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Risk Factors of Stunting Among Toddlers in the Working Area of Kandeman Community Health Center, Batang Regency

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ABSTRACT

This study aims to identify the risk factors associated with stunting among toddlers in the working area of Kandeman Community Health Center, Batang Regency. Background data indicate that stunting remains a major public health problem in Indonesia, with a national prevalence of 21%, showing a decline yet still not achieving the 2020–2024 RPJMN target of 14% or the WHO standard of below 20%. Among 38 provinces, only 15 are below the national rate. In Central Java, Batang Regency set a target of 15.5%, but SSGI data place it among the top ten highest, with January 2025 records showing the highest cases in Bawang Health Center (543 toddlers), followed by Kandeman (525 toddlers) and Reban (391 toddlers). This study employed an analytical observational approach with a case-control design to analyze the relationship between independent variables (exclusive breastfeeding, complementary feeding practices, immunization status, and sanitation) and the dependent variable, which is stunting among toddlers in the Kandeman Health Center area. The sample was selected through systematic random sampling and determined using the Lemeshow formula, yielding 88 respondents (44 cases and 44 controls, 1:1 ratio). Data were analyzed using SPSS through univariate and bivariate analyses. The results showed that all four factors had a significant relationship with stunting, namely exclusive breastfeeding (p=0.000; OR=12.000), quality and appropriateness of complementary feeding (p=0.006; OR=2.850), complete basic immunization status (p=0.000; OR=4.200), and environmental sanitation (p=0.000; OR=7.286).

INTRODUCTION

According to the World Health Organization (WHO), the global stunting incidence reached 22% or 149.2 million toddlers in 2020, while in Indonesia the prevalence of stunting based on the 2022 SSGI was 21.6%, a decrease from 24.4% in the previous year, but still above the WHO standard of <20% and the national target of 14% in 2024 (Apriastini et al., 2024). Ministry of Health Spokesperson M. Syahrir emphasized that stunting remains a serious health problem in Indonesia because it not only affects children's physical growth, but also cognitive development and long-term performance due to suboptimal brain development. Based on the 2023 SKI, the prevalence of stunting decreased slightly from 21.6% (2022 SSGI) to 21.5% and this downward trend continued during 2012–2023, but still did not meet the 2020–2024 RPJMN target of 14% and the WHO standard of below 20%. Of Indonesia's 38 provinces, 15 have stunting prevalence below the national average, and globally, Indonesia ranks 115th out of 151 countries (Kesuma et al., 2022). The 2024 Basic Health Research (Riskesdas) data shows that Indonesia's stunting prevalence is 21.6%, a decrease from 24.4% the previous year, but still exceeds the WHO-set threshold. Nationally, stunting prevalence was recorded at 24.4% in 2021, dropping to 21.6% in 2022, 17.8% in 2023, and is targeted to reach 14% in 2024. While stunting remains a focus for global nutrition improvement until 2025 (Directorate General of Regional Development, 2024;Agustiani & Meliyana, 2024). At the regional level, Batang Regency set a stunting prevalence target of 15.5% in its 2022 Regional Development Plan (RKPD), based on 2017 e-PPBG data of 9.62%, or 4,958 stunted infants out of 51,553. In 2018, the prevalence was 9.35% (4,921 out of 52,653 infants), 10.27% (5,303 out of 51,622 infants) in 2019, and 16.71% (5,915 out of 35,397 infants) in 2020. In 2021, the stunting rate dropped to 14.14% (5,275 out of 47,302 infants/children) and decreased again in 2022 to 13.56% (5,182 out of 38,211 infants), although based on the SSGI of 21%, Batang Regency is still in the top 10 in Central Java. In January 2025, the highest number of stunted toddlers in Batang Regency was recorded at Bawang Health Center with 543 toddlers, followed by Kandeman Health Center with 525 toddlers and Reban Health Center with 391 toddlers.

Stunting is a multifactorial problem influenced by poor parenting, inadequate sanitation and water supply, food insecurity, and low educational attainment of caregivers, along with other factors such as household wealth indicators, maternal and paternal smoking habits, short stature, and overcrowding (Sari & Harianis, 2022). Factors causing stunting during a child's golden age are also related to parental parenting patterns, maternal knowledge, economic status, low birth weight (LBW), and inadequate nutritional intake (Pokhrel, 2024). In Batang Regency, the prevalence of stunting tends to fluctuate, increasing from 9.62% in 2017 to 16.65% in 2020, then decreasing to 14.14% in 2021. The increase in stunting cases in Batang Regency is caused by the still-low knowledge of pregnant women regarding nutritional and health fulfillment, which impacts malnutrition for pregnant and postpartum mothers, as well as suboptimal access to clean water and sanitation.

Exclusive breastfeeding coverage in Batang Regency in 2023 was 68.81%, indicating that the ideal coverage of 100% has not been achieved. Meanwhile, complete basic immunization coverage in 2023 has exceeded the national target of 85% with an achievement of 107.42%, an increase from 98.84% in 2022. At the Kandeman Community Health Center, exclusive breastfeeding coverage in 2024 reached 71%, better than the national average in 2022 of 67.96%, but still has room for improvement. Complete basic immunization coverage at the Kandeman Community Health Center in 2023 reached 121.76%, making it the community health center with the second highest immunization coverage after the Gringsing 2 Community Health Center at 144%. Kandeman District covers an area of 4,060.20 ha, comprising 13 villages and a population of 55,515. Based on the February 2022 ePPGBM (National Child Health Survey), the stunting prevalence rate was 8.07%. The highest rate was in Botolambat Village at 14.01% and the lowest in Depok Village at 0.63%. The average coverage of 29 essential services was 58.95%. However, the stunting prevalence in Kandeman District increased by 1.65% compared to the previous year, making it one of two priority districts for stunting reduction in Batang Regency. Six villages, including Botolambat Village, experienced an increase in prevalence.

Previous research consistently shows that maternal characteristics and family socioeconomic conditions play a significant role in stunting. Research by Nyimas Elsa Octa Aditia et al. (2023) found that poor parenting significantly increased the risk of stunting (OR=10.065), as did low maternal knowledge (OR=9.441). These findings align with a study by Tanzil Lisa & Hafrani (2021), which identified maternal education (OR=22.667) and family income (OR=13.222) as very strong determinants. Analysis by Agushybana et al. (2025) based on the Indonesian Family Life Survey (IFLS) confirmed that the determinants of stunting in Indonesia are complex and related to long-term parenting patterns. Dewi et al. (2023) added that maternal education level is significantly correlated with health behaviors that directly impact a child's nutritional status from pregnancy to birth. In terms of early nutrition, exclusive breastfeeding has been shown to be a key protective factor, with toddlers not exclusively breastfed having a 10.2-fold greater risk of stunting (OR=10.247), as reported by Nyimas Elsa Octa Aditia et al. (2023) and supported by Lanita et al. (2023).

In addition to breastfeeding, the complementary feeding (MPASI) phase is a crucial transition period for child development. Nyimas Elsa Octa Aditia et al. (2023) showed that poor-quality MPASI was significantly associated with stunting (OR=9.362). This finding is supported by Tanzil Lisa & Hafrani (2021), who emphasized that adequate protein (OR=7.000) and energy (OR=9.333) are absolutely essential for children's linear growth. A meta-analysis by Babys et al. (2022) also concluded that poor MPASI practices consistently increase the risk of stunting in children aged 6–59 months. On the other hand, environmental health factors and medical history also play a role, where infectious diseases increase the risk of stunting by 4.1 times (OR=4.194) according to Nyimas Elsa Octa Aditia et al. (2023).

This risk is exacerbated by poor sanitation and hygiene (Pradapaningrum & Kusnoputranto, 2023; Anismuslim et al., 2023), as well as repeated diarrheal infections that interfere with nutrient absorption, especially in children with incomplete immunization status (Modern et al., 2020; Nasution et al., 2023).

Based on the background description, the high national prevalence of stunting at 21.6% in 2022, the high stunting rate in Central Java at 20.9% in 2021, which is still far from the national target of 14%, and the increase in the prevalence of stunted toddlers in the Kandeman Community Health Center working area from 8.07% in 2022 to 17.06% in 2023 indicate that stunting remains a health problem that requires serious attention. This condition indicates the existence of risk factors that contribute to the incidence of stunting at the primary health care level, especially at the Kandeman Community Health Center. Therefore, this study aims to determine the risk factors for stunting in toddlers in the Kandeman Community Health Center working area, Batang Regency, by analyzing the role of exclusive breastfeeding, provision of complementary feeding, immunization status, and sanitation conditions as factors suspected of influencing the incidence of stunting.

LITERATURE REVIEW

Stunting in Toddlers

Stunting in toddlers is a condition of growth failure characterized by a child's length or height falling below the standard for their age, i.e., less than minus two standard deviations based on WHO anthropometric measurements. It is classified as a chronic nutritional problem resulting from long-term nutritional deficiencies (Ministry of Health of the Republic of Indonesia, 2018; Candra, 2020). This condition is influenced by various factors, including maternal nutritional status during pregnancy, socioeconomic conditions, inadequate nutritional intake, and a history of infectious diseases in the child (Sutarto, Mayasari, & Indriyani, 2018). Stunting primarily occurs during the critical period of the First 1,000 Days of Life (HPK), from before pregnancy, through the fetal period, birth, and through toddler growth and development. It is related not only to genetic factors or health services, but also to parenting patterns and the quality of long-term nutritional intake (Nurlatif & Priharwanti, 2019). The impact of stunting is not only visible on physical growth, but also significantly affects cognitive development, learning ability, and increases the risk of non-communicable diseases such as diabetes, hypertension, and obesity in adulthood (Edi Kurniawan, 2022). Globally, the WHO reported a stunting prevalence of 22% or 149.2 million children under five in 2020, while Indonesia is among the countries with a high prevalence in the Southeast Asian region and is ranked 115th out of 151 countries in the world (Jihan Putri Adhani et al.; WHO). In Indonesia, the stunting prevalence based on the 2022 SSGI is 21.6% and although it shows a downward trend from 2012 to 2023, this figure is still above the WHO standard (<20%) and the 2020–2024 RPJMN target of 14%. Therefore, stunting remains a priority issue for nutritional improvement until 2025.

Risk Factors for Stunting in Toddlers

Exclusive breastfeeding and complementary feeding are important risk factors for stunting in toddlers because they play a direct role in meeting nutritional needs during the critical first 1,000 days of life. Exclusive breastfeeding provides complete nutrition and immunological protection, so its absence significantly increases the risk of stunting, as demonstrated by various studies with high odds ratios (Julianti & Elni, 2020; Rachmayanti et al., 2022; Andika et al., 2021). Inappropriate complementary feeding practices, whether too early, lacking nutritional quality, or at an age-inappropriate frequency, have been shown to increase the risk of stunting through nutritional deficits and increased gastrointestinal infections (Babys et al., 2022; Ahmad et al., 2022). Furthermore, incomplete basic immunization status leads to a weakened immune system, making children susceptible to infectious diseases, which impact growth retardation (Agustina et al., 2020). Environmental factors such as poor sanitation and limited access to clean water also contribute to stunting by increasing the risk of recurrent infectious diseases such as diarrhea and worms, which inhibit nutrient absorption (Rahayu & Darmawan, 2019; Maryani & Mandagi, 2023).

In addition to biological and environmental factors, social and family behavioral factors play an equally important role in stunting. Low maternal education is associated with limited nutritional knowledge, suboptimal parenting patterns, and health behaviors, which increase the risk of stunting in toddlers (Saman & Darmin, 2021; Lisa et al., 2021). Poor maternal parenting practices, particularly regarding feeding, hygiene, and utilization of health services, have been shown to be significantly associated with stunting (Rianti et al., 2023; Evy, 2021). Poor maternal knowledge about nutrition and stunting also influences children's food choices and variations, which impact long-term nutritional status (Komalasari et al., 2020). Furthermore, a family's economic status plays a significant role in determining food adequacy and quality, with limited income leading to low protein, vitamin, and mineral consumption, leading to chronic malnutrition and stunting (Rahmawati et al., 2020). Thus, stunting is a multifactorial problem influenced by the interaction between nutritional intake, environmental health, parenting behavior, maternal education, and the family's socioeconomic conditions.

Theoretical Framework

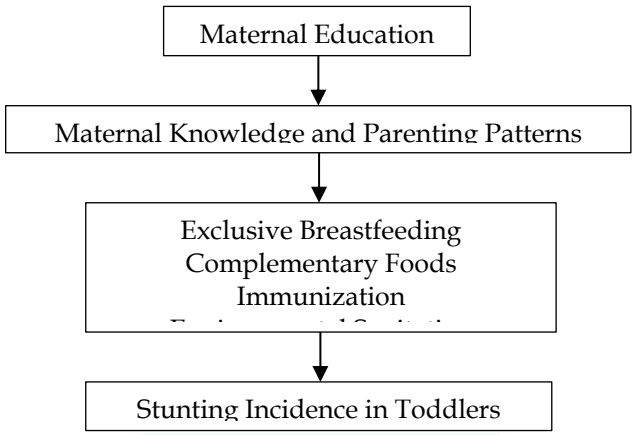


Figure 1.Research Framework

METHODOLOGY

This study uses an analytical observational approach with a case-control design to analyze the risk factors for stunting in toddlers in the Kandeman Community Health Center, Batang Regency. The study population was mothers with toddlers, with a sample of 88 respondents consisting of 44 stunted toddlers (cases) and 44 non-stunted toddlers (controls), determined using the Lemeshow formula with a 1:1 ratio and systematic random sampling techniques. Data were collected through a structured questionnaire that had been tested for validity and reliability, observation, interviews, and documentation, and supported by secondary data from the community health center and related literature. The independent variables included exclusive breastfeeding, complementary feeding, immunization, and sanitation, while the dependent variable was stunting incidence. Data processing was carried out through the editing, coding, tabulation, and cleaning stages, then analyzed using the SPSS program with univariate analysis to see the frequency distribution and bivariate analysis using the Chi-Square test or Fisher test with a significance level of 0.05.

RESEARCH RESULT

Bivariate Analysis

Table 1. Results of Bivariate Analysis of Exclusive Breastfeeding Variable

Exclusive Breastfeeding	Case (Stunted)		Control (Non-Stunted)		P-Value	OR
	N	%	N	%		
Non-exclusive breastfeeding	30	68.2	10	22.7	0.000	7.286
Exclusive breastfeeding	14	31.8	34	77.3		
Total	44	100	44	100		**CI = 2.822–18.810**

Source: IBM SPSS Statistics 26

Based on Table 1, it can be seen that among 44 stunted children, the majority (68.2%) did not receive exclusive breastfeeding. In contrast, among non-stunted children, most (77.3%) received exclusive breastfeeding.

The Chi-Square test showed a p-value of 0.000 (< 0.05), indicating a statistically significant association between exclusive breastfeeding and stunting among under-five children in the working area of Kandeman Public Health Center. The Odds Ratio (OR) was 7.286 with a 95% Confidence Interval (CI) of 2.822–18.810, meaning that children who did not receive exclusive breastfeeding had a 7.2 times higher risk of experiencing stunting compared to those who received exclusive breastfeeding. Since the CI does not include 1, this relationship is statistically significant.

These findings are consistent with the study by Hidayati et al. (2021), which reported that infants who were not exclusively breastfed had a higher risk of stunting than those who were exclusively breastfed. Similarly, Rahayu et al. (2020) stated that exclusive breastfeeding fulfills optimal nutritional needs during the first six months of life and plays a crucial role in preventing growth disorders.

Table 2. Results of Bivariate Analysis of Complementary Feeding (MP-ASI) Variable

Complementary Feeding (MP-ASI)	Case (Stunted)		Control (Non-Stunted)		P-Value	OR
	N	%	N	%		
Inappropriate	28	63.6	15	34.1	0.006	3.383
Appropriate	16	36.4	29	65.9		
Total	44	100	44	100		**CI = 1.410–8.117**

Source: IBM SPSS Statistics 26

Based on Table 2, the majority of stunted children (63.6%) received inappropriate complementary feeding, while most non-stunted children (65.9%) received appropriate complementary feeding.

The Chi-Square test showed a p-value of 0.006 (< 0.05), indicating a significant association between the appropriateness of complementary feeding and stunting. The Odds Ratio (OR) was 3.383 with a 95% Confidence Interval (CI) of 1.410–8.117, which means that children who received inappropriate complementary feeding had a 3.4 times higher risk of stunting compared to those who received appropriate complementary feeding. Since the CI does not cross 1, this association is statistically significant.

These results align with the findings of Rachmawati et al. (2020), who reported that complementary feeding given too early (<6 months), too late (>8 months), or not meeting nutritional requirements can inhibit linear growth in children. WHO and UNICEF (2021) recommend that complementary feeding should begin at six months of age with adequate quality and quantity, as nutritional needs at this stage can no longer be met by breast milk alone.

Table 3. Analysis of the Relationship between Immunization Status and Stunting among Under-Five Children in the Working Area of Kandeman Public Health Center

Immunization Status	Case (Stunted)		Control (Non-Stunted)		P-Value	OR
	N	%	N	%		
Incomplete	27	61.4	9	20.5	0.000	3.383
Complete	17	38.6	35	79.5		
Total	44	100	44	100		**CI = 2.386–15.990**

Source: IBM SPSS Statistics 26

Based on Table 3, most stunted children (61.4%) had incomplete basic immunization status, whereas most non-stunted children (79.5%) had complete basic immunization status.

The Chi-Square test yielded a p-value of 0.000 (< 0.05), indicating a significant association between basic immunization status and stunting. The Odds Ratio (OR) was 3.383 with a 95% Confidence Interval (CI) of 2.386–15.990, suggesting that children with incomplete immunization had a 3.38 times higher risk of stunting compared to those with complete immunization. Since the CI does not include 1, the association is statistically significant.

These findings are consistent with Dewi et al. (2021), who found that children with incomplete immunization are more susceptible to infectious diseases such as diarrhea and acute respiratory infections, which can impair nutrient absorption and growth. Handayani and Sitorus (2020) also reported that complete basic immunization acts as a protective factor against stunting.

Biologically, immunization protects children from infectious diseases that disrupt metabolism and nutrient absorption. Children who frequently suffer from infections require increased energy for recovery, reducing the energy available for growth (Ministry of Health of the Republic of Indonesia, 2022).

Table 4. Analysis of the Relationship between Sanitation and Stunting among Under-Five Children in the Working Area of Kandeman Public Health Center

Sanitation Condition	Case (Stunted)		Control (Non-Stunted)		P-Value	OR
	N	%	N	%		
Poor	30	68.2	10	22.7	0.000	7.286
Good	14	31.8	34	77.3		
Total	44	100	44	100		**CI = 2.822–18.810**

Source: IBM SPSS Statistics 26

Based on Table 4, most stunted children (68.2%) lived in households with poor sanitation conditions. Conversely, most non-stunted children (77.3%) lived in households with good sanitation.

The Chi-Square test showed a p-value of 0.000 (< 0.05), indicating a significant relationship between household sanitation conditions and stunting. The Odds Ratio (OR) was 7.286 with a 95% Confidence Interval (CI) of 2.822–18.810, meaning that children living in households with poor sanitation had a 7.2 times higher risk of stunting compared to those living in households with good sanitation. Since the CI does not include 1, this association is statistically significant.

These results are consistent with Prasetyo et al. (2020), who found a significant association between poor environmental sanitation and stunting in Sidoarjo Regency. Septiani et al. (2021) also reported that access to clean water and adequate sanitation facilities can reduce the risk of stunting by up to 40%.

This finding is further supported by WHO (2022), which explains that poor Water, Sanitation, and Hygiene (WASH) practices increase the incidence of infectious diseases, one of the direct causes of stunting. UNICEF emphasizes that sanitation improvement interventions are a key strategy in reducing stunting prevalence in developing countries.

Supporting and Inhibiting Factors

Table 5 below presents the supporting and inhibiting factors encountered during the implementation of the study.

Table 5. Supporting and Inhibiting Factors in the Research Implementation

Category	Factors
Supporting Factors	Permission and support from the public health center and the local health office facilitated access to data and respondents.
	Favorable weather conditions and smooth transportation access supported efficient field data collection.
	Mothers of under-five children participated voluntarily by completing questionnaires and taking part in interviews honestly and openly.
Inhibiting Factors	The relatively large sample size required a considerable amount of time for data processing and analysis.

DISCUSSION

The findings of this study indicate that exclusive breastfeeding, appropriate complementary feeding (MP-ASI), complete immunization, and adequate sanitation are significantly associated with stunting among under-five children in the working area of

Kandeman Public Health Center. Univariable and inferential analyses demonstrated that children who did not receive exclusive breastfeeding, inappropriate MP-ASI, incomplete basic immunization, and poor household sanitation had a significantly higher proportion of stunting ($p < 0.05$). These results are consistent with previous studies showing that exclusive breastfeeding provides optimal nutrition and passive immunity essential for growth and infection prevention (Rachmayanti et al., 2022; Lanita et al., 2023; Dewi et al., 2023). Early or inadequate feeding practices disrupt immature gastrointestinal function, increase susceptibility to infection, and impair nutrient absorption, which cumulatively contribute to growth faltering and stunting (Punuh et al., 2022; Ludji, 2024). Similarly, inappropriate MP-ASI timing and quality were found to increase the risk of chronic energy and protein deficiency, particularly when protein-rich foods are insufficient, as highlighted by Babys et al. (2022) and Ahmad et al. (2022).

Furthermore, this study reinforces the role of immunization and environmental sanitation as critical determinants of child growth. Children with incomplete immunization were more vulnerable to recurrent infections, which divert metabolic energy from growth to immune responses, leading to chronic nutritional deficits (Modern et al., 2020; Supadmi et al., 2024). Maternal health behavior in ensuring complete immunization has therefore been identified as a key protective factor against stunting (Nasution et al., 2023; Fadmi et al., 2024). In addition, poor sanitation was strongly associated with stunting through mechanisms such as Environmental Enteric Dysfunction (EED), characterized by chronic intestinal inflammation and malabsorption due to continuous fecal–oral pathogen exposure (Prasetyo & Susanna, 2025). Recurrent diarrheal disease and parasitic infections further exacerbate nutrient loss and growth failure (Puteri & Fitria, 2025; Anismuslim et al., 2023). These findings align with WHO recommendations emphasizing that stunting prevention requires integrated interventions addressing nutrition, immunization, and Water, Sanitation, and Hygiene (WASH), as nutritional interventions alone are insufficient without improvements in environmental health (Fadjriah et al., 2021; WHO, 2022).

The bivariate analysis showed that exclusive breastfeeding, complementary feeding practices (MPASI), and immunization status were significantly associated with stunting among under-five children. Exclusive breastfeeding was identified as a strong protective factor, with a p-value of 0.000 (<0.05) and an Odds Ratio (OR) of 7.286 (95% CI: 2.822–18.810), indicating that children who did not receive exclusive breastfeeding had a markedly higher risk of stunting. This finding reflects inappropriate early feeding practices observed in the study area, such as the provision of prelacteal foods and early complementary feeding before six months of age, which reduce breast milk intake and expose infants to infections. Similarly, inappropriate MPASI practices were significantly associated with stunting ($p = 0.006$; OR = 2.850; 95% CI: 1.038–7.826), suggesting that incorrect timing, type, and frequency of complementary foods contribute to inadequate nutrient intake during a critical growth period.

In addition to feeding practices, immunization status and environmental sanitation were also significantly related to stunting. Children who did not receive complete basic immunization had a higher risk of stunting ($p = 0.000$; OR = 4.200; 95% CI: 1.600–10.800), highlighting the role of recurrent infections in disrupting growth due to reduced appetite and increased metabolic demands.

Furthermore, poor environmental sanitation showed a strong association with stunting (p = 0.000; OR = 7.286; 95% CI: 2.822–18.810). Unsanitary living conditions increase exposure to pathogens and contribute to chronic gastrointestinal infections and environmental enteric dysfunction, which impair nutrient absorption. These findings emphasize that stunting is a multifactorial condition influenced not only by nutritional intake but also by health protection and environmental factors, reinforcing the need for integrated interventions combining nutrition, immunization, and sanitation improvement.

CONCLUSIONS AND RECOMMENDATIONS

Bivariate analysis showed a statistically significant relationship between exclusive breastfeeding and stunting incidence (p-value = 0.000; OR = 12.000), indicating that children who did not receive exclusive breastfeeding had a twelve-fold higher risk of stunting. In addition, inappropriate quality and timing of complementary feeding (MP-ASI) were significantly associated with stunting (p-value = 0.006; OR = 2.850). Incomplete basic immunization status was also found to be a significant risk factor (p-value = 0.000; OR = 4.200), as well as poor environmental sanitation (p-value = 0.000; OR = 7.286). These findings confirm that nutritional practices, preventive health services, and environmental conditions play a critical role in the occurrence of stunting. It is recommended that Kandeman Public Health Center strengthen continuous education and mentoring programs for pregnant women and mothers of under-five children, particularly regarding exclusive breastfeeding for the first six months, appropriate complementary feeding practices, and the importance of completing basic immunizations through routine services and catch-up (sweeping) activities. Mothers of under-five children are encouraged to practice exclusive breastfeeding, provide age-appropriate and nutritionally balanced complementary foods, ensure complete immunization, and consistently maintain household sanitation and hygiene to reduce infection risks.

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