Indonesian Journal of Advanced Research (IJAR)
Vol. 5, No. 9, 2026: 1715-1730

The Association Between a History of Exclusive Breastfeeding and the Incidence of Stunting Among Children Aged 2–4 Years at Warakas Integrated Health Post (Posyandu), RW 010, in 2022

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A R T I C L E I N F O

Keywords: Stunting, Exclusive Breastfeeding, Toddler

Received: 19, July
Revised: 20, August
Accepted: 30, September

A B S T R A C T

Stunting is a growth and developmental disorder caused by chronic malnutrition, particularly during the first 1,000 days of life. This study aimed to determine the association between exclusive breastfeeding history and stunting among children aged 2–4 years at Posyandu Warakas RW 010 in 2022. An analytic observational study with a cross-sectional design was conducted using purposive sampling. The sample included 70 mothers and their children aged 2–4 years. Of the 70 children, 58 were not stunted, and 12 were stunted. Among the stunted children, 3 had received exclusive breastfeeding, and 9 had not. Fisher's exact test showed a significant association between exclusive breastfeeding history and stunting incidence (p = 0.002; OR = 8.6).

INTRODUCTION

The first 1,000 days of life, beginning at conception and continuing until a child reaches two years of age, represent a critical period for optimal growth and development. During this period, maternal nutritional adequacy, health status, and access to antenatal care play essential roles in supporting fetal growth and subsequent child health. After birth, several factors influence nutritional outcomes during the first two years of life, including exclusive breastfeeding, birth weight, immunization status, and appropriate complementary feeding. Adequate nutrition during this period is particularly important because rapid physical growth and neurological development occur during infancy and early childhood (Hijrawati et al., 2021). Exclusive breastfeeding is recommended during the first six months of life, followed by the gradual introduction of nutritionally appropriate complementary foods while breastfeeding is continued during the subsequent months (Politano & Berroa, 2020; Putri & Listi, 2020).

Optimal nutritional status can be achieved when children receive adequate and balanced nutrient intake according to their age and physiological requirements. Inadequate nutrition, particularly when it persists over a prolonged period, can lead to chronic nutritional problems, including stunting. Stunting is a condition characterized by impaired linear growth resulting from chronic or recurrent undernutrition. According to the World Health Organization growth standards, stunting is commonly identified using height-for-age z-scores below -2 standard deviations, while values below -3 standard deviations indicate severe stunting. This condition is clinically and socially important because its consequences may extend beyond childhood and affect physical growth, cognitive development, metabolic health, and future productivity (Khoeroh & Indriyanti, 2017; Soliman et al., 2021).

Stunting remains a major public health concern, particularly in low- and middle-income countries. Nutritional deprivation, inappropriate infant feeding practices, socioeconomic disadvantage, maternal factors, and limited access to health services contribute to its occurrence (Goudet et al., 2019; Mulyaningsih et al., 2021). Studies have also shown that childhood stunting is influenced by factors beyond individual characteristics, including household, community, environmental, and educational conditions. Maternal education may contribute to improved child feeding and caregiving practices, although education alone may not be sufficient to eliminate the risk of stunting (Delisle, 2021; Mulyaningsih et al., 2021). These findings indicate that stunting has a multidimensional etiology and requires prevention strategies that address both nutritional and contextual determinants.

Indonesia continues to face a considerable burden of childhood stunting despite improvements in nutritional indicators over time. National monitoring has shown that the prevalence of stunting remains a major concern and requires sustained intervention through maternal and child nutrition programs (Kementerian Kesehatan RI, 2021). Among modifiable nutritional factors, exclusive breastfeeding has received particular attention because breast milk provides essential nutrients and bioactive components that support immune

function, gastrointestinal development, and infant growth (Almeida et al., 2021). Appropriate breastfeeding practices may therefore contribute to the prevention of nutritional deficiencies and growth impairment during early childhood. However, the association between a history of exclusive breastfeeding and stunting may vary across populations due to differences in socioeconomic conditions, maternal characteristics, feeding practices, and access to health services.

Evidence from community-level settings is therefore necessary to clarify the role of exclusive breastfeeding in preventing stunting among young children. Local data are particularly important for informing targeted nutritional interventions and strengthening maternal and child health programs at the primary healthcare level. Accordingly, this study aimed to determine the association between a history of exclusive breastfeeding and the incidence of stunting among children aged 2–4 years at Posyandu Warakas RW 010 in 2022.

LITERATURE REVIEW

Theoretical Foundation of Child Nutrition and Stunting

This study is primarily grounded in the UNICEF Conceptual Framework on the Determinants of Maternal and Child Nutrition. The framework explains nutritional outcomes through interconnected immediate, underlying, and enabling determinants. At the immediate level, adequate diets and appropriate care practices directly support optimal maternal and child nutrition. At the underlying level, food availability, feeding practices, health services, sanitation, and household conditions determine whether children receive sufficient nutrition and care. Broader socioeconomic resources, social norms, and governance constitute enabling determinants that shape these conditions. Within this framework, breast milk represents an age-appropriate, nutrient-rich food during early childhood, while breastfeeding constitutes an essential feeding and caregiving practice that supports child growth and development (UNICEF, 2020).

This framework is relevant to the present study because exclusive breastfeeding represents an early-life nutritional exposure, whereas stunting represents a cumulative growth outcome. The relationship between the two cannot be separated from other determinants, including maternal nutritional status, birth weight, infection, complementary feeding, household socioeconomic conditions, sanitation, and healthcare utilization. Recent systematic evidence confirms that childhood stunting results from interacting prenatal, natal, postnatal, socioeconomic, and environmental determinants rather than from a single nutritional factor (Ayue et al., 2025).

Recent evidence also supports a life-course perspective on childhood growth. Victora et al. (2021) reported that linear growth failure may begin before birth and that the incidence of stunting and wasting can increase substantially during the first months of life. This indicates that nutritional exposures during pregnancy, infancy, and the transition to complementary feeding contribute cumulatively to subsequent growth outcomes. Therefore, breastfeeding during the first six months should be understood as one

component of a broader nutritional pathway operating during the first 1,000 days of life.

Exclusive Breastfeeding

Exclusive breastfeeding refers to feeding an infant only breast milk during the first six months of life, without additional foods or liquids, including water, except when medically indicated. The World Health Organization and UNICEF currently recommend initiation of breastfeeding within the first hour after birth, exclusive breastfeeding during the first six months, and continued breastfeeding until two years of age or beyond together with nutritionally adequate and safe complementary foods beginning at approximately six months of age (World Health Organization [WHO], 2026).

Breast milk provides energy, macronutrients, micronutrients, immunological components, enzymes, hormones, and other bioactive substances required during early infancy. Exclusive breastfeeding also reduces children's exposure to contaminated food and water during the period when their immune and gastrointestinal systems are still developing. WHO emphasizes that early, exclusive, and continued breastfeeding contributes to healthy growth and reduces exposure to diarrheal and respiratory infections, which can adversely affect children's nutritional status (WHO, 2026).

From the perspective of nutritional growth, the protective pathway of exclusive breastfeeding may operate through at least two mechanisms. First, breast milk supplies nutrients in forms appropriate for infant digestion and physiological requirements. Second, breastfeeding supports immunity and lowers exposure to infections. Recurrent infections can reduce appetite, increase metabolic requirements, impair nutrient absorption, and consequently interfere with linear growth. This biological pathway provides a theoretical explanation for why children without a history of exclusive breastfeeding may experience a higher probability of growth impairment under certain environmental and socioeconomic conditions.

However, exclusive breastfeeding should not be interpreted as an isolated guarantee against stunting. After six months, breast milk alone no longer fulfills all nutritional requirements. Appropriate complementary foods must therefore be introduced while breastfeeding continues. WHO notes that inappropriate timing, inadequate diversity, low feeding frequency, unsafe food preparation, and insufficient nutrient density during complementary feeding may contribute to growth faltering (WHO, 2026).

Concept of Stunting

Stunting describes impaired linear growth resulting primarily from chronic or recurrent nutritional deprivation and related adverse health conditions. WHO currently defines a child as stunted when height-for-age is more than two standard deviations below the median of the WHO Child Growth Standards. Stunting reflects accumulated nutritional and health disadvantages rather than a short-term change in body size (WHO, 2025).

The condition has consequences beyond short stature. Stunting is associated with limitations in physical and cognitive development and may

affect health, learning capacity, productivity, and human capital later in life. WHO therefore regards childhood stunting as an important indicator of child nutrition and human development (WHO, 2025).

Recent studies further describe stunting as a multidimensional nutritional outcome. Mulyaningsih et al. (2021), using Indonesian data and multilevel analysis, demonstrated that individual characteristics alone could not fully explain childhood stunting. Household economic conditions, parental education, access to health services, dietary conditions, and community characteristics also contributed to differences in stunting risk. Likewise, Sartika et al. (2021) found that low birth weight, preterm birth, diarrhea, maternal stature, and incomplete immunization were relevant prenatal and postnatal determinants of stunting among Indonesian infants.

These findings support the theoretical assumption that stunting among children aged 2–4 years represents the cumulative outcome of nutritional and health exposures that occurred before and after the age of two. Consequently, the history of exclusive breastfeeding during the first six months remains relevant when examining stunting in older toddlers because early nutritional conditions may influence subsequent growth trajectories.

Relationship Between Exclusive Breastfeeding and Stunting

The theoretical relationship between exclusive breastfeeding and stunting can be explained through nutritional adequacy, immune protection, infection prevention, and continuity of optimal infant feeding. Infants who receive exclusive breastfeeding during the first six months obtain nutrition specifically adapted to early physiological requirements while experiencing less exposure to potentially contaminated substitute foods or liquids. These conditions can support healthy growth during an important stage of linear growth.

Empirical evidence from Indonesia supports this relationship. Hadi et al. (2021) investigated children from a low-income population in Eastern Indonesia and concluded that exclusive breastfeeding had a protective relationship with childhood stunting. Their study emphasized that the protective effect was especially relevant in economically disadvantaged populations, where children may face higher exposure to nutritional and environmental risks.

A broader systematic review and meta-analysis by Mardani et al. (2022) examined breastfeeding and undernutrition among children younger than five years in developing countries. The synthesis supported an association between breastfeeding practices and major forms of childhood undernutrition, reinforcing the role of appropriate breastfeeding within strategies to prevent growth impairment (Mardani et al., 2022).

More recent Indonesian evidence provides additional support. Astuti et al. (2024) analyzed 706 children aged 6–59 months in Karanganyar, Central Java. Their findings showed that inappropriate feeding practices were associated with stunting. Children who did not receive exclusive breastfeeding were more likely to experience stunting than children who received exclusive breastfeeding. The study also identified prelacteal feeding, socioeconomic

conditions, vaccination status, traditional feeding practices, and place of residence as relevant factors, illustrating the multifactorial nature of the association (Astuti et al., 2024).

Similarly, Ashar et al. (2024) studied children younger than two years in Papua, Indonesia, and identified several characteristics related to stunting, including residential setting, maternal characteristics, socioeconomic conditions, child characteristics, and breastfeeding-related factors. Their findings reinforce the importance of placing breastfeeding within the wider maternal, household, and environmental context rather than examining it as an independent determinant (Ashar et al., 2024).

International evidence also supports the nutritional importance of breastfeeding. A multicenter study by Zhang et al. (2024) found that exclusive breastfeeding was associated with more favorable nutritional outcomes compared with formula or mixed feeding during infancy. The findings strengthen the biological rationale that appropriate breastfeeding during early life contributes to healthy nutritional development.

Nevertheless, empirical findings are not entirely uniform. Tello et al. (2022), in a study examining breastfeeding and feeding practices, reported that high breastfeeding prevalence was not independently associated with stunting in the population investigated. More recently, Cendana and Kim (2025), using data from 87,722 Indonesian children aged 6–23 months in the 2022 Indonesian Nutritional Status Survey, found that maternal education, antenatal care, and low birth weight were important predictors of stunting, whereas some breastfeeding indicators, including early breastfeeding initiation, did not demonstrate a significant independent relationship after statistical analysis.

These differences are theoretically important. They suggest that the association between breastfeeding and stunting can depend on population characteristics, measurement methods, age at assessment, complementary feeding, birth outcomes, infection, maternal education, household resources, and environmental exposures. A systematic review by Ayue et al. (2025), which synthesized 92 studies published between 2015 and 2024, identified maternal education, socioeconomic status, sanitation, maternal characteristics, birth weight, exclusive breastfeeding, and complementary feeding as among the most consistent predictors of childhood stunting. The review concluded that some determinants are universal, whereas others vary according to regional and population contexts.

Previous Research and Research Position

Overall, recent national and international evidence supports a plausible relationship between exclusive breastfeeding history and childhood stunting, although the magnitude and statistical significance of this relationship differ among populations. Hadi et al. (2021), Mardani et al. (2022), Astuti et al. (2024), and Ayue et al. (2025) provide evidence supporting the protective contribution of appropriate breastfeeding practices. In contrast, Tello et al. (2022) and Cendana and Kim (2025) demonstrate that breastfeeding variables may lose

statistical significance when other maternal, biological, and socioeconomic determinants are considered.

This inconsistency establishes the empirical relevance of examining the relationship in specific local populations. Children aged 2–4 years at Posyandu Warakas RW 010 represent a population in which early breastfeeding history can be compared with subsequent linear growth status. Based on the UNICEF conceptual framework and previous empirical findings, the present study assumes that a history of exclusive breastfeeding is associated with the incidence of stunting among children aged 2–4 years. Exclusive breastfeeding is conceptualized as the independent variable, while stunting status based on height-for-age represents the dependent variable.

Accordingly, the theoretical proposition of this study is that children without a history of exclusive breastfeeding have a higher likelihood of experiencing stunting than children who received exclusive breastfeeding during the first six months of life. This proposition does not imply a single causal pathway because childhood stunting remains influenced by multiple prenatal, nutritional, health, socioeconomic, and environmental determinants.

METHODOLOGY

This study employed an analytic observational design with a cross-sectional approach to examine the association between a history of exclusive breastfeeding and the incidence of stunting among children aged 2–4 years. The study was conducted at Posyandu Warakas RW 010 in 2022, with primary data collection carried out on July 18, 2022. The study population consisted of mothers and their children aged 2–4 years attending the Posyandu. A total of 70 mother-child pairs were included as study participants. The participants were selected using purposive sampling, a non-probability sampling technique in which respondents were chosen according to characteristics that were consistent with the objectives and research problems.

The independent variable in this study was the history of exclusive breastfeeding, categorized as exclusive breastfeeding and non-exclusive breastfeeding, while the dependent variable was stunting status. Exclusive breastfeeding was defined as feeding an infant only breast milk during the first six months of life without additional food or liquids, except for medicines, vitamins, minerals, or oral rehydration solution when medically required. This definition is consistent with the recommendation of the World Health Organization (WHO, 2026). Stunting status was determined based on the height-for-age z-score. Children with height-for-age values below -2 standard deviations from the median of the WHO Child Growth Standards were classified as stunted.

The study used primary data obtained directly from participating mothers and their children. Maternal information was collected using a structured questionnaire that included personal characteristics and information regarding the history of exclusive breastfeeding. Child-related information included age, sex, body weight, and height. Anthropometric measurements were performed directly on the children, and the results were subsequently

entered into WHO Anthro software to calculate height-for-age z-scores according to age and sex. The WHO Child Growth Standards were used as the reference for determining the nutritional status of children under five years of age (World Health Organization, n.d.).

Before the questionnaire was distributed to the main study participants, validity and reliability tests were conducted to ensure that the instrument appropriately measured the variables under investigation. The validity test was used to assess the ability of each questionnaire item to measure the intended construct. An item was considered valid when the calculated correlation coefficient was greater than the corresponding critical value. Reliability testing was conducted to assess the internal consistency of the questionnaire using Cronbach's alpha. A total of 30 individuals who were not included in the final study sample participated in the pilot test. The instrument was considered reliable when the Cronbach's alpha coefficient was greater than 0.60. The reliability analysis was performed using the Statistical Package for the Social Sciences (SPSS). After the questionnaire met the predetermined validity and reliability criteria, it was used for the main data collection.

During the data collection process, mothers with children aged 2–4 years were asked to complete the questionnaire regarding maternal characteristics and their children's exclusive breastfeeding history. Subsequently, each child underwent direct measurement of body weight and height. The completed questionnaires and anthropometric measurements were checked for completeness and consistency before data entry. Child age, sex, body weight, and height were then entered into WHO Anthro software to determine the height-for-age z-score and classify the child's stunting status.

Data analysis was performed using descriptive and inferential statistical methods. Descriptive analysis was used to present the characteristics of the participants, exclusive breastfeeding history, and stunting status in the form of frequencies and percentages. Bivariate analysis was conducted to determine the association between exclusive breastfeeding history and stunting status. Fisher's exact test was applied to assess the statistical association between the two categorical variables, with a significance level of $p < 0.05$. The odds ratio (OR) was also calculated to estimate the magnitude of the association between the absence of exclusive breastfeeding and the incidence of stunting. All statistical analyses were conducted using SPSS.

RESULTS AND DISCUSSION

A total of 70 mother-child pairs participated in this study. The maternal characteristics included age, educational attainment, and occupation. Most mothers were aged 30–39 years (47.1%), followed by those aged 19–29 years (40.0%) and 40–49 years (12.9%). Regarding educational attainment, the majority had completed senior high school or vocational high school (61.4%), while 17.1% had completed junior high school, 10.0% held a bachelor's degree, and 8.6% had completed elementary school. Most mothers were housewives or unemployed (80.0%), while 11.4% were employees and smaller proportions worked as entrepreneurs, laborers, or teachers.

Maternal Age Distribution

Table 1. Maternal characteristics of study participants

Characteristics	Category	n	%
Age (years)	19–29	28	40.0
	30–39	33	47.1
	40–49	9	12.9
Education	Bachelor's degree	7	10.0
	Diploma III	1	1.4
	Diploma I	1	1.4
	Senior high school/vocational school	43	61.4
	Junior high school	12	17.1
	Elementary school	6	8.6
Occupation	Housewife/unemployed	56	80.0
	Laborer	2	2.9
	Teacher	1	1.4
	Employee	8	11.4
	Entrepreneur	3	4.3

Note. N = 70.

The study included 27 boys (38.6%) and 43 girls (61.4%). In terms of age, 33 children (47.1%) were 2 years old, 32 (45.7%) were 3 years old, and 5 (7.1%) were 4 years old. Thus, most participants were between 2 and 3 years of age.

Table 2. Characteristics of children aged 2–4 years

Characteristics	Category	n	%
Sex	Male	27	38.6
	Female	43	61.4
Age	2 years	33	47.1
	3 years	32	45.7
	4 years	5	7.1
Total		**70**	**100.0**

Maternal knowledge related to exclusive breastfeeding was predominantly categorized as good. Of the 70 mothers, 55 (78.6%) demonstrated good knowledge, 3 (4.3%) had moderate knowledge, and 12 (17.1%) had poor knowledge. Regarding breastfeeding-related practices, 44 mothers (62.9%) demonstrated positive practices, whereas 26 (37.1%) demonstrated negative practices.

Table 3. Maternal knowledge and breastfeeding-related practices

Variable	Category	n	%
Knowledge	Good	55	78.6
	Moderate	3	4.3
	Poor	12	17.1
Breastfeeding-related practices	Positive	44	62.9

Variable	Category	n	%
	Negative	26	37.1
Total		**70**	**100.0**

Regarding breastfeeding history, 46 children (65.7%) had received exclusive breastfeeding during infancy, whereas 24 children (34.3%) had not received exclusive breastfeeding.

Table 4. Distribution of exclusive breastfeeding history

Exclusive breastfeeding history	**n**	%
Exclusive breastfeeding	46	65.7
Non-exclusive breastfeeding	24	34.3
Total	**70**	**100.0**

Anthropometric assessment using height-for-age z-scores showed that 12 children (17.1%) were classified as stunted, whereas 58 children (82.9%) were classified as non-stunted.

Table 5. Distribution of stunting status based on height-for-age z-score

Stunting status	**n**	%
Stunted	12	17.1
Non-stunted	58	82.9
Total	**70**	**100.0**

Cross-tabulation demonstrated a clear difference in the distribution of stunting according to exclusive breastfeeding history. Among the 46 children with a history of exclusive breastfeeding, 3 were stunted, and 43 were non-stunted. In contrast, among the 24 children without a history of exclusive breastfeeding, 9 were stunted, and 15 were non-stunted. Therefore, the proportion of stunting within the non-exclusive breastfeeding group was 37.5% (9/24), compared with 6.5% (3/46) among children with a history of exclusive breastfeeding.

Table 6. Distribution of stunting status based on height-for-age z-score

Exclusive breastfeeding history	**Stunted, n (%)**	**Non-stunted, n (%)**	**Total**	***p*-value**	**OR**
Exclusive breastfeeding	3 (6.5)	43 (93.5)	46		
Non-exclusive breastfeeding	9 (37.5)	15 (62.5)	24	**0.002**	**8.6**
Total	**12**	**58**	**70**		

Note. Percentages for stunting and non-stunting are calculated within each breastfeeding category. Fisher's exact test was used for statistical analysis. OR = odds ratio.

Fisher's exact test yielded a *p*-value of 0.002, which was below the predetermined significance level of 0.05. Therefore, there was a statistically significant association between exclusive breastfeeding history and stunting

among children aged 2–4 years at Posyandu Warakas RW 010. The odds ratio was 8.6, indicating that children without a history of exclusive breastfeeding had 8.6 times higher odds of being stunted than children who had received exclusive breastfeeding.

The main finding of this study was a significant association between a history of exclusive breastfeeding and stunting among children aged 2–4 years. Stunting occurred in 37.5% of children who had not received exclusive breastfeeding, compared with only 6.5% of children who had received exclusive breastfeeding. Fisher's exact test confirmed that this difference was statistically significant (p = 0.002). Furthermore, an OR of 8.6 indicated substantially higher odds of stunting among children without a history of exclusive breastfeeding.

This finding supports the theoretical role of exclusive breastfeeding during the first six months of life as an important component of adequate nutrition during the first 1,000 days. Breast milk provides nutrients that are appropriate for infant physiological requirements and supports immune function during a period of rapid growth and development. Appropriate nutritional intake during this critical period contributes to optimal linear growth, whereas prolonged nutritional inadequacy can contribute to growth faltering and ultimately stunting (Hijrawati et al., 2021).

The findings also demonstrate an important difference in the distribution of stunting between breastfeeding groups. Among the 12 children classified as stunted, 9 had not received exclusive breastfeeding, while only 3 had a history of exclusive breastfeeding. Conversely, 43 of the 46 children who had received exclusive breastfeeding were classified as non-stunted. This distribution suggests that exclusive breastfeeding may serve as an important protective nutritional practice during early childhood. Nevertheless, because this study employed a cross-sectional design, the findings establish an association rather than a direct causal relationship.

The biological plausibility of this association relates to both nutritional and immunological mechanisms. During the first six months, breast milk provides nutrients and bioactive components that support growth, gastrointestinal development, and immune protection. Inadequate breastfeeding practices can increase early exposure to alternative foods or liquids that may have insufficient nutritional content or introduce infectious agents. Recurrent infection and inadequate nutrient intake can adversely affect nutrient absorption and utilization and may consequently interfere with linear growth. Soliman et al. (2021) emphasized that chronic nutritional deficits during childhood may have both early and long-term consequences for physical growth and development.

However, stunting should not be interpreted as the consequence of breastfeeding practices alone. Childhood stunting has a multifactorial etiology involving prenatal, postnatal, household, socioeconomic, environmental, and healthcare-related determinants. Mulyaningsih et al. (2021) demonstrated that stunting in Indonesia is influenced by factors extending beyond individual child characteristics. These determinants include parental characteristics, household socioeconomic conditions, community-level factors, and access to resources. Therefore, although the present study identified a strong association between

non-exclusive breastfeeding and stunting, other determinants may also have contributed to the observed nutritional outcomes.

Maternal characteristics may also influence infant feeding practices. In this study, 78.6% of mothers demonstrated good knowledge regarding exclusive breastfeeding, while 62.9% showed positive breastfeeding-related practices. Knowledge can influence maternal understanding of the nutritional and health benefits of breastfeeding, although adequate knowledge does not necessarily guarantee consistent implementation. Putri and Listi (2020) similarly highlighted the relevance of maternal knowledge and attitudes to exclusive breastfeeding practices. This finding suggests that breastfeeding promotion should not focus solely on increasing knowledge but should also address practical, social, family, and environmental barriers that affect maternal feeding behavior.

Maternal education may further affect childcare practices and access to nutritional information. Most mothers in the present study had completed senior high school or vocational school (61.4%), whereas a smaller proportion had received higher education. Education may shape a mother's ability to obtain, understand, and apply information related to breastfeeding, complementary feeding, hygiene, disease prevention, and child growth monitoring. Nevertheless, education should be considered alongside other social and household determinants because nutritional outcomes result from multiple interacting factors.

The majority of mothers in this study were housewives or not formally employed (80.0%). Maternal employment status may affect breastfeeding opportunities, although the direction of this relationship cannot be determined from the current data because occupation was examined descriptively rather than analytically. Mothers who spend more time at home may have greater opportunity to breastfeed directly, whereas working mothers can experience constraints related to working hours, maternity leave, breastfeeding facilities, and breast milk expression and storage. Future studies should therefore examine whether maternal occupation modifies or confounds the relationship between breastfeeding practices and child growth.

The prevalence of stunting in this study was 17.1%, with 12 of the 70 children classified as stunted. Most children, accounting for 82.9% of the sample, had normal height-for-age status. Although the majority of children were not stunted, the presence of stunting in nearly one-fifth of the sample remains relevant from a public health perspective because chronic growth impairment can have consequences extending into later childhood and adulthood. Soliman et al. (2021) reported that nutritional stunting is associated with long-term consequences that may affect physical development and subsequent health.

The findings also reinforce the importance of nutritional interventions during the first 1,000 days of life. Exclusive breastfeeding represents only one stage of this continuum. After six months of age, adequate complementary feeding becomes essential to meet increasing nutritional requirements. Thus, children who received exclusive breastfeeding may still develop stunting if subsequent complementary feeding is inadequate, infections occur repeatedly, or household and environmental conditions restrict optimal growth. This may

partly explain why three exclusively breastfed children in the present study were nevertheless classified as stunted.

Conversely, 15 children without a history of exclusive breastfeeding were not stunted. This finding further demonstrates that stunting cannot be explained by a single exposure. Other protective factors, such as adequate complementary feeding, sufficient overall dietary intake, appropriate healthcare utilization, favorable birth outcomes, good sanitation, and household socioeconomic resources, may contribute to maintaining normal linear growth. The current study did not statistically evaluate these potential confounding variables. Consequently, the OR of 8.6 should be interpreted as an unadjusted association between breastfeeding history and stunting.

The strong association observed in this study has practical implications for maternal and child health services at the community level. Posyandu can strengthen breastfeeding education beginning during pregnancy, provide counseling on early and exclusive breastfeeding, monitor breastfeeding difficulties during the first six months, and subsequently provide guidance regarding appropriate complementary feeding. Growth monitoring should also continue beyond infancy because stunting reflects cumulative nutritional and health exposures rather than a single event.

Overall, this study found that children without a history of exclusive breastfeeding had substantially higher odds of stunting than children who received exclusive breastfeeding. The significant Fisher's exact test result (p = 0.002) and OR of 8.6 support the study hypothesis that exclusive breastfeeding history is associated with stunting status among children aged 2–4 years at Posyandu Warakas RW 010. However, these findings should be interpreted within the context of the cross-sectional design, purposive sampling, relatively small sample size, retrospective maternal reporting of breastfeeding history, and the absence of multivariable adjustment for potential confounders. Future studies should employ larger samples and multivariable analytical models to determine whether exclusive breastfeeding remains independently associated with stunting after controlling for birth weight, maternal nutritional status, complementary feeding, infection history, sanitation, socioeconomic status, and other relevant determinants.

CONCLUSIONS AND RECOMMENDATIONS

The findings indicate that exclusive breastfeeding was relatively common among children attending Posyandu Warakas RW 010, with 65.7% of the children having a history of exclusive breastfeeding. The prevalence of stunting was 17.1%, while the majority of children had normal anthropometric status. Among children who had received exclusive breastfeeding, 43 children (61.4% of the total sample) were classified as non-stunted, whereas only three were stunted. In contrast, nine children with no history of exclusive breastfeeding were stunted. These findings demonstrate that stunting occurred more frequently among children who had not received exclusive breastfeeding during the first six months of life.

Statistical analysis using Fisher's exact test showed a significant association between exclusive breastfeeding history and stunting among children aged 2–4 years at Posyandu Warakas RW 010 in 2022 ($p = 0.002$; $p < 0.05$). The odds ratio of 8.6 further indicated that children without a history of exclusive breastfeeding had 8.6 times higher odds of being stunted than those who had received exclusive breastfeeding. These results support the study hypothesis and emphasize the importance of exclusive breastfeeding as an early nutritional practice associated with better linear growth outcomes. However, because this study used a cross-sectional design, the findings should be interpreted as an association rather than evidence of a direct causal relationship.

The findings also suggest that maternal knowledge and breastfeeding practices remain important components of stunting prevention. Although most mothers demonstrated good knowledge and appropriate breastfeeding practices, a considerable proportion still reported breastfeeding practices that did not fully comply with recommended exclusive breastfeeding guidelines. Therefore, community-based maternal and child health programs should strengthen breastfeeding education, counseling, and practical support, particularly during pregnancy and the first six months after delivery. Posyandu health workers and community health cadres should provide continuous education regarding the benefits of exclusive breastfeeding, appropriate breastfeeding techniques, and strategies for managing common breastfeeding difficulties.

Regular monitoring of child growth should also be strengthened to identify growth faltering at an early stage. After six months of age, breastfeeding promotion should be accompanied by education on timely, adequate, safe, and nutritionally balanced complementary feeding to maintain optimal growth. Future studies should involve larger and more representative samples and apply multivariable analysis to account for potential confounding factors, including birth weight, maternal nutritional status, complementary feeding practices, infection history, sanitation, household socioeconomic conditions, and healthcare utilization. Longitudinal research is also recommended to clarify the temporal relationship between infant feeding practices and subsequent stunting.

ACKNOWLEDGMENT

The authors would like to express their sincere gratitude to the management, health workers, and community health cadres of Posyandu Warakas RW 010 for their support and assistance during the data collection process. Appreciation is also extended to all mothers and children who participated in this study and contributed valuable information to the research. The authors are grateful to all individuals and institutions who provided academic guidance, technical support, and constructive input throughout the research and manuscript preparation. Their contributions were essential to the completion of this study.

REFERENCES

Almeida, C. C., Mendonça Pereira, B. F., Leandro, K. C., Costa, M. P., Spisso, B. F., & Conte-Junior, C. A. (2021). Bioactive compounds in infant formula and their effects on infant nutrition and health: A systematic literature review. *International Journal of Food Science, 2021*, Article 8850080.

Ashar, H., Laksono, A. D., Supadmi, S., Kusumawardani, H. D., Yunitawati, D., Purwoko, S., & Khairunnisa, M. (2024). Factors related to stunting in children under 2 years old in Papua, Indonesia: Does the type of residence matter? *Saudi Medical Journal, 45*(3), 273–278.

Astuti, Y., Paek, S. C., Meemon, N., & Marohabutr, T. (2024). Analysis of traditional feeding practices and stunting among children aged 6 to 59 months in Karanganyar District, Central Java Province, Indonesia. *BMC Pediatrics, 24*, Article 29. doi:10.1186/s12887-023-04486-0.

Ayue, H. I., Nurdiana, N., Wardhani, V., Astuti, A. B., Prayitno, H., Laksono, A. D., & Sundjaya, T. (2025). Exploring the multifactorial predictors of stunting in children under five: A systematic review of the literature, 2015–2024. *Journal of Public Health Research, 14*(4), Article 22799036251403945. doi:10.1177/22799036251403945.

Black, R. E., Victora, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., de Onis, M., Ezzati, M., Grantham-McGregor, S., Katz, J., Martorell, R., & Uauy, R. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. *The Lancet, 382*(9890), 427–451.

Cendana, P., & Kim, S.-Y. (2025). Maternal factors and breastfeeding practices associated with stunting among Indonesian children aged 6 to 23 months. *Asia Pacific Journal of Public Health, 37*(4), 402–410.

De Sanctis, V., Soliman, A., Alaaraj, N., Ahmed, S., Alyafei, F., & Hamed, N. (2021). Early and long-term consequences of nutritional stunting: From childhood to adulthood. *Acta Biomedica, 92*(1), Article e2021168.

Delisle, H. (2021). Maternal education is essential but may not be sufficient to prevent child stunting: A commentary. *Public Health Nutrition, 24*(12), 3753–3755. doi:10.1017/S1368980020003754.

Goudet, S. M., Bogin, B. A., Madise, N. J., & Griffiths, P. L. (2019). Nutritional interventions for preventing stunting in children (birth to 59 months) living in urban slums in low- and middle-income countries (LMIC). *Cochrane Database of Systematic Reviews, 2019*(6), Article CD011695.

Hadi, H., Fatimatasari, F., Irwanti, W., Kusuma, C., Alfiana, R. D., Asshiddiqi, M. I. N., Nugroho, S., Lewis, E. C., & Gittelsohn, J. (2021). Exclusive breastfeeding protects young children from stunting in a low-income population: A study from Eastern Indonesia. *Nutrients, 13*(12), Article 4264. doi:10.3390/nu13124264.

Hijrawati, Usman, A. N., Syarif, S., Hadju, V., As'ad, S., & Baso, Y. S. (2021). Use of technology for monitoring the development of nutritional status 1000 HPK in stunting prevention in Indonesia. *Gaceta Sanitaria, 35*(S2), S231–S234. doi: 10.1016/j.gaceta.2021.10.028.

Kementerian Kesehatan Republik Indonesia. (2021). *Buku saku hasil studi Status Gizi Indonesia (SSGI) tingkat nasional, provinsi, dan kabupaten/kota tahun 2021*. Kementerian Kesehatan Republik Indonesia.

Khoeroh, H., & Indriyanti, D. (2017). Evaluasi penatalaksanaan gizi balita stunting di wilayah kerja Puskesmas Sirampog. *Unnes Journal of Public Health, 6*(3), 189–195. doi:10.15294/ujph. v6i3.11723.

Mardani, R. A. D., Wu, W. R., Nhi, V. T., & Huang, H. C. (2022). Association of breastfeeding with undernutrition among children under 5 years of age in developing countries: A systematic review and meta-analysis. *Journal of Nursing Scholarship, 54*(6), 692–703. doi:10.1111/jnu.12799.

Mulyaningsih, T., Mohanty, I., Widyaningsih, V., Gebremedhin, T. A., Miranti, R., & Wiyono, V. H. (2021). Beyond personal factors: Multilevel determinants of childhood stunting in Indonesia. *PLOS ONE, 16*(11), Article e0260265. doi: 10.1371/journal.pone.0260265.

Politano, C. A., & López-Berroa, J. (2020). Omega-3 fatty acids and fecundation, pregnancy and breastfeeding. *Revista Brasileira de Ginecologia e Obstetrícia, 42*(3), 160–164. doi:10.1055/s-0040-1708090.

Putri, M., & Listi, D. (2020). The relationship between mothers' knowledge and attitude toward breastfeeding and exclusive breastfeeding. *Jurnal Proteksi Kesehatan, 9*(1), 44–51. doi:10.36929/jpk. v9i1.248.

Sartika, A. N., Khoirunnisa, M., Meiyetriani, E., Ermayani, E., Pramesthi, I. L., & Nur Ananda, A. J. (2021). Prenatal and postnatal determinants of stunting at age 0–11 months: A cross-sectional study in Indonesia. *PLOS ONE, 16*(7), Article e0254662. doi: 10.1371/journal.pone.0254662.

Tello, B., Rivadeneira, M. F., Moncayo, A. L., Buitrón, J., Astudillo, F., Estrella, A., & Torres, A. L. (2022). Breastfeeding, feeding practices, and stunting in indigenous Ecuadorians under 2 years of age. *International Breastfeeding Journal, 17*(1), Article 19. doi:10.1186/s13006-022-00461-0.

United Nations Children's Fund. (2020). *UNICEF conceptual framework on maternal and child nutrition*. UNICEF.

Victora, C. G., Christian, P., Vidaletti, L. P., Gatica-Domínguez, G., Menon, P., & Black, R. E. (2021). Revisiting maternal and child undernutrition in low-income and middle-income countries: Variable progress towards an unfinished agenda. *The Lancet, 397*(10282), 1388–1399. doi:10.1016/S0140-6736(21)00394-9.

World Health Organization. (n.d.-a). *The WHO child growth standards*. World Health Organization.

World Health Organization. (n.d.-b). *WHO Anthro Survey Analyser and other tools*. World Health Organization.

World Health Organization. (2025). *Global nutrition targets 2030: Stunting brief*. World Health Organization.

World Health Organization. (2026). *Infant and young child feeding*. World Health Organization.

Zhang, L., Liu, H.-J., Li, P., Liu, Y., Zhang, T., Zhu, J.-Y., Zhu, H.-M., Zhou, Y.-P., Wang, H.-J., & Li, Y. (2024). Association of early-term birth and breastfeeding practices with nutritional outcomes in singleton term infants: A multicenter cross-sectional study. *International Breastfeeding Journal, 19*, Article 46. doi:10.1186/s13006-024-00653-w.