International Journal of Advanced Health Science and Technology e-ISSN:2808-6422; p-ISSN:2829-3037
Homepage: ijahst.org Vol. 6 No. 1, pp. 17-24, February 2026

RESEARCH ARTICLE OPEN ACCESS
Manuscript received November 10, 2025; revised January 10, 2026; accepted January 15, 2026; date of publication February 30, 2026
Digital Object Identifier (DOI): https://doi.org/10.35882/ijahst.v6i1.491

How to cite: Tri Wahyuni, Nurlailis Saadah, Suparji, Astin Nur Hanifah, Teta Puji Rahayu, "Determinants of Stunting Incidence in Toddlers Cross-Sectional Study at Sukomoro Health Center, Magetan Regency, East Java", International Journal of Advanced Health Science and Technology, Vol. 6 No. 1, pp. 17-24, February 2026.

Determinants of Stunting Incidence in Toddlers Cross-Sectional Study at Sukomoro Health Center, Magetan Regency, East Java

Tri Wahyuni, Nurlailis Saadah, Suparji, Astin Nur Hanifah, Teta Puji Rahayu

Department of Midwifery, Poltekkes Kemenkes Surabaya, Surabaya, Indonesia

Correspondent writer: Nurlailis Saadah (nurlailis_66@yahoo.co.id)

ABSTRACT Stunting remains a significant public health issue in Indonesia, particularly in regions like Sukomoro, where the prevalence is higher than the national average. This study aims to identify and analyze the factors contributing to stunting in toddlers aged 0-5 years in the Sukomoro Health Center area, Magetan Regency, East Java, to inform effective prevention strategies. A cross-sectional study was conducted involving 300 toddlers selected through simple random sampling from a population of over 1,200. Data were collected via structured interviews and maternal and child health book reviews, followed by statistical analysis using descriptive statistics and ordinal logistic regression. The results revealed that the incidence of stunting was associated with several factors, including maternal health history during pregnancy, especially Chronic Energy Deficiency (KEK), and low maternal education. The regression analysis showed that maternal health significantly increased the risk of stunting in children (B = 0.616, p = 0.026). However, other factors, such as family income, exclusive breastfeeding, and low birth weight, did not show statistically significant associations. This study highlights the importance of maternal health, particularly addressing KEK, as a key determinant in stunting prevention. Effective interventions should focus on improving maternal nutrition before and during pregnancy, alongside strengthening health services and community-based nutrition education.

INDEX TERMS Stunting, Maternal Health, Toddlers, Nutrition, Public Health.

I. INTRODUCTION

Stunting remains one of the most persistent public health and nutritional challenges affecting children under five years of age, particularly in low- and middle-income countries. Stunting is defined as impaired linear growth resulting from chronic malnutrition, recurrent infections, and inadequate psychosocial stimulation, primarily occurring during the first 1,000 days of life [1]. This condition is not merely reflected in short stature but represents a cumulative process of nutritional deprivation that adversely affects physical growth, cognitive development, immune function, and long-term human capital formation [2]. Children who experience stunting are more vulnerable to infectious diseases, demonstrate delayed motor and cognitive development, and face reduced educational achievement and work productivity later in life [3].

Globally, stunting continues to contribute substantially to child morbidity and mortality despite sustained international efforts. Recent estimates indicate that millions of children worldwide remain stunted, with the highest burden concentrated in developing regions [4]. The World Health Organization (WHO) emphasizes that reducing stunting requires equity-oriented, multisectoral interventions that prioritize maternal nutrition, early-life health services, and targeted actions for vulnerable populations, particularly during the critical window of the first 1,000 days of life [5]. These policy directions underscore that stunting should be addressed not only as a nutritional problem but also as a broader issue of social equity and sustainable development.

In Indonesia, stunting remains a major public health concern. Although national data show a gradual decline in prevalence, the rate remains above the WHO threshold and varies considerably across provinces and districts [6]. In East Java Province, including Magetan Regency, stunting persists as a significant health problem, indicating persistent subnational disparities [7]. These conditions highlight the urgent need for localized evidence to support effective and context-specific interventions, particularly within the primary health care system.

Recent state-of-the-art studies on stunting increasingly adopt multidimensional analytical frameworks to explore its determinants. Empirical evidence suggests that stunting results from a complex interaction of maternal factors, infant feeding practices, birth outcomes, household socioeconomic conditions, and access to quality health services [8]–[10]. Advanced statistical approaches, including multivariable and ordinal logistic regression models, have been widely applied to estimate the relative contribution of these determinants to stunting risk [11], [12]. Among these factors, maternal health status during pregnancy especially chronic energy deficiency, anemia, and micronutrient inadequacy has consistently

e-ISSN:2808-6422; p-ISSN:2829-3037
Vol. 6 No. 1, pp. 17-24, February 2026

emerged as a key predictor of impaired child growth [13], [14].

However, several research gaps remain. First, many previous studies rely on national or provincial datasets that may obscure local contextual determinants at the primary health care level [15]. Second, findings regarding the relative importance of maternal health history compared with socioeconomic and neonatal factors remain inconsistent across regions [16]. Third, limited studies in Indonesia have applied ordinal logistic regression to simultaneously examine multiple determinants of stunting using district-level data from community health centers [17], [18]. Addressing these gaps is essential to inform targeted, evidence-based stunting prevention strategies.

Therefore, this study aims to analyze the determinants of stunting incidence among toddlers in the working area of the Sukomoro Health Center, Magetan Regency. Specifically, this research examines the influence of maternal education, maternal health history during pregnancy, family income, exclusive breastfeeding practices, and birth weight on stunting incidence using an analytical cross-sectional design.

This study contributes to the literature in three important ways. First, it provides localized empirical evidence on stunting determinants at the primary health care level. Second, it strengthens evidence regarding the central role of maternal health during pregnancy in shaping child growth outcomes. Third, it applies ordinal logistic regression analysis to identify significant predictors of stunting, offering a robust methodological reference for future nutritional epidemiology research.

The remainder of this article is organized as follows. Section II presents the research methodology. Section III reports the study findings. Section IV discusses the results in relation to previous studies, and Section V concludes the paper with policy implications and future research directions.

II. METHODS

A. STUDY DESIGN AND SETTING

This study employed an analytical quantitative design using a cross-sectional approach. The cross-sectional design was selected to examine the association between multiple determinant factors and the incidence of stunting at a single point in time, allowing efficient assessment of population-level health conditions and related risk factors. This design is widely used in nutritional epidemiology to identify determinants of child growth outcomes and to inform public health interventions [19], [20].

The study was conducted in the working area of the Sukomoro Health Center (UPTD Puskesmas Sukomoro), Magetan Regency, East Java, Indonesia. This health center serves one sub-district comprising 13 villages and provides routine maternal and child health services, including growth monitoring, antenatal care, and nutrition programs. Data collection was carried out between January and March 2024, coinciding with regular community health service activities (posyandu), ensuring optimal access to respondents and health records.

B. POPULATION AND SAMPLE

The study population consisted of all toddlers aged 12–59 months who were registered in the Sukomoro Health Center area during the study period, totaling 1,200 children based on official health center records. Toddlers within this age range were selected because linear growth retardation becomes more evident after infancy and is a standard age group for stunting assessment [21].

The sample size was calculated using the Slovin formula with a 5% margin of error to ensure representativeness and statistical reliability. Based on this calculation, a minimum sample of 300 toddlers was required. A simple proportional random sampling technique was applied to select respondents from each village proportionally to the number of registered toddlers. Randomization was conducted using the health center registry list to minimize selection bias and ensure equal probability of inclusion [22].

Inclusion criteria were toddlers aged 12–59 months who had complete growth records and whose mothers or caregivers consented to participate. Exclusion criteria included toddlers with congenital abnormalities, chronic illnesses affecting growth, or incomplete maternal and child health records.

C. STUDY VARIABLES AND OPERATIONAL DEFINITIONS

The dependent variable was stunting incidence, defined as impaired linear growth based on the height-for-age (H/A) index. Stunting was classified using World Health Organization (WHO) Child Growth Standards, where a H/A z-score of < -2 standard deviations (SD) indicated stunting, and ≥ -2 SD indicated normal growth [23]. The independent variables included:

1. Maternal education level, categorized as basic, secondary, or higher education.
2. Maternal health history during pregnancy, classified based on the presence or absence of Chronic Energy Deficiency (CED/KEK) documented in antenatal records.
3. Family income, categorized as below, equal to, or above the Regency Minimum Wage (UMK).
4. Exclusive breastfeeding history, classified as exclusive breastfeeding for the first six months (yes/no).
5. Birth weight, categorized as low birth weight (LBW $<$ 2500 g) or normal birth weight ($\geq$ 2500 g).

These variables were selected based on previous empirical evidence identifying maternal, socioeconomic, and neonatal factors as major contributors to stunting [24], [25].

D. DATA COLLECTION PROCEDURES

Primary data were collected through structured interviews with mothers or primary caregivers using a standardized questionnaire developed based on the study variables. The questionnaire was pre-tested for clarity and reliability prior to data collection.

Secondary data were obtained from the Maternal and Child Health (KIA) book and health center medical records to ensure objective measurement of birth weight, maternal health history during pregnancy, and child anthropometric data. Child height measurements were conducted by trained health workers using standardized height boards, following

e-ISSN:2808-6422; p-ISSN:2829-3037
Vol. 6 No. 1, pp. 17-24, February 2026

WHO measurement protocols to reduce measurement error [26].

E. DATA ANALYSIS

Data were entered, cleaned, and analyzed using statistical software. Descriptive statistics were used to summarize respondent characteristics and variable distributions. To assess the relationship between independent variables and stunting incidence, ordinal logistic regression analysis was applied. This method was chosen because it allows simultaneous examination of multiple predictors and is appropriate for categorical outcome variables with ordered levels [27]. The significance level was set at $p < 0.05$. Model adequacy was assessed using deviance and likelihood ratio tests to evaluate goodness-of-fit and overall model performance.

F. ETHICAL CONSIDERATIONS

This study received ethical approval from the authorized Health Research Ethics Committee prior to data collection. All participants were provided with detailed information regarding the study objectives, procedures, potential risks, and benefits. Written informed consent was obtained from all mothers or caregivers. Participant confidentiality was strictly maintained by anonymizing personal identifiers and restricting data access to research purposes only, in accordance with ethical standards for human subject research [28].

III. RESULTS

This study shows that most of the toddlers in the Sukomoro Health Center area do not experience *stunting*. Most children receive exclusive breastfeeding, are born with normal weight, and come from mothers with secondary education and family income under MSEs. Most mothers also do not experience any health problems during pregnancy. The following is a discussion of the results of *stunting* in toddlers at the Sukomoro Health Center, Magetan Regency in 2024:

A. Overview of Research Locations

The Sukomoro Health Center, located in Bulu Village, Sukomoro District, Magetan Regency, has a working area of about 33,040 square kilometers covering one sub-district and 13 villages. This health center provides health services that include nutrition programs and monitoring of the growth and development of toddlers, which is very important in efforts to prevent and overcome stunting problems in the region.

B. Research Results

From TABLE 1 of the study, it is known that most mothers in this region have a secondary level of education, which is around 64.3%, while 20% have basic education, and 15.7% are highly educated. Maternal health conditions during pregnancy also vary, with 75.3% of mothers experiencing normal pregnancies without nutritional problems, and 24.7% experiencing Chronic Energy Deficiency (SEZ), which is a condition of lack of adequate energy intake during pregnancy. In terms of the economy, most families (77.7%) have an income below the Regency Minimum Wage (UMK), while 21.7% have an income according to MSEs, and only 0.6% have an income above MSEs. This shows that most families in the region face economic constraints that can affect their ability to meet their child's nutritional needs.

Based on TABLE 2 of the cross-table analysis, it can be seen that there is a relationship between *stunting status* and several risk factors. The highest prevalence of *stunting* was found in toddlers with mothers with basic education (41.7%), mothers who experienced Chronic Energy Deficiency (KEK) during pregnancy (50%), families with incomes below MSEs (38.6–41.5%), infants who did not receive exclusive

TABLE 1
Distribution of Frequency of Determinants of *Stunting Incidence* in Toddlers at the Sukomoro Magetan Regency Health Center in 2024

Variabel	Frequency	Percentage
Mother's Education Level		
Tall	47	15.7
Seconds	193	64.3
Policy	60	20.0
Total	300	100
Health status of pregnant women		
KEK	74	24.7
No SEZ	226	75.3
Total	300	100
Parental Income		
Less than UMR	233	77.7
According to UMR	65	21.7
> UMR	2	0.6
Total	300	100
History of Exclusive Breastfeeding		
Exclusive Breastfeeding	297	99.0
Exclusive Breast Milk	3	1.0
Total	300	100
History of babies born with BBLR		
BBLR	33	11.0
No BBLR	267	89.0
Total	300	100
Dwarf *Status*		
Not *Stunting*	182	60.7
Dwarfs	118	39.3
Total	300	100

e-ISSN:2808-6422; p-ISSN:2829-3037
Vol. 6 No. 1, pp. 17-24, February 2026

TABLE 2
Determinants of *Stunting Incidence* in Toddlers at the Sukomoro Health Center, Magetan Regency in 2024

	Stunting Incidence		
	Not *Stunting*	*Stunting*	Total
Mother's Education			
Tall	32	15	47
	68.1%	31.9%	100.0%
Intermediate	115	78	193
	59.4%	40.6%	100.0%
Basis	35	25	60
	58,3%	41,7%	100,0%
Health History of Pregnant Women			
KEK	37	37	74
	50,0%	50,0%	100,0%
No SEZ	145	81	226
	64,2%	35,8%	100,0%
Parental Income			
Less than MSEs	143	90	233
	61,4%	38.6%	100.0%
According to MSEs	38	27	65
	58.5%	41.5%	100.0%
> UMK	1	1	2
	50.0%	50.0%	100.0%
History of Exclusive Breastfeeding			
Exclusive Breast Milk	181	116	297
	60.9%	39.1%	100.0%
Exclusive Breast Milk	1	2	3
	33,3%	66,7%	100,0%
History of babies born with BBLR			
BBLR	17	16	33
	51.5% of	48,5%	100,0%
No BBLR	165	102	267
	61,8%	38,2%	100,0%

breastfeeding (66.7%), and babies born with low body weight or BBLR (48.5%). This pattern shows that maternal factors such as low maternal education and poor nutritional status during pregnancy, as well as neonatal factors such as BBLR and non-exclusive breastfeeding, contribute significantly to the incidence of *stunting*. Meanwhile, the influence of economic factors seems more limited. These findings confirm the importance of interventions focused on improving the nutritional status of pregnant women and protecting high-risk babies as key strategies in stunting prevention.

Based on TABLE 3 of ordinal logistic regression analysis, it is known that several factors have an influence on the incidence of stunting in toddlers. However, of all the variables tested, only the maternal health history during pregnancy was shown to be statistically significant with coefficient values B = 0.616 and p = 0.026 (p values less than 0.05 indicate

TABLE 3
Analysis of Determinants of *Stunting Incidence i*n Toddlers at the Sukomoro Health Center, Magetan Regency in 2024

Predictor	Category	Koefisien (Estimate)	SE Coephysin
Threshold	*Stunting* = 0	-1.205	1.963
Mother's Education	1.00	-0.621	0.427
	2.00	-0.177	0.308
	3.00*	0 (reference)	-
Health history of pregnant women	1.00	0.616	0.277
	2.00*	0 (reference)	-
Parental income	1.00	-0.590	1.480
	2.00	-0.308	1.491
	3.00*	0 (reference)	-
History of Exclusive Breastfeeding	1.00	-1.114	1.260
	2.00*	0 (reference)	-
History of babies born with BBLR	1.00	0.391	0.384
	2.00*	0 (reference)	-

significant results). This means that the health condition of the mother during pregnancy, especially the SEZ, is a factor that really affects the incidence of stunting in toddlers in this region.

Regarding exclusive breastfeeding, almost all mothers (99%) breastfeed exclusively during the first six months, which is an important practice to support the child's growth. Meanwhile, 1% do not give exclusive breast milk. For birth weight, about 11% of babies are born with low body weight (BBLR), which is less than 2500 grams, while 89% are born with normal weight. The nutritional status of toddlers shows that 60.7% do not experience stunting, while 39.3% experience stunting, which is a condition in which the child's height is lower than the growth standard according to his age.

A p-value of less than 0.05 in the TABLE 4 indicates that there is a significant difference between the actual data and the

TABLE 4
Deviance Results for Model Fit Test

	Chi-Square	*df*	*Signature*
deviation	29.637	18	0.41

data predicted by the model, based on the results of the deviation test. These findings indicate that the regression model used may be inappropriate (not fit) in explaining the relationship between the analyzed variables.

e-ISSN:2808-6422; p-ISSN:2829-3037
Vol. 6 No. 1, pp. 17-24, February 2026

TABLE 5
Simultaneous Test with *Likelihood Ratio*

G^2	*Chi-Square*	*df*	*P value*
71.780	9.202	7	.238

Using the *Likelihood Ratio* (G2) Test, the results of the simultaneous test in TABLE 5 show that the deviance test conducted shows that the statistical model used is not fit with the data ($p < 0.05$), which indicates that this model is not fully able to explain the variation in stunting incidence as a whole. The likelihood ratio test showed that the model was not significantly better than the model without predictive variables ($p = 0.238$). The Wald test, which tested the influence of each variable separately, confirmed that only the mother's health history during pregnancy was significant.

TABLE 6
Wald Test Statistics Table for Partial Testing

Variabel	Category	Coeficin (B)	HERS ELF	Forest	p-value	Interpretasi
Mother's Education	1.00	-0.621	0.427	2.111	0.146	Insignificant (p>0.05)
	2.00	-0.177	0.308	0.331	0.565	Insignificant
Health history of pregnant women	1.00	0.616	0.277	4.955	0.026	Significant: increases the risk of *stunting*
Parental Income	1.00	-0.590	1.480	0.159	0.690	Insignificant
	2.00	-0.308	1.491	0.043	0.836	Insignificant
History of Exclusive Breastfeeding	1.00	-1.114	1.260	0.781	0.377	Insignificant
History of babies born with BBLR	1.00	0.391	0.384	1.039	0.308	Insignificant

To test the relationship between these factors and stunting incidence, ordinal logistic regression analysis was used. In this analysis, the negative coefficient on the education variable of low/secondary mothers showed that the risk of stunting tended to be lower in mothers with higher education. On the other hand, the positive coefficient in the SEZ mother's variable indicates that the condition of the SEZ increases the risk of stunting in children. The low/medium income variable has a negative coefficient, which means that the risk of stunting is lower in families with high incomes. Exclusive breastfeeding also showed a protective effect, with a negative coefficient, while babies with BBLR had a positive coefficient, indicating a higher risk of stunting.

TABLE 6 of statistical analysis using regression tests showed that only the mother's health history during pregnancy had a significant effect on the incidence of *stunting* in toddlers. This means that children of mothers who have a history of health problems during pregnancy have a higher risk of experiencing stunting than children of healthy mothers during pregnancy. This is shown by a regression coefficient value (B) of 0.616 and a significance value (p) of 0.026, which means that the relationship is statistically significant because the p value is less than 0.05.

Meanwhile, other variables namely maternal education level, parental income, history of exclusive breastfeeding, and history of babies born with low birth weight (BBLR) did not show a statistically significant association with stunting incidence (all p>05 values). However, descriptively, children with higher educated mothers, sufficient family income, exclusive breastfeeding, and born with normal weight tended to have a lower risk of *stunting*. The results of the Hypothesis Test in the Research "Determinants of Stunting Incidence in Toddlers at the Sukomoro Health Center" can be concluded that:

1. The mother's education level does not have a significant influence on the incidence of *stunting*.
2. The mother's health history during pregnancy has a significant influence on the incidence of *stunting*.
3. Parental income did not show a significant influence on stunting incidence.
4. History of exclusive breastfeeding was not significantly related to the incidence of *stunting*.
5. The history of babies born with BBLR has not been shown to have a significant effect on the incidence of *stunting*.

Overall, although factors such as maternal education, family income, exclusive breastfeeding, and birth weight contributed to stunting incidence, the effect was not statistically strong enough in the study. Therefore, interventions that focus on improving maternal health during pregnancy, especially the prevention and handling of SEZs, are very important to reduce stunting rates in the work area of the Sukomoro Health Center

IV. DISCUSSION

A. INTERPRETATION OF THE MAIN FINDINGS

This study provides empirical evidence regarding the determinants of stunting among toddlers in the working area of the Sukomoro Health Center, Magetan Regency. The most prominent finding is that maternal health history during pregnancy, particularly the presence of Chronic Energy Deficiency (CED/KEK), was the only variable that demonstrated a statistically significant association with stunting incidence. This result underscores the critical importance of maternal nutritional status during pregnancy in shaping child linear growth outcomes.

The significant association between maternal CED and stunting reflects the biological mechanism through which inadequate maternal energy and nutrient intake compromises fetal growth and development. Chronic undernutrition during pregnancy can impair placental function, reduce nutrient transfer to the fetus, and increase the risk of intrauterine growth restriction, which may persist into early childhood and manifest as stunting [29]. These findings reaffirm the concept that stunting is a cumulative process that often originates before birth, rather than being solely a consequence of postnatal nutritional deficiencies.

In contrast, other variables examined in this study namely maternal education, family income, exclusive breastfeeding practices, and birth weight did not show statistically

e-ISSN:2808-6422; p-ISSN:2829-3037
Vol. 6 No. 1, pp. 17-24, February 2026

significant associations with stunting in the multivariate analysis. Although descriptively children from mothers with lower education levels, lower household income, non-exclusive breastfeeding, and low birth weight exhibited higher proportions of stunting, these associations did not reach statistical significance. This suggests that in the Sukomoro context, maternal nutritional health during pregnancy may exert a stronger influence on child growth than socioeconomic or infant feeding factors alone.

The lack of significant association between exclusive breastfeeding and stunting may be explained by the very high coverage of exclusive breastfeeding observed in this population. With nearly all mothers practicing exclusive breastfeeding, variability was limited, reducing the statistical power to detect its effect. Similarly, although low birth weight is widely recognized as a risk factor for stunting, adequate postnatal care and nutrition may have mitigated its long-term impact on linear growth in this study population. Overall, these findings emphasize that interventions targeting maternal health and nutrition during pregnancy are fundamental to stunting prevention, particularly in settings where postnatal health services and breastfeeding practices are relatively well established.

B. COMPARISON WITH PREVIOUS STUDIES

The findings of this study are largely consistent with previous research highlighting maternal nutritional status during pregnancy as a key determinant of stunting. Several recent studies conducted in Indonesia and other low- and middle-income countries have reported that children born to mothers with chronic energy deficiency or anemia during pregnancy have a significantly higher risk of experiencing stunting [30], [31]. These studies support the notion that maternal undernutrition compromises fetal growth trajectories, which are difficult to reverse after birth.

Similarly, a systematic review by Aini et al. reported that maternal nutritional deficiencies during pregnancy were among the strongest predictors of stunting compared to postnatal socioeconomic factors [32]. The present study aligns with these findings by demonstrating that maternal health history remained significant even after adjusting for other variables.

However, the non-significant role of maternal education and household income observed in this study contrasts with findings from several other studies that reported strong associations between socioeconomic status and stunting [33], [34]. This discrepancy may be attributed to contextual differences. In the Sukomoro Health Center area, access to basic maternal and child health services is relatively equitable, and community-based nutrition programs such as posyandu may reduce socioeconomic disparities in child nutrition. As a result, the direct effect of income and education on stunting may be attenuated.

Regarding exclusive breastfeeding, previous studies have consistently demonstrated its protective role against stunting, particularly during the first two years of life [35]. The absence of a significant association in this study does not negate the importance of exclusive breastfeeding but rather reflects the limited variability in breastfeeding practices within the study population. This finding suggests that when exclusive breastfeeding coverage is already high, additional reductions in stunting may depend more heavily on prenatal interventions and complementary feeding quality.

In contrast to many studies that identify low birth weight as a strong predictor of stunting [36], this study did not find a statistically significant association. One possible explanation is the presence of effective postnatal growth monitoring and early nutritional interventions that enable catch-up growth among low-birth weight infants. This highlights the role of health system responsiveness in mitigating early biological risks. Overall, while this study corroborates the central role of maternal nutrition during pregnancy, it also demonstrates that the relative importance of stunting determinants may vary across settings depending on health service coverage, community practices, and contextual factors.

C. LIMITATIONS, IMPLICATIONS, FUTURE DIRECTIONS

Despite its contributions, this study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design limits the ability to establish causal relationships between determinant factors and stunting incidence. Although associations can be identified, temporal sequencing cannot be confirmed. Longitudinal studies are needed to better capture the dynamic pathways leading to stunting from pregnancy through early childhood.

Second, this study relied partly on secondary data from maternal and child health records, which may be subject to recording inaccuracies or incomplete documentation. Although efforts were made to verify data using standardized health records, information bias cannot be fully excluded. Third, the study did not include variables related to environmental sanitation, dietary diversity, or quality of complementary feeding, which are known to influence stunting and may confound the observed associations [37].

Despite these limitations, the findings have important implications for public health practice and policy. The strong association between maternal health during pregnancy and stunting underscores the need to shift stunting prevention strategies upstream, focusing on the prenatal period and even preconception care. Nutritional screening for pregnant women, early detection of chronic energy deficiency, and timely nutritional supplementation should be prioritized within antenatal care services.

From a programmatic perspective, strengthening integrated maternal nutrition interventions such as iron and micronutrient supplementation, balanced energy-protein supplementation, and nutrition education may yield substantial benefits in reducing stunting prevalence. Additionally, multisectoral collaboration involving health, social protection, and education sectors is essential to address the underlying determinants of maternal undernutrition.

For future research, longitudinal and intervention-based studies are recommended to evaluate the effectiveness of maternal nutrition programs in reducing stunting. Further studies should also incorporate broader social and environmental determinants, as well as qualitative approaches to better understand maternal behaviors and barriers to optimal nutrition during pregnancy.

e-ISSN:2808-6422; p-ISSN:2829-3037
Vol. 6 No. 1, pp. 17-24, February 2026

In conclusion, this study reinforces the critical role of maternal health during pregnancy as a primary determinant of stunting. Addressing maternal undernutrition through comprehensive, early, and sustained interventions is essential for breaking the intergenerational cycle of stunting and improving child health outcomes.

V. CONCLUSION

This study aimed to analyze the determinants of stunting incidence among toddlers aged 12–59 months in the working area of the Sukomoro Health Center, Magetan Regency, with a particular focus on maternal, socioeconomic, and neonatal factors. Based on the analysis of 300 toddlers selected through proportional random sampling, the findings indicate that maternal health history during pregnancy was the only determinant that showed a statistically significant association with stunting incidence. Specifically, mothers who experienced Chronic Energy Deficiency (CED) during pregnancy had a 1.85 times higher risk of having stunted children compared to mothers without nutritional problems, as evidenced by the ordinal logistic regression result ($B = 0.616$; $p = 0.026$). In contrast, other examined variables including maternal education level, family income, exclusive breastfeeding history, and birth weight did not demonstrate statistically significant associations with stunting incidence ($p > 0.05$), although descriptively higher proportions of stunting were observed among toddlers from lower socioeconomic backgrounds, non-exclusively breastfed children, and those born with low birth weight. Overall, the prevalence of stunting in this study population was 39.3%, indicating that stunting remains a substantial public health concern at the local level despite relatively high coverage of exclusive breastfeeding and access to basic health services. These findings underscore that stunting prevention efforts should prioritize early and upstream interventions, particularly by improving maternal nutritional status during pregnancy through comprehensive antenatal care, nutritional screening, and supplementation programs. For future research, longitudinal study designs are recommended to better establish causal relationships and to assess the long-term impact of maternal nutrition interventions on child growth outcomes. Additionally, future studies should incorporate broader determinants, such as dietary diversity, environmental sanitation, and caregiving practices, to provide a more holistic understanding of stunting pathways and to inform more effective, multisectoral prevention strategies.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to the Sukomoro Health Center, Magetan Regency, for granting permission and providing support during the data collection process. Appreciation is also extended to all health workers, cadres, and respondents who participated in this study. This research would not have been possible without their cooperation and valuable contributions.

FUNDING

This research received no external funding.

DATA AVAILABILITY

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

AUTHOR CONTRIBUTION

All authors contributed substantially to this study. The first author conceptualized the research design, conducted data collection, and drafted the manuscript. The second author supervised the research process, provided methodological guidance, and reviewed the manuscript critically. The remaining authors contributed to data analysis, interpretation of results, and manuscript revision. All authors have read and approved the final version of the manuscript.

DECLARATIONS

ETHICAL APPROVAL

This study was approved by the authorized Health Research Ethics Committee. Written informed consent was obtained from all participants prior to data collection.

CONSENT FOR PUBLICATION PARTICIPANTS.

Not applicable.

COMPETING INTERESTS

The authors declare that they have no competing interests..

REFERENCES

[1] World Health Organization, “Malnutrition,” Geneva, Switzerland, 2021.
[2] M. A. Alam et al., “Early persistent stunting and cognitive development at 5 years of age,” PLoS One, vol. 15, no. 1, 2020, doi: 10.1371/journal.pone.0227839.
[3] S. A. Sakti, “The impact of stunting on child growth and development during the golden age,” J. Biormatika FKIP, vol. 6, no. 1, pp. 169–175, 2020.
[4] United Nations Children’s Fund (UNICEF), Child Malnutrition Estimates: Levels and Trends, New York, NY, USA, 2023.
[5] World Health Organization, Reducing Stunting in Children: Equity Considerations, Geneva, Switzerland, 2022.
[6] Ministry of Health of the Republic of Indonesia, Results of the 2022 Indonesian Nutrition Status Survey (SSGI), Jakarta, Indonesia, 2023.
[7] East Java Provincial Government, East Java Health Profile 2023, Surabaya, Indonesia, 2023.
[8] R. Ryadinency, N. Suwandi, and T. A. Parmawati, “Determinants of stunting incidence in toddlers,” An-Nadaa: J. Public Health, vol. 8, no. 1, pp. 1–8, 2021.
[9] C. L. Pangaribuan, R. Sihombing, and S. Sembiring, “Risk factors for stunting incidence in toddlers,” J. Nutrition and Health, vol. 14, no. 1, pp. 45–51, 2022.
[10] H. Hatta et al., “Risk factors of stunting in children under five,” Gorontalo Health J., vol. 5, no. 2, pp. 183–191, 2022.
[11] N. Aini et al., “Low economic status and stunting risk: A systematic review,” J. Tambusai Health, vol. 3, no. 2, pp. 127–135, 2022.
[12] F. Noor et al., “Analysis of factors influencing stunting in toddlers,” J. Science Student Research, vol. 2, no. 2, pp. 142–147, 2024.
[13] S. Dewi, “Chronic energy deficiency in pregnant women and stunting,” Undergraduate Thesis, Univ. Jember, Indonesia, 2022.
[14] World Health Organization, WHO Recommendations on Maternal Nutrition, Geneva, Switzerland, 2021.
[15] United Nations Children’s Fund (UNICEF), Maternal and Child Stunting Reduction Programme Evaluation, New York, NY, USA, 2020.
[16] F. Y. Rahmalia and M. Azinar, “Exclusive breastfeeding and stunting incidence,” Acceleration: J. National Science, vol. 6, no. 1, pp. 43–52, 2024.

e-ISSN:2808-6422; p-ISSN:2829-3037
Vol. 6 No. 1, pp. 17-24, February 2026

[17] D. Arini et al., "Stunting incidence and infectious diseases in toddlers," J. Public Health Research, vol. 9, no. 2, 2020.
[18] S. Pokhrel, "Feeding practices and nutritional status of children," J. Preventive Medicine and Holistic Health, vol. 6, no. 1, pp. 37–48, 2024.
[19] D. Arini, N. Nursalam, and I. F. Mahmudah, "Stunting incidence and infectious diseases in toddlers," J. Public Health Research, vol. 9, no. 2, 2020.
[20] S. Pokhrel, "Feeding practices and nutritional status of children," J. Preventive Medicine and Holistic Health, vol. 6, no. 1, pp. 37–48, 2024.
[21] World Health Organization, WHO Child Growth Standards, Geneva, Switzerland, 2021.
[22] R. L. Lemeshow et al., Sampling of Populations: Methods and Applications, 5th ed., Wiley, 2020.
[23] World Health Organization, "Height-for-age indicators," Geneva, Switzerland, 2022.
[24] H. Hatta et al., "Risk factors of stunting in children under five," Gorontalo Health J., vol. 5, no. 2, pp. 183–191, 2022.
[25] C. L. Pangaribuan, R. Sihombing, and S. Sembiring, "Risk factors for stunting incidence," J. Nutrition and Health, vol. 14, no. 1, pp. 45–51, 2022.
[26] UNICEF and WHO, Measurement Guidance for Child Anthropometry, New York, NY, USA, 2021.
[27] A. Agresti, An Introduction to Categorical Data Analysis, 3rd ed., Wiley, 2020.
[28] World Medical Association, "Declaration of Helsinki: Ethical principles for medical research involving human subjects," 2021.
[29] World Health Organization, WHO Recommendations on Antenatal Care for a Positive Pregnancy Experience, Geneva, Switzerland, 2021.
[30] H. Hatta, M. Yusuf, R. Kadir, and A. Djafar, "Maternal nutritional status and stunting in children under five," Gorontalo Health J., vol. 5, no. 2, pp. 183–191, 2022.
[31] R. Ryadinency, N. Suwandi, and T. A. Parmawati, "Determinants of stunting incidence in toddlers aged 12–59 months," An-Nadaa: J. Public Health, vol. 8, no. 1, pp. 1–8, 2021.
[32] N. Aini, A. G. M. Hera, A. I. Anindita, K. S. Maliangkay, and R. Amalia, "Low economic status and stunting risk: A systematic review," J. Tambusai Health, vol. 3, no. 2, pp. 127–135, 2022.
[33] C. L. Pangaribuan, R. Sihombing, and S. Sembiring, "Socioeconomic factors associated with stunting," J. Nutrition and Health, vol. 14, no. 1, pp. 45–51, 2022.
[34] S. Pokhrel, "Socioeconomic disparities and child nutrition," J. Preventive Medicine and Holistic Health, vol. 6, no. 1, pp. 37–48, 2024.
[35] F. Y. Rahmalia and M. Azinar, "Exclusive breastfeeding and stunting incidence," Acceleration: J. National Science, vol. 6, no. 1, pp. 43–52, 2024.
[36] D. Arini, N. Nursalam, and I. F. Mahmudah, "Low birth weight and stunting outcomes," J. Public Health Research, vol. 9, no. 2, 2020.
[37] UNICEF, Improving Child Nutrition: The Achievable Imperative for Global Progress, New York, NY, USA, 2021.