfiroh, M. S., & Laksono, A. D. (2020). Diberi air gula… awalnya nangis menjadi diam, karena kenyang, gak lemas, daya tahan tubuhnya meningkat" ["Given sugar water ... at first the cry became silent, because it was full, not limp, its endurance increased"; Study of patterns of infant intake]. *Amerta Nutrition*, *4*(2), 116–122. https://doi.org/10.20473/amnt.v4i2.2020.116-122

Muldiasman, M., Kusharisupeni, K., Laksminingsih, E., & Besral, B. (2018). Can early initiation to breastfeeding prevent stunting in 6–59 months old children? *Journal of Health Research*, *32*(5), 334–341. https://doi.org/10.1108/JHR-08-2018-038

Mutasa, K., Tome, J., Rukobo, S., Govha, M., Mushayanembwa, P., Matimba, F. S., Chiorera, C. K., Majo, F. D., Tavengwa, N. V, Mutasa, B., Chasekwa, B., Humphrey, J. H., Ntozini, R., Prendergast, A. J., & Bourke, C. D. (2022). Stunting status and exposure to infection and inflammation in early life shape antibacterial immune cell function among Zimbabwean children. *Frontiers in Immunology*, *13*, Article 899296. https://doi.org/10.3389/fimmu.2022.899296

Nankinga, O., Kwagala, B., & Walakira, E. J. (2019). Maternal employment and child nutritional status in Uganda. *PLOS ONE*, *14*(12), Article e0226720. https://doi.org/10.1371/journal.pone.0226720

National Team for the Acceleration of Poverty Reduction. (2017, August). *100 Kabupaten Kota prioritas untuk Intervensi Anak Kerdil (Stunting): Volume I [100 Priority Regencies/Cities for Stunting Intervention (Stunting): Volume 1]*. https://www.tnp2k.go.id/images/uploads/downloads/Binder_Volume1.pdf

Ngandu, C. B., Momberg, D., Magan, A., Chola, L., Norris, S. A., & Said-Mohamed, R. (2020). The association between household socio-economic status, maternal socio-demographic characteristics and adverse birth and infant growth outcomes in sub-Saharan Africa: A systematic review. *Journal of Developmental Origins of Health and Disease*, *11*(4), 317–334. https://doi.org/10.1017/S2040174419000680

Nsereko, E., Mukabutera, A., Iyakaremye, D., Umwungerimwiza, Y. D., Mbarushimana, V., & Nzayirambaho, M. (2018). Early feeding practices and stunting in Rwandan children: A cross-sectional study from the 2010 Rwanda demographic and health survey. *Pan African Medical Journal*, *29*, Article 157. https://doi.org/10.11604/pamj.2018.29.157.10151

Nshimyiryo, A., Hedt-Gauthier, B., Mutaganzwa, C., Kirk, C. M., Beck, K., Ndayisaba, A., Mubiligi, J., Kateera, F., & El-Khatib, Z. (2019). Risk factors for stunting among children under five years: A cross-sectional population-based study in Rwanda using the 2015 Demographic and Health Survey. *BMC Public Health*, *19*(1), Article 175. https://doi.org/10.1186/s12889-019-6504-z

Ntoimo, L. F. C., & Odimegwu, C. O. (2014). Health effects of single motherhood on children in sub-Saharan Africa: A cross-sectional study. *BMC Public Health*, *14*(1), Article 1145. https://doi.org/10.1186/1471-2458-14-1145

Paramita, A., Izza, N., Tjandrarini, D. H., & Laksono, A. D. (2022). Does the proximity of the area affect in incidence of stunting?: Study on densely populated provinces in Indonesia. *Indian Journal of Forensic Medicine and Toxicology*, *16*(3), 131–140. https://doi.org/10.37506/ijfmt.v16i3.18257

Pratita, I., & Laksono, A. D. (2020). "Anak ini kalau makan, ya apapun yang diminta…": Eksplorasi Nilai Anak dan Pola Pengasuhan Anak pada Suku Jawa di Desa Besowo, Kediri, Jawa Timur ["If this child eats, whatever she/he is asked ...": Exploration of value of children and parenting patterns in Javanese in the Besowo village, Kediri, East Java]. *Amerta Nutrition*, *4*(2), 147–154. https://doi.org/10.20473/amnt.v4i2.2020.147-154

Purwita, E., Kesehatan Kementerian Kesehatan, P., Soekarno -Hatta, J., Darul Imarah, K., & Aceh Besar, K. (2022). Determinants of stunting in children under five in rural areas. *Science Midwifery*, *10*(4), 2858–2865. https://doi.org/10.35335/midwifery.v10i4.729

Raj, E., Calvo-Urbano, B., Heffernan, C., Halder, J., & Webster, J. P. (2022). Systematic review to evaluate a potential association between helminth infection and physical stunting in children. *Parasites and Vectors*, *15*(1), Article 135. https://doi.org/10.1186/s13071-022-05235-5

Ridwanah, A. A., Megatsari, H., Laksono, A. D., & Ibad, M. (2021). Factors related to stunted in East

Java Province in 2019: An ecological analysis. *Medico-Legal Update*, *21*(2), 230–235. https://doi.org/10.37506/mlu.v21i2.2678

Simanjuntak, B. Y., Haya, M., Suryani, D., & Ahmad, C. A. (2018). Inisiasi menyusui dini dan suplementasi vitamin A dengan status gizi anak usia 6-59 bulan [Early inititation of breastfeeding and vitamin A supplementation with nutritional status of children aged 6-59 months]. *Kesmas: National Public Health Journal*, *12*(3), 107–113. http://dx.doi.org/10.21109/kesmas.v12i3

Situmeang, N. S. D., Sudaryati, E., & Jumirah. (2020). Correlation of parenting and nutrient intake with stunting in children 24-59 months. *Britain International of Exact Sciences (BIoEx) Journal*, *2*(1), 280–285. https://doi.org/10.33258/bioex.v2i1.147

Suratri, M. A. L., Putro, G., Rachmat, B., Nurhayati, Ristrini, Pracoyo, N. E., Yulianto, A., Suryatma, A., Samsudin, M., & Raharni. (2023). Risk factors for stunting among children under five years in the province of East Nusa Tenggara (NTT), Indonesia. *International Journal of Environmental Research and Public Health*, *20*(2), Article 1640. https://doi.org/10.3390/ijerph20021640

Susyani, S., Febry, F., Margarhety, I., Sadiq, A., Sartono, S., Sari, I. P., & Ni'mah, T. (2022). Maternal risk factor on incidence of stunting in South Sumatera. *Open Access Macedonian Journal of Medical Sciences (OAMJMS)*, *10*(E), 1599–1604. https://doi.org/10.3889/OAMJMS.2022.10761

Talukder, A., Razu, S. R., & Hossain, M. Z. (2018). Factors affecting stunting among children under five years of age in Bangladesh. *Family Medicine and Primary Care Review*, *20*(4), 356–362. https://doi.org/10.5114/fmpcr.2018.79348

Tariku, A., Biks, G. A., Derso, T., Wassie, M. M., & Abebe, S. M. (2017). Stunting and its determinant factors among children aged 6-59 months in Ethiopia. *Italian Journal of Pediatrics*, *43*(1), Article 112. https://doi.org/10.1186/s13052-017-0433-1

Thurstans, S., Opondo, C., Seal, A., Wells, J., Khara, T., Dolan, C., Briend, A., Myatt, M., Garenne, M., Sear, R., & Kerac, M. (2020). Boys are more likely to be undernourished than girls: a systematic review and meta-analysis of sex differences in undernutrition. *BMJ Global Health*, *5*(12), Article e004030. https://doi.org/10.1136/BMJGH-2020-004030

Titaley, C. R., Ariawan, I., Hapsari, D., Muasyaroh, A., & Dibley, M. J. (2019). Determinants of the stunting of children under two years old in Indonesia: A multilevel analysis of the 2013 Indonesia Basic Health Survey. *Nutrients*, *11*(5), Article 1106. https://doi.org/10.3390/nu11051106

Utami, R. A., Setiawan, A., & Fitriyani, P. (2019). Identifying causal risk factors for stunting in children under five years of age in South Jakarta, Indonesia. *Enfermeria Clinica*, *29*, 606–611. https://doi.org/10.1016/j.enfcli.2019.04.093

Wali, N., Agho, K. E., & Renzaho, A. M. N. (2020). Factors associated with stunting among children under 5 years in five south asian countries (2014–2018): Analysis of demographic health surveys. *Nutrients*, *12*(12), Article 3875. https://doi.org/10.3390/nu12123875

World Health Organization (WHO). (2014, December 30). *Global nutrition targets 2025: Stunting policy brief*. https://www.who.int/publications/i/item/WHO-NMH-NHD-14.3

World Health Organization (WHO). (2015, November 19). *Stunting in a nutshell*. https://www.who.int/news/item/19-11-2015-stunting-in-a-nutshell

Wulandari, R. D., & Laksono, A. D. (2023). Factors related to stunted toddlers in Eastern Indonesia. *Jurnal Keperawatan Indonesia Timur (East Indonesian Nursing Journal)*, *3*(1), 1–10. https://doi.org/10.32695/JKIT.V3I1.451

Wulandari, R. D., Laksono, A. D., Kusrini, I., & Tahangnacca, M. (2022). The targets for stunting prevention policies in Papua, Indonesia: What mothers' characteristics matter? *Nutrients*, *14*(3), Article 549. https://doi.org/10.3390/nu14030549

Wulandari, R. D., Laksono, A. D., Prasetyo, Y. B., & Nandini, N. (2022). Socioeconomic disparities in hospital utilization among female workers in Indonesia: A cross-sectional study. *Journal of Primary Care & Community Health*, *13*(2), 1–7. https://doi.org/10.1177/21501319211072679

Yoto, M., Hadi, M. I., Pratita, I., Syahriyatul, M., Maghfiroh, Multazam, A. Z., Tyastirin, E., Media, A., Ridwanah, A. A., Sarweni, K. P., Husnia, Z., Esvanti, M., Nugraheni, R., Megatsari, H., & Laksono, A. D. (2020). *Determinan sosial penanggulangan stunting: Riset aksi partisipatif desa sehat berdaya fokus penanggulangan stunting [Social determinants of stunting countermeasures: Participatory action research in healthy villages empowered by stunting countermeasures]*. Health Advocacy.

Zewdu, D., & Halala Handiso, Y. (2020). Under-nutrition of 2–5 years old children and associated factor among employed and unemployed women: Comparative cross-sectional study. *Cogent Food & Agriculture*, *6*(1), Article 1801215. https://doi.org/10.1080/23311932.2020.1801215

Zhang, N., Bécares, L., & Chandola, T. (2016). Patterns and determinants of double-burden of malnutrition among rural children: Evidence from China. *PLOS One*, *11*(7), Article e0158119. https://doi.org/10.1371/journal.pone.0158119