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The Correlation between Maternal Nutrition, Toddler Feeding Patterns, and Household Economic Status on Stunted: A Case Study in Kelurahan Arjowinangun and Mergosono, Malang City

Hubungan Gizi Ibu, Pola Pemberian Makan Balita, dan Status Ekonomi Rumah Tangga dengan Kejadian Stunting: Studi Kasus di Kelurahan Arjowinangun dan Mergosono, Kota Malang

Lorenza Arinda Saputri[1]*, Anita Sulistyorini[1], Vivi Novianti[2], Agung Kurniawan[3]

[1]Department Public Health Sciences, Faculty of Sports Sciences, State University of Malang, Malang, 65145, Indonesia
[2]Department Biology, Faculty of Mathematics and Natural Sciences, State University of Malang, Malang, 65145, Indonesia
[3]Department Medicine, Faculty of Medicine, State University of Malang, Malang, 65145, Indonesia

Article Info

***Correspondence:**
Lorenza Arinda Saputri
lorenzarndptr@gmail.com

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ABSTRACT

Background: Indonesia has a higher potential to experience an increase in stunting cases, because around 31% of children under the age of five experience stunting. The prevalence can be influenced by direct and indirect factors, from pregnancy to early childhood growth. The increasing number of stunting cases affects the quality of human resources, resulting in various significant impacts, such as declining public health, economic stagnation, poverty, and social inequality.

Objectives: This study aimed to examine the correlation between maternal nutrition, toddler feeding patterns, and household economic status with stunted cases in Kelurahan (Urban Village of) Arjowinangun and Kelurahan Mergosono, Malang City.

Methods: This study employed a quantitative approach, utilizing a retrospective cross-sectional design with correlation analysis methods. As many as 60 respondents (mothers and stunted toddlers) participated in the study. Statistical analysis includes Spearman's Rank test for bivariate analysis with a 95% significance level (p=0.05) and multiple logistic regression for multivariate analysis.

Results: Bivariate analysis revealed significant positive correlations between maternal nutrition (p=0.000), toddler feeding patterns (p=0.000), and household economic status (p=0.000) with stunted cases. Among these variables, household economic status demonstrated the strongest correlation, with a correlation coefficient of 0.617. Multivariate analysis showed that the household economic status variable had a greater chance of correlating with stunted cases by 30.989 times.

Conclusion: All three independent variables were significantly correlated with stunted, with household economic status being the strongest determinant.

Keywords: Children, Diet, Malnutrition, Maternal undernutrition, Urban poverty

ABSTRAK

Latar Belakang: *Indonesia memiliki potensi lebih tinggi untuk mengalami peningkatan kasus stunting, dikarenakan sekitar 31% anak yang berusia dibawah lima tahun telah mengalami stunting. Prevalensi tersebut dapat dipengaruhi oleh faktor langsung dan tidak langsung, yang muncul sejak masa kehamilan hingga masa pertumbuhan anak usia dini. Meningkatnya jumlah kasus stunting mempengaruhi kualitas sumber daya manusia, sehingga menimbulkan berbagai*

dampak yang signifikan, seperti menurunnya kesehatan masyarakat, stagnasi ekonomi, kemiskinan, dan kesenjangan sosial.

Tujuan: *Penelitian ini bertujuan untuk mengetahui hubungan antara gizi ibu, pola pemberian makan balita, dan status ekonomi rumah tangga dengan kasus stunting di Kelurahan Arjowinangun dan Kelurahan Mergosono, Kota Malang.*

Metode: *Penelitian ini menggunakan pendekatan kuantitatif, menggunakan desain potong lintang retrospektif dengan metode analisis korelasi. Sebanyak 60 responden (ibu dan balita stunting) berpartisipasi dalam penelitian ini. Analisis statistik meliputi Uji Spearman Rank untuk analisis bivariat dengan tingkat signifikansi 95% (p=0.05) dan Regresi Logistik Berganda untuk analisis multivariat.*

Hasil: *Analisis bivariat menunjukkan adanya hubungan positif yang signifikan antara gizi ibu (p=0.000), pola pemberian makan balita (p=0.000), dan status ekonomi rumah tangga (p=0.000) dengan kasus stunting. Di antara variabel-variabel tersebut, status ekonomi rumah tangga menunjukkan korelasi yang paling kuat, dengan koefisien korelasi sebesar 0.617. Analisis multivariat menunjukkan bahwa variabel status ekonomi rumah tangga memiliki peluang lebih besar untuk berkorelasi dengan kasus stunting sebesar 30.989 kali.*

Kesimpulan: *Ketiga variable independent penelitian ini menunjukkan hasil yang signifikan terhadap kasus stunting, variabel yang paling dominan adalah status ekonomi keluarga.*

Kata kunci: *Anak, Gizi ibu hamil, Kemiskinan perkotaan, Malnutrisi, Pola makanan*

INTRODUCTION

Nutritional health issues are diverse, with stunting remaining a critical concern and a widely discussed topic both nationally and globally. The overall health status of a country is also influenced by stunted prevalence, which contributes to increased morbidity and mortality rates (Amalia et al., 2021). A rise in stunted cases can negatively impact a nation's economic growth, poverty levels, and social inequality, primarily due to the decline in human resource quality and decreased workforce productivity (Suryana and Azis, 2023). Stunting is a nutritional problem characterized by impaired growth due to prolonged inadequate nutrient intake, leading to growth disorder such as a height-for-age deficit (Retno et al., 2024).

According to the Global Nutrion Report (GNP) (2018) the global prevalence of stunting stands at 22.2%. The data from the World Health Organitation (WHO) (2022) indicate that approximately 148.1 million children under the age of five worldwide are affected by stunting. Furthermore, statistics from the Asian Development Bank (ADB) (2024) revealed that in 2022, 31% of children under five in Indonesia experienced stunting. UNICEF (2020) reports that Indonesia ranks fourth globally in stunting prevalence. Although data from the 2022 Indonesia Nutritional Status Survey (SSGI) show a 2.8% decline in stunting cases, Indonesia remains classified as having a high prevalence at 21.6% (Ministry of Health, 2022). This classification is based on the public health cut-off values for stunting, where a prevalence of 10% to <20% is categorized as a moderate public health issue (WHO, 2018b). In 2022, the Indonesian Health Survey reported that stunting prevalence in East Java Province reached 17.7% (Ministry of Health, 2023). This issue requires special attention, particularly in achieving the national stunted reduction target of 14% (Ministry of Health, 2022). In Malang City, the stunting rate among children under five was 18%, which was categorized as a moderate public health issue (Malang City Health Office, 2022).

Fluctuations in stunting cases are influenced by various direct and indirect factors. The primary direct cause of stunting is prolonged inadequate nutrient intake (Ministry of Health, 2022). Stuntingf risk can emerge as early as adolescence, particularly in females who experience nutritional deficiencies and face higher risks during pregnancy, a critical period requiring increased nutritional intake (nutritionally vulnerable groups) (P2PTM Ministry of Health, 2018). Adequate nutrition must be ensured during the golden period, also known as the first 1,000 days of life, which consists of 270 days (9 months) in the womb and 730 days from birth until the child reaches two years of age. During the 270 days of pregnancy, significant physical and hormonal changes occur in the mother, making proper nutrition crucial (Nasriyah and Ediyono, 2023). Thus, maternal nutrition during pregnancy plays a key role in fetal development and the child's subsequent growth (Anitya et al., 2022). While maternal nutrition is a factor to stunting, other factors also play a role, particularly feeding practices for toddlers. Since young children are entirely dependent on adults for their nutrition, parents' feeding behaviors significantly influence their

growth and development (Pratama et al., 2024). Previous studies have identified parental care and feeding patterns as dominant factors in stunting cases. Optimizing toddler feeding patterns is a strategy of paramount importance in stunted prevention, with mothers playing a central role in ensuring proper nutrition for their children (Wibowo et al., 2023). Poor feeding practices can lead to insufficient nutrient intake, increasing the risk of stunting. The successful implementation of proper feeding practices within a family is also closely tied to household income, as higher economic status allows for greater food purchasing power and dietary diversity (Santoso, 2024).

Economic status, including household income and family size, also affects stunting prevalence (Aida, 2019). Previous studies have shown that low-income countries tend to have poor living habits, particularly in dietary patterns, which significantly contribute to higher stunting rates. This has been demonstrated in research conducted in Dhaka, Bangladesh, where low-income populations were found to be at a greater risk of stunted, especially among children under five years old (Goudet et al., 2019). According to the data from the National Socioeconomic Survey (Susenas) by Statistics Indonesia (BPS) (2023) the national poverty rate in Indonesia reached 9.36%, while East Java Province recorded a poverty rate of 10.35%, with 4.26% of the poor population residing in Malang City. Malang City has three subdistricts with a relatively high prevalence of stunted toddlers: Kedungkandang, Sukun, and Lowokwaru. Among these, Kedungkandang Subdistrict has the highest number of poor populations in Malang City (Rukmi et al., 2019). A preliminary study using secondary data from the Malang City Health Office, based on the most recent growth monitoring data from January to April 2024, revealed an increase in stunting cases in four urban villages (*kelurahan*) within Kedungkandang Subdistrict. Stunted cases rose in Kelurahan Arjowinangun (from 55 to 72 cases), Kelurahan Tlogowaru (from 29 to 38 cases), and Kelurahan Bumiayu (from 87 to 89 cases), while a decline was observed in Kelurahan Mergosono (from 106 to 100 cases). Among these areas, Kelurahan Arjowinangun recorded the highest increase in new stunting cases, with 17 additional cases, whereas Kelurahan Mergosono had the highest overall stunting prevalence in Kedungkandang Subdistrict. Given the high stunting rates in Malang City, particularly in these two urban villages, further research is needed to investigate the correlation between maternal nutrition, toddler feeding patterns, and household economic status in relation to stunting cases. Given the high rate of stunting in Malang City, further research was needed to analyze the relationship between maternal nutrition, toddler feeding patterns, and household economic status with stunting cases. This study focused on Arjowinangun and Mergosono urban villages in Malang City with the hope that it would provide factual evidence and direct benefits to efforts to overcome stunting cases locally and nationally.

METHODS

This quantitative study, which used an analytical survey design, retrospective cross-sectional approach, and observational methods, has been granted ethical approval certificate number 1057/HRECC.FODM/2024. It was conducted from August to October 2024. The research procedures included subject selection, data collection through questionnaires and interviews, and statistical analysis. There are two research subjects: mothers and stunted toddlers aged 6-59 months in Arjowinangun Village and Mergosono Village, Malang City. Sampling in this study used random probability sampling techniques to give equal opportunities to the entire population to become samples (Sugiyono, 2022). The sample size was calculated using the Correlative Axis formula by adding the value (α) or type I error rate of 5% (1.64) to the value (β) of type II error of 10% (1.28), divided by 0.5 ln multiplied by the value (r) or correlation coefficient, and then adding 3 (Dahlan, 2016). This calculation is based on the independent variable being dependent on the dependent variable from previous literature, and the total final sample size was accumulated to a minimum of 33.9 mothers and stunted children. This study implemented efforts to reduce dropouts, so the researcher added 76%, as the ideal range for sample addition is 70%-80% (Sugiyono, 2022). According to the Direktorat Gizi dan Kesehatan Ibu dan Anak (2017), a child's nutritional status can be determined based on Z-score calculations. This study focuses on measuring the height or length of toddlers according to their age. The criteria for infant respondents were determined based on anthropometric measurements in the last month that met the nutritional status threshold indicators for children, namely the very short category (<-3 standard deviations) and the short category (-3 to <-2 standard deviations) (Ministry of Health Regulation of the Republic of Indonesia, 2020). The selection of respondents was also analyzed based on the economic background of the infants' families according to the Criteria for Determining the Poor Population in Districts or Cities (Akhmadi, 2016).

A total of 60 mother-child pairs were included as respondents, all of whom met the inclusion criteria, namely having toddlers who were classified as very short or short, residing in the study area, and able to communicate in Indonesian. This was intended to anticipate respondents' misunderstanding in filling out the questionnaire. This study had exclusion criteria that included

mothers and toddlers experiencing urgent conditions or illness, making it impossible for them to contribute during the data collection. This study divided the characteristics of respondents into two groups, namely mothers' and toddlers' characteristics, which were measured using several research instruments. These research instruments included questionnaires and anthropometric measuring tools. The questionnaire was administered to mothers to collect data on maternal characteristics, including age, education level, occupation, body mass index before pregnancy, and weight gain. The research questionnaire also covers pregnancy nutrient variables' characteristics, categories, maximum limits, infant feeding patterns, and family economic status. Pregnancy nutrients were measured based on the fulfillment of the mother's macro and micro nutrient intake during pregnancy (Iswardy, 2018). This variable has characteristics including energy intake, protein, fat, carbohydrates, fiber, and water (Ministry of Health Regulation of the Republic of Indonesia 2019). This variable's categories and maximum limits include inadequate, adequate, and good nutrition, with a maximum limit for the highest score of 85 (Widyastuti, 2022). The feeding pattern of infants is measured based on the type of food, the amount of food given, and the feeding schedule in accordance with the Ministry of Health Regulation of the Republic of Indonesia (2019). This variable has categories and maximum limits that include inadequate nutrition, adequate nutrition, and good nutrition, with a maximum score of 95 (Widyastuti, 2022). The final variable was family economic status, which refers to family income and the ability to meet family food needs based on the Criteria for Determining the Poor Population in Districts or Cities (Akhmadi, 2016). The categories in this variable are extreme poverty, poverty, and near-poverty, with a maximum score of 70 (Jolliffe and Tetteh-Baah, 2024).

The Minister of Health of the Republic of Indonesia (2022) stipulates that anthropometric measurements of children must use appropriate tools and techniques, including measuring body length using an infantometer/lengthboard for children aged 0-2 years or who are unable to stand, while measuring height using a microtoise/stadiometer for children aged >2 years. These measurements will yield Height-for-Age (HFA) or Length-for-Age (LFA) data, which will be analyzed using the WHO-Antro application to determine Z-Scores. Children's nutritional status was also investigated through weight measurements, a baby scale for infants or those unable to stand, and a digital scale/step-on scale for children who can stand. These measuring instruments meet Indonesian National Standards (SNI). In this study, the dependent variable, namely stunting cases, focuses on two categories: Very Short and Short, under the nutritional status thresholds for children (Ministry of Health Regulation of the Republic of Indonesia, 2020). Statistical analysis includes Spearman's Rank test for bivariate analysis at a significance level of 95% (p=0.05) and multiple logistic regression for multivariate analysis.

RESULTS AND DISCUSSION

Respondent Characteristics: Mothers of Stunted Toddlers in Kelurahan Arjowinangun and Kelurahan Mergosono

This study was conducted on 60 mothers who had stunted toddlers from Arjowinangun Village and Mergosono Village with various characteristics contained in Table 1 below. Starting from the mother's age characteristics, it was found that most (26.7%) were 25-30 years old. The dominant level of education was high school/vocational school (46.7%), and most mothers were housewives (68.3%). Regarding BMI before pregnancy, almost half (46.7%) had a BMI in the normal range (18.5-24.9 kg/m²). In addition, 53.3% of mothers experienced a weight gain of 9-<10 kg during pregnancy until delivery.

Characteristics of maternal age are divided into five age groups, which are based on descriptive calculations to provide an overview of the distribution of maternal age ranges among research respondents. These age characteristics show that the age distribution of mothers of stunted toddlers is evenly spread, with a method limitation of an interval of 5-6 years. The mothers' education levels are classified into five categories that have been adjusted to the formal education levels in Indonesia. These categories have methodological limitations, including primary, secondary, and higher education (Youth and Sports Service of Sleman Regency, 2018).

The researcher determined the division of mothers' occupational characteristics in this study based on field conditions. These maternal occupational categories are divided into six groups based on the formal level of employment, type of work, and work location. For the body mass index (BMI) characteristics of pregnant women, measurements were taken based on maternal anthropometric history before and during pregnancy, as recorded in the KIA (Mother and Child Health) book. From this data, BMI calculations were performed using the formula: the mother's weight (kg) divided by her height (Iswardy, 2018). Based on the recommendations of the Institute of Medicine (IOM) and the National Research Council (NRC) the BMI characteristics before pregnancy are categorized into four groups with the following thresholds: <18.5 (underweight), 18.5–24.9 normal), 25–29.9 (overweight), and >30 (obese). The characteristics of weight gain during pregnancy are aligned with the BMI classification, which was divided into groups with the following ranges: 12.5-

18 kg for underweight, 11.5-16 kg for normal weight, 7-11.5 kg for overweight, and 5-9 kg for obesity (Khanolkar et al., 2020).

Based on the age characteristics of the mothers, the data indicate that many mothers fall within the ideal age range (25–30 years) for raising children. However, previous research has found that this age group also has the highest prevalence of stunted children (Marlani et al., 2021). The data also show that 40 mothers fall outside the ideal age range, aligning with Duncan et al. (2018), who reported that mothers younger than 25 years or older than 35 years face greater health risks for both themselves and their children. This is due to younger mothers (<25 years) often lacking emotional and physical maturity (Chakole et al., 2022). Older mothers (>35 years) are at a higher risk of experiencing pregnancy complications (Correa-De-Araujo and Yoon, 2021). Regarding educational background, most mothers had low education levels, with only nine respondents having attended higher education. This finding is consistent with previous studies indicating that mothers with only primary or secondary education are more likely to have stunted children (Laksono et al., 2022). Maternal education is closely related to knowledge about health and nutrition (Paramita et al., 2022), as well as the implementation of proper hygiene and sanitation practices in food preparation (Mariana and Muhrofi-G, 2017). Regarding employment status, the data show that homemakers (unemployed mothers) are more likely to have stunted children (Mentari and Hermansyah, 2019). This could be attributed to a correlation between unemployment and lower education levels, which in turn affect nutritional knowledge and feeding practices, potentially disrupting child growth and development (Setyaningsih et al., 2024).

Table 1. Frequency Distribution Based on Maternal Age (Years), Education Level, Occupation, Pre-pregnancy Body Mass Index (BMI) (kg/m²), and Maternal Weight Gain during Pregnancy (kg)

Characteristic	n	%
Maternal Age (Years)		
19–24	15	25
25–30	16	26.7
31–36	15	25
37–42	10	16.7
43–48	4	6.7
Total	60	100.0
Maternal Education Level		
Elementary school	8	13.3
Junior high school	15	25
Senior/vocational high school	28	46.7
Diploma (D-3)	2	3.3
Bachelor's degree (S-1)	7	11.7
Total	60	100.0
Maternal Occupation		
Homemaker	41	68.3
Factory worker	6	10
Tailor/trader/home-based laundry worker	5	8.3
Private employee	6	10
Teacher/nurse	2	3.3
Total	60	100.0
Pre-pregnancy BMI (kg/m^2)		
<18.5	13	21.7
18.5–24.9	28	46.7
25–29.9	15	25
>30	4	6.7
Total	60	100.0
Maternal Weight Gain during Pregnancy (kg)		
<5–8	11	18.3
9–<10	32	53.3
>10–14	15	25
16–20	2	3.3
Total	60	100.0

Note: n = sample size

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Regarding maternal BMI before pregnancy and gestational weight gain, many mothers did not meet the recommended weight gain standards established by the Institute of Medicine (IOM) and the National Research Council (NRC) in 2009 (Khanolkar et al., 2020). The findings indicate that most mothers had a normal BMI (18.5–24.9 kg/m²) before pregnancy, with a recommended weight gain of 11.5–16 kg. However, many mothers experienced weight gain of less than 10 kg, which aligns with previous research showing a positive correlation between inadequate gestational weight gain (<10 kg) and stunting cases (Noviyanti et al., 2019). Several factors influence this condition, including maternal nutrition intake, hygiene and sanitation practices, socioeconomic status, and cultural factors (Yudianti et al 2017).

Characteristics of Stunted Toddlers in Kelurahan Arjowinangun and Kelurahan Mergosono

This study was conducted on 60 respondents who were toddlers experiencing stunting to explore the characteristics of toddlers, including their age and gender. The age characteristics of the toddlers were measured based on the calculation of their date of birth and data collection obtained from the KIA book or questionnaires filled out by the toddlers' mothers. The age categories of the toddlers in this study were divided into five age groups (months) arranged by the researchers based on the conditions of the respondents in the field and based on the classification of children's ages (0-60 months) (Ministry of Health Regulation of the Republic of Indonesia, 2020).

Table 2. Characteristics of Stunted Toddlers Based on Age (Months) and Sex

Characteristic	n	%
Toddler Age (Months)		
6–15	13	21.7
16–25	13	21.7
26–35	11	18.3
36–45	11	18.3
46–56	12	20.0
Total	60	100.0
Sex		
Male	32	53.3
Female	28	46.7
Total	60	100.0

Note: n = sample size

Table 2 presents the characteristics of stunted toddlers in Kelurahan Arjowinangun and Kelurahan Mergosono based on age (in months) and sex. The dominant age groups, out of the 60 participants, were 6–15 months (21.7%) and 16–25 months (21.7%). Additionally, the majority of stunted toddlers were male (53.3%).

Overview of Independent and Dependent Variables

This study obtained results on the distribution between independent variables and dependent variables. The distribution was divided into four variables, including maternal nutrition, which was categorized into three groups (poor, sufficient, and good); toddler feeding patterns, which were categorized into three groups (poor, sufficient, and good); and household economic status, which was categorized into three groups (extremely poor, poor, and near poor). The data were measured using the research instrument and analyzed descriptively.

Table 3 shows that 81.7% of respondents had sufficient maternal nutritional intake during pregnancy. The majority of toddlers (75.0%) had sufficient feeding patterns, while 68.3% of families were classified as poor. According to the World Bank (2023) standards, families are categorized as poor if their monthly income is below IDR 1,500,000. This indicates that most respondents in Kelurahan Arjowinangun and Kelurahan Mergosono fell into the category of poor.

This study found that toddlers aged 12–23 months have a higher risk of stunting, which was also found in previous studies (Titaley et al., 2019). The discussion in this study is based on the conditions at the time of measurement, which is consistent with the age range of toddlers who are transitioning from exclusive breastfeeding to complementary feeding (MP-ASI). At this age, infants are more susceptible to infections, which can significantly increase the risk of stunting and exacerbate existing cases (Qomariyah and Fatmawati, 2024). The data also reveal that the majority of stunted toddlers are male (53.3%), while female toddlers account for 46.7%. This is consistent with Thompson (2022), who found that male children are more susceptible to infections and malnutrition due to biological, social, and

environmental factors. Biologically, male children are more vulnerable than females because estrogen production in females enhances immune function more effectively than androgen production in males (White et al., 2022). From a social perspective, parenting styles for male children tend to be more lenient, leading to higher exposure to environmental risks and infections, which in turn increases their vulnerability to stunted (Thompson, 2022). Recent studies have further confirmed that male children face a higher risk of stunting compared to female children (Aurora et al., 2024).

Table 3. Distribution of Maternal Nutrition, Toddler Feeding Patterns, Household Economic Status, and Stunted

Characteristic	n	%
Maternal Nutrition		
Poor	10	16.7
Sufficient	49	81.7
Good	1	1.7
Total	60	100.0
Toddler Feeding Patterns		
Poor	13	21.7
Sufficient	45	75.0
Good	2	3.3
Total	60	100.0
Household Economic Status		
Extremely poor	6	10.0
Poor	41	68.3
Near poor	13	21.7
Total	60	100.0
Stunted		
Severely stunted (<-3 SD)	26	43.3
Stunted (-3 SD to < -2 SD)	34	56.7
Total	60	100.0

Note: n = sample size

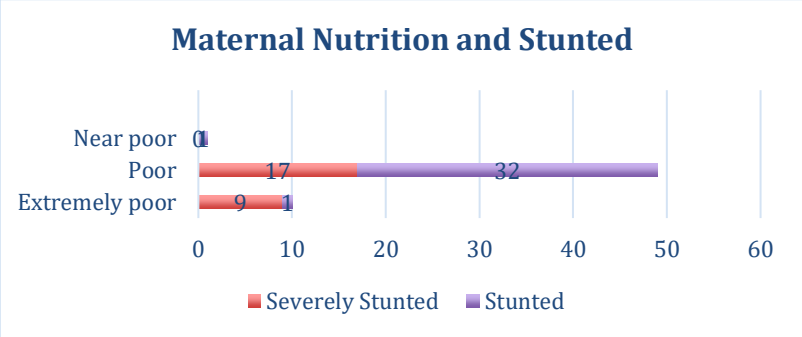

Chart 1. Maternal Nutrition and Stunted

Chart 1 presents the relationship between maternal nutritional intake during pregnancy and stunted status among toddlers. According to Chart 1, the majority of respondents had sufficient maternal nutrition, regardless of whether their child was severely stunted or stunted. Among the 60 respondents, 34.7% of mothers with sufficient nutritional intake had severely stunted children, while 65.3% had stunted children. From the results of the analysis, it can be interpreted that maternal nutritional intake during pregnancy is not the main factor that can influence the emergence of stunted cases in the two regions, but is also influenced by other factors.

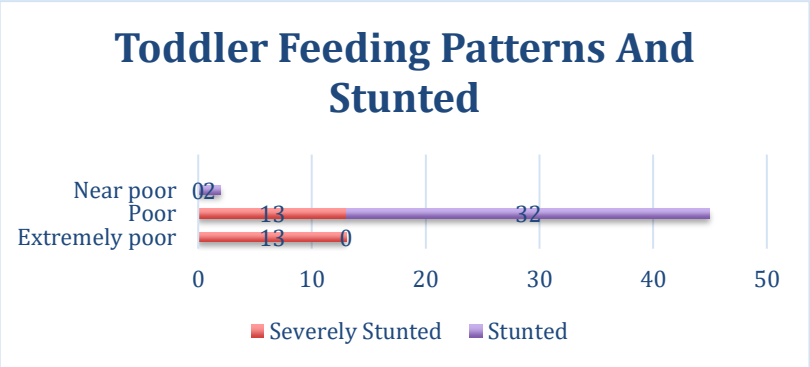

Chart 2. Toddler Feeding and Stunted

Chart 2 shows the relationship between toddler feeding patterns and stunted status among toddlers. Based on Chart 2, it was found that most mothers of toddlers have implemented a fairly good feeding pattern. Of the 60 respondents who have a fairly good feeding pattern, 28.9% of toddlers are in the severely stunted category and 71.1% of toddlers are in the stunted category. This finding can be interpreted that even though toddlers with fairly good feeding patterns still have the possibility of experiencing stunted. This is caused by other causal factors, so that in the application of nutrition, it is not only focused on the adequacy of good feeding patterns, but also needs to consider other factors.

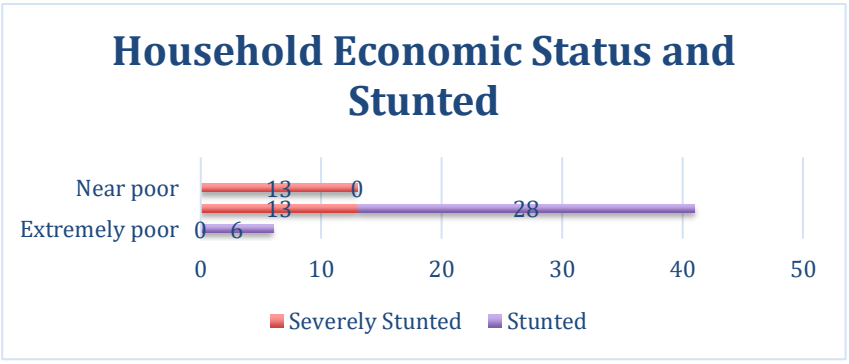

Chart 3. Household Economic and Stunted

Chart 3 presents the relationship between household economic status and stunted among toddlers. The chart shows that severely stunted children were predominantly from near-poor and poor households, while stunted children mainly were from poor households. Among the 60 respondents, all children from near-poor households (100%) were classified as severely stunted. Additionally, among children from poor households, 68.3% were stunted, and 31.7% were severely stunted. From these results, it can be interpreted that the lower the family economic status, the greater the risk of children experiencing stunted. A more optimal strategy is needed to support the improvement of family economic welfare in both regions.

Correlation Analysis between Maternal Nutrition and Stunting in Kelurahan Arjowinangun and Kelurahan Mergosono

Based on Spearman's Rank correlation test between maternal nutrition and stunting, the significance value (Sig. (2-tailed)) was 0.000, less than 0.05, indicating a statistically significant relationship. The correlation coefficient (r) was -0.447, suggesting a moderate negative correlation. This implies that better maternal nutritional intake during pregnancy is associated with a lower likelihood of stunted children. There is a relationship between pregnancy nutrients and stunting, but it is not the main factor causing toddlers to experience severely stunted or stunted. Maternal nutrient intake is categorized as adequate if the mother maintained a healthy diet and sufficient nutrient intake throughout pregnancy, as assessed based on questionnaire scoring aligned with the Recommended Dietary Allowance *(Angka Kecukupan Gizi)* standards (Minister of Health Regulation No. 28 of 2019 on Recommended Nutritional Adequacy Rates for Indonesian People). These findings suggest that the majority of respondents had an adequate nutrient intake during pregnancy. Pregnancy is a critical period for fetal growth, as nutrient supply is transferred through the placenta. Mothers with insufficient nutrient intake during pregnancy are at risk of nutrient deficiencies (Nurlaili et al., 2024). Poor maternal nutrition increases the risk of stunted in children, as deficiencies in vitamins A, C, and D during pregnancy can lead to impaired linear growth in infants (Fitriani et al., 2020). Inadequate maternal

nutrient intake can also reduce blood volume, negatively affecting fetal growth. However, maternal nutrient fulfillment during pregnancy is influenced by multiple factors, including hygiene, socioeconomic status, cultural practices, and environmental conditions (Yudianti et al., 2017). Research by Mirza et al. (2023) also found that poor maternal nutrition is associated with low birth weight (LBW), which indirectly contributes to an increased risk of stunting.

Correlation Analysis between Toddler Feeding Patterns and Stunting in Kelurahan Arjowinangun and Kelurahan Mergosono

The Spearman's Rank correlation test between toddler feeding patterns and stunting shows that the significance value (Sig. (2-tailed)) was 0.000, which is less than 0.05. It indicates a statistically significant correlation. The correlation coefficient (r) was -0.438, suggesting a moderate negative correlation. This implies that better toddler feeding patterns are associated with a reduced risk of stunting.

There is a relationship between toddler feeding patterns and stunting, but it is not the main factor causing toddlers to experience severely stunted and stunted. This indicates that most stunted children in Kelurahan Arjowinangun and Kelurahan Mergosono had sufficient or poor feeding patterns. Feeding patterns describe toddler's nutritional intake, including the type, quantity, and feeding schedule, all of which influence child health (Susanti and Putri, 2023). Previous studies have found that low parental awareness, limited education, and poor food selection and preparation contribute to stunting (Septriliyana et al., 2022). Additionally, unresponsive feeding practices increase the risk of stunting by 8.1 times (Darojat et al., 2023). Research by Yunita et al. (2022) also found a significant relationship between feeding patterns and stunting , with most children following an appropriate feeding pattern. However, nutritional intake remains insufficient in terms of both quality and quantity, which continues to be a significant factor contributing to stunting (Vitriasari et al., 2023).

Correlation Analysis between Household Economic Status and Stunting in Kelurahan Arjowinangun and Kelurahan Mergosono

The result of the Spearman's Rank correlation test assessing the relationship between household economic status and stunting shows a significance value (Sig.(2-tailed)) of 0.000, which is less than 0.05, indicating a statistically significant positive correlation. The correlation coefficient (r) was 0.617, suggesting a strong positive correlation. This indicates that households with middle or adequate economic status still have a likelihood of having stunted children.

There is a relationship between family economic status and severely stunted and stunted toddlers, where it was found that the lower the family economy, the greater the risk of toddlers experiencing severely stunted and stunted cases. This finding aligns with previous studies that have established a significant relationship between economic status and stunting cases (Amra, Rambe and Bancin, 2024). A literature review by Nurahadiyatika et al. (2022) found that poverty is directly linked to fluctuations in stunting rates, as economic constraints limit access to healthcare and sanitation services, thereby increasing the risk of infections that can hinder child growth and development. Furthermore, low-income status is often associated with lower parental education levels, which can lead to poor knowledge of childcare practices and inadequate nutritional intake, both of which contribute to stunting. According to Statistics Indonesia (BPS) (2023) as of September 2022, approximately 26.36 million Indonesians were living below the poverty line, marking an increase of 9.57%. However, economic status alone does not guarantee optimal nutritional fulfillment (Rohmatin and Wulan, 2019). Surprisingly, previous research suggests that children from middle-income families may have a higher risk of stunting (Hidayah et al., 2021). Sinaga (2023) supports this finding, stating that poor food allocation and inappropriate food choices, regardless of economic status, can lead to inadequate nutrition. Similarly, Suparmi et al. (2023) found that even children from economically stable families may experience malnutrition due to inadequate parenting practices, including limited time, lack of parental support, and insufficient psychosocial stimulation.

Correlation Analysis Between Maternal Nutrition, Toddler Feeding Patterns, and Household Economic Status to Stunting in Kelurahan Arjowinangun and Kelurahan Mergosono

The results indicate a significant association between maternal nutrition, toddler feeding patterns, and household economic status and stunting, as evidenced by *p*-values<0.25. Consequently, multiple logistic regression selected all variables as candidates for further analysis. This stage aims to determine the factors most likely to influence stunting independently. The additional study will help identify and develop interventions that target the main causal factors with the most significant impact, thereby effectively supporting efforts to address the stunting problem.

Both maternal nutrition and household economic status had *p*-values<0.05, indicating a significant positive association with stunting. Among the variables, household economic status exhibited the highest odds ratio, suggesting that children from lower-income families are 30.989

times more likely to experience stunting. These findings align with Ardha et al. (2023), who reported that children from low-income households are 2.6 times more likely to suffer from stunting. Moreover, lower household economic status often leads to inadequate nutritional fulfillment, thereby increasing the risk of malnutrition (Adebisi et al., 2019). Household economic status has the greatest influence on stunting risk, increasing the likelihood by 30.989 times. This finding is consistent with Ardha et al. (2023), who reported that children from low-income families are 2.6 times more likely to experience stunting. Previous studies have also suggested that socioeconomic status is an indirect factor influencing stunting prevalence (Aryastami et al., 2017). Low economic status often leads to inadequate nutritional intake, increasing the risk of malnutrition (Adebisi et al., 2019). Economic constraints limit a family's purchasing power, preventing them from meeting dietary needs following nutritional adequacy standards. Furthermore, lower economic status is often associated with lower parental education levels, negatively affecting nutritional knowledge and feeding practices during pregnancy and infancy. As a result, even when food availability is sufficient, improper maternal nutrition and suboptimal infant feeding practices may still contribute to stunting. The results of the study have limitations of analysis only based on systematic review, the strongest results obtained are that the economy is the most influential factor. Therefore, further research is needed that analyzes directly in field conditions to determine the correlation of each factor causing stunting (Aini et al., 2022).

The strength of this study is its ability to address topics that align with the Sustainable Development Goals (SDGs) in efforts to combat malnutrition and prevent child mortality. This study also employs multivariate analysis, providing insights into the broader causes of stunting and retrospective analysis to examine history, as well as cross-sectional analysis to generate data on the relationships between variables simultaneously. The use of primary and secondary data in this study minimizes data bias. This study's limitation is that it does not examine other variables that may influence stunting cases, focusing solely on the correlation between maternal nutrition, infant feeding patterns, and family economic status and stunting. It only analyzes the correlation between pregnancy nutrition, toddler feeding patterns, family economic status, and stunting. This study is further limited due to resource constraints, time, and funding from the researchers. The researchers can compensate for this by ensuring representative sampling and accurate statistical analysis with the assistance of experts from faculty members or research validators.

CONCLUSION

The findings indicate that all three independent variables are correlated with stunting, while household economic status shows the strongest association. Among these factors, economic status significantly influences stunting risk compared to the other two variables. A limitation of this study is that it did not account for other potential independent variables that may also contribute to stunting. Therefore, future research should explore additional factors such as environmental influences, maternal and child psychological conditions, and exposure to unhealthy foods. As a recommendation, both study areas should enhance preventive efforts and stalled interventions, including educational programs for mothers and nutrition-focused assistance for affected children. Raising public awareness of the underlying causes of stunting is also crucial.

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None.

Author Contributions

LAS: conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; resources; software; supervision; validation; visualization; roles/writing - original draft; writing - review & editing; AS: conceptualization; methodology; supervision; validation; writing - review & editing; VN: writing–review and editing; AK: writing–review and editing.

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