Demographic Characteristics, Knowledge, Attitudes, and Actions of Mothers Related to Nutrition among Stunting Toddlers

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Abstract

Stunting is a chronic nutritional problem that affects children's growth and development. Indonesia still has a high prevalence of stunting, including in urban areas such as Bogor. Maternal characteristics and nutrition-related behaviors are important factors to consider when designing effective interventions. This study aims to describe maternal demographics, nutrition-related knowledge, attitudes, and practices, as well as the incidence of stunting among toddlers in Gunung Batu Village, Bogor City. A quantitative descriptive observational design was applied, involving all mothers of stunted toddlers aged 6-59 months registered at the Gunung Batu Community Health Center in February 2025. A total of 54 respondents were selected using total sampling. Data on maternal knowledge, attitudes, and practices were collected through questionnaires, while stunting data were obtained from health center records. Descriptive analysis was conducted using frequencies and percentages. The average maternal age was 30.7 years. Most mothers had completed senior high school or vocational education (42.59%) and were housewives (72.22%). All toddlers in the study (N = 54) were classified as stunted. Most mothers demonstrated good levels of knowledge and practices related to toddler nutrition (96.3%), and all reported positive attitudes. Despite these favorable maternal characteristics, stunting persisted among all toddlers in this study. These findings suggest that factors beyond maternal nutrition-related behaviors may contribute to stunting and highlight the need for further studies to identify additional determinants and strengthen prevention strategies.

Keywords: Stunting, Knowledge, Attitude, Practice, Mother, Toddler, Demography.

INTRODUCTION

Stunting among toddlers is one of the most critical global public health challenges, with profound effects on children's growth, development, and long-term health. It is defined as being too short for one's age, measured by a height-for-age z-score below −2 standard deviations, reflecting chronic undernutrition and recurrent infections during the most sensitive periods of growth. Stunted children face lifelong consequences, including limited cognitive and physical development, reduced productivity, and poorer overall health. According to the Joint Child Malnutrition Estimates (JME) 2024, an estimated 148 million children under five years of age (22.3%) worldwide were stunted. Although global prevalence has gradually declined over the past decade, the absolute number of affected children remains alarmingly high, pointing to persistent structural and behavioral determinants of undernutrition (benjohnson, 2025). Stunting is associated with irreversible outcomes, such as impaired

cognitive development, lower educational attainment, increased risk of non-communicable diseases, and diminished economic productivity in adulthood.

Recent evidence from multiple countries shows that stunting remains a widespread and complex problem. South Asia carries the highest global burden, with India and Pakistan together accounting for more than one-third of stunted children worldwide. In several states, national prevalence rates exceed 30% (benjohnson, 2025). In Sub-Saharan Africa, stunting rates remain persistently high in countries such as Nigeria, Ethiopia, and the Democratic Republic of Congo, where food insecurity, poor maternal nutrition, and limited access to health services continue to hinder progress (Akombi et al., 2017; Black et al., 2013). In Latin America, overall prevalence is lower, yet urban poor populations in countries such as Guatemala and Peru still face significant stunting, driven by socioeconomic inequality and inadequate infant feeding practices (Victora et al., 2021).

Asia, the world's most populous region, carries the largest share of the global stunting burden. The JME 2024 report estimates that over 57% of all stunted children worldwide (approximately 84.5 million) live in this region. While South Asia accounts for the greatest proportion, Southeast Asian countries, such as Indonesia, Cambodia, and the Philippines, continue to report moderate-to-high prevalence, particularly among low-income and urban marginalized populations (benjohnson, 2025). Research in urban slums in Manila, Dhaka, and Ho Chi Minh City highlights how rapid urbanization, limited food affordability, and suboptimal caregiving practices contribute significantly to persistent stunting in cities (Headey et al., 2021; Ruel et al., 2017).

In Indonesia, stunting remains a key national development priority. The 2024 Indonesian Nutritional Status Survey (SSGI) reported a decline in national stunting prevalence to 19.8%, down from 21.5% in 2023. Despite this progress, the rate is still above the national target of 14% in the 2020–2024 *Rencana Pembangunan Jangka Menengah Nasional* (RPJMN). In response, the Indonesian government has strengthened both nutrition-specific and nutrition-sensitive interventions, focusing on maternal and child nutrition, household food security, and behavior change communication (Kemenko, 2025).

At the provincial level, West Java recorded a stunting prevalence of 15.9% in 2024, showing improvement but still above the national target. Significant disparities remain across districts and cities, with some urban areas reporting lower rates while others continue to face substantial burdens. Nutrition-sensitive programs, such as the Healthy and Independent Sustainable Yard (ASRI) initiative, have been introduced to strengthen household-level food

availability and dietary diversity, reflecting the growing emphasis on family-based nutrition practices (Nurulliah, 2025).

In Bogor Regency, stunting prevalence reportedly declined sharply to 7.59% in 2024, a reduction attributed to innovative local strategies such as the Stunting Prevention House (CETING) program and foster parent initiatives. However, district-level figures may mask disparities within urban areas, particularly in Bogor City, where socioeconomic inequality, maternal employment patterns, and lifestyle factors can shape caregiving and feeding practices. Recent local reports indicate that, despite regular participation in nutrition education programs, stunting cases continue to be recorded in several urban health center catchment areas (Rowa & Averus, 2025; Utami et al., 2024).

Over the past five years, evidence has consistently highlighted the critical role of maternal knowledge, attitudes, and practices (KAP) in shaping child nutritional status. A meta-analysis of low- and middle-income countries found that children of mothers with inadequate nutrition knowledge were 2.3 times more likely to be stunted than those whose mothers had adequate knowledge (Novitasari & Wanda, 2020a). Studies in Bangladesh, Vietnam, and Nepal further showed that poor maternal understanding of complementary feeding timing, meal frequency, and dietary diversity significantly increases risk (Din et al., 2023; Headey et al., 2021; Simanjuntak et al., 2019). In Malaysia, inappropriate feeding practices and low maternal responsiveness were independently linked to stunting among toddlers in urban settings (Bayked et al., 2024). In Indonesia, research conducted between 2020 and 2024 reported strong associations between maternal education, nutrition knowledge, feeding attitudes, and child growth outcomes (Umwali, 2020; Wahyuni et al., 2023).

However, most of these studies focused on the rural or provincial level, leaving limited evidence at the urban city-level, particularly in Bogor City. This gap restricts local governments from designing interventions tailored to urban household characteristics. A preliminary survey at the Gunung Batu Community Health Center in January 2025 identified several stunted toddlers despite regular maternal participation in nutrition counseling sessions, suggesting that attendance alone may not ensure adequate knowledge, positive attitudes, or appropriate practices. Therefore, a systematic assessment of maternal demographics and nutrition-related KAP is urgently needed. This study aims to describe maternal characteristics, knowledge, attitudes, and practices related to toddler nutrition, along with the profiles of stunted toddlers in Gunung Batu Village, Bogor City, in February 2025. The findings are expected to provide locally relevant evidence to support targeted, behavior-focused stunting prevention strategies in urban settings.

METHODS

This study employed a quantitative observational design with a descriptive–analytic approach, conducted in Gunung Batu Village, Bogor City, during February 2025. The objective was to describe maternal demographic characteristics, nutritional knowledge, attitudes, and practices (KAP), as well as the profiles of stunted toddlers. The study population included all mothers with stunted toddlers aged 6–59 months registered in the *By Name By Address* (BNBA) database of Gunung Batu Village. The BNBA is an official registry maintained by the Community Health Center (*Puskesmas*) that records children with nutritional problems, including stunting, along with individual and household information.

A total sampling technique was applied. Based on BNBA data for February 2025, 54 mother–toddler pairs met the eligibility criteria and were included in the study (N = 54). No sample size calculation was performed because the population was relatively small and fully accessible. Inclusion criteria were mothers who: had toddlers aged 6–59 months classified as stunted in the February 2025 BNBA records; resided in Gunung Batu Village, and provided informed consent. Exclusion criteria included mothers who were unavailable during data collection, declined participation, or had incomplete questionnaire responses. The study variables were grouped into three categories:

1) Maternal demographic variables: age, level of education, occupation, and parity.
2) Maternal nutrition-related variables:

a. Knowledge (14 items; Guttman scale; categorized as good/poor);
b. Attitudes (15 items; 5-point Likert scale; categorized as positive/negative), and
c. Practices (12 items; Guttman scale; categorized as appropriate/inappropriate);

3) Toddler characteristics: age (months), gender, and stunting severity (moderate or severe).

Stunting status was assessed using height-for-age z-scores (HAZ) based on the 2026 WHO Child Growth Standards. Children with HAZ < −2 SD were classified as stunted, while those with HAZ < −3 SD were categorized as severely stunted. Anthropometric measurements were performed by trained health workers at the *Posyandu* or *Puskesmas* using standardized equipment, a length board for children under two years and a microtoise for those aged two years and above. Anthropometric data were obtained from routine nutrition monitoring records at the Gunung Batu Community Health Center for February 2025.

Data were collected using a structured questionnaire adapted from validated and reliable instruments. The questionnaire assessed maternal knowledge, attitudes, and practices related to toddler nutrition and feeding. Before data collection, the instrument was reviewed to

ensure clarity and relevance. Trained enumerators conducted face-to-face interviews to administer the questionnaire.

All collected data were processed and analyzed descriptively. Categorical variables were summarized using frequencies and percentages, while numerical variables were presented as mean values. The analysis was used to describe maternal characteristics, levels of knowledge, attitudes, and practices related to nutrition, as well as the distribution of stunting cases among toddlers.

This study received ethical approval from the Lembaga Penelitian dan Pengabdian kepada Masyarakat (LPPM), Christian University of Indonesia (Ethical Approval No.: 021/UKI.LPPM/PPM.00.00/ET.2025).

RESULTS

Table 1. Demographic Characteristics of Respondents Based on Maternal Age

Descriptive Statistics	N
Mean	30.7
Median	29
Mode	28, 36, 40
Minimum	22
Maximum	46
Total Data	**54**

The distribution of maternal ages showed considerable variation. The average age was 30.7 years, with a median of 29 years, indicating that most mothers were in the young to early adult age group. The most frequently reported ages were 28, 36, and 40 years. The youngest mother was 22 years old, while the oldest was 46, based on a total of 54 respondents.

Table 2 Demographic Characteristics of Respondents Based on Maternal Education, Occupation, and Monthly Family Income

Descriptive Statistics	Frequency	Percentage
Maternal Education		
Senior High School	23	42.6
Primary School	15	27.8
Junior High School	13	24.07
Higher Education	3	5.55
Maternal Occupation		
Housewife	39	72.22
Trader	12	22.22
Seblak Seller	1	1.85
Teacher or Lecturer	1	1.85
Laborer	1	1.85
Monthly Family Income		
≥ Rp 3.000.000	18	33.33
Rp 1.000.000 - < Rp 2.000.000	17	31.48
Rp 2.000.000 - < Rp 3.000.000	17	31.48
< Rp 1.000.000	2	3.70

Table 2 shows that most mothers in this sample had a secondary education background. High school or vocational high school education was the most common level of education, reported by 42.6% (23 respondents), followed by elementary school at 27.8% (15 respondents) and junior high school at 24.07% (13 respondents). Only 5.55% (3 respondents) had higher education.

Occupational data indicate that the majority of mothers were housewives (72.22%,39 respondents). Traders accounted for 22.22% (12 respondents), while other occupations, including selling seblak (spicy rice cakes), teaching or lecturing, and labor, were each represented by a single respondent (1.9% per category).

Family income distributions were relatively even across categories. The largest group (33.33%, 18 families) reported monthly incomes of ≥ Rp 3,000,000. Two other categories, Rp 1,000,000 to < Rp 2,000,000 and Rp 2,000,000 to < Rp 3,000,000, each accounted for 31.5% (17 families). Only 3.7% (2 families) reported incomes below Rp 1,000,000.

Table 3. Distribution of Maternal Knowledge Level Regarding Stunting

Category Level	Frequency	Percentage
Maternal Knowledge		
Fair (≥ 9 score)	52	96.3
Poor (≤ 8 score)	2	3.7
Maternal Attitude		
Fair (≥ 36 score)	54	100
Poor (≤ 35 score)	0	0
Maternal Action		
Fair (≥ 8 score)	52	96.3
Poor (≤ 7 score)	2	3.7

**Note: Knowledge category criteria (Max score 14): Fairly Good ≥60 (score ≥8.4, rounded up to ≥9); Poor <60 (score ≤8)*
**Note: Attitude category criteria (Max score 60): Fair ≥60 (score ≥36); Poor <60 (score ≤35)*
**Note: Action category criteria (Max score 12): Fair ≥60 (score ≥7.2, rounded to ≥8); Poor <60 (score ≤7).*

Table 3 shows that the majority of mothers (96.3%) had a "fairly good" level of knowledge about stunting, indicating that most respondents understood its definition, causes, characteristics, impacts, and prevention efforts. In terms of attitudes, all mothers (100.0%) demonstrated a 'Fairly Good' attitude toward stunting prevention, reflecting strong support for practices that promote children's nutritional health. Finally, most mothers (96.3%) demonstrated 'Fairly Good' practices or actions in stunting prevention efforts, suggesting that they have implemented concrete steps to support stunting prevention among toddlers.

DISCUSSION

The results of this study align with previous research indicating that legume flour incorporation enhances snack bar nutritional quality. Enrichment with pulse flours significantly

increases protein and dietary fiber content while maintaining sensory acceptability (Escobedo & Mojica, 2021). Enhanced fiber content may support metabolic health benefits relevant to adolescent populations (Edwards et al., 2015; WHO, 2020). These findings support the use of pigeon pea flour as a functional ingredient for developing nutritious snack products targeted at adolescents.

The hedonic test showed significantly higher scores for color, aroma, texture, and overall acceptance in the developed product compared with the control. This indicates that pigeon pea flour can be successfully incorporated into snack bar formulations without negatively affecting consumer preference. The brownish color and distinctive aroma were likely influenced by the natural pigments and bioactive compounds in pigeon peas, which intensify during thermal processing and contribute to product appeal.

Texture acceptability may be attributed to the interaction between the protein and starch components of the mixed flours, which affect moisture retention and structural integrity. Previous studies have reported that legume-based formulations improve texture and nutritional quality due to their high protein and complex carbohydrate content. Protein also plays a role in water binding, contributing to a softer and more desirable texture.

From a nutritional perspective, the developed snack bar contained 14.25% protein, 20.55% fat, and 51.34% carbohydrates, with an energy value of 447.31 kcal per 100 g. In addition, each 30 g serving provided approximately 5 g of dietary fiber, supporting its potential as a high-fiber snack alternative. This composition aligns with adolescent nutritional needs, particularly in addressing low fiber intake and reliance on energy-dense, nutrient-poor snacks. The high acceptance rate (83%) indicates that adolescents are receptive to snack products formulated with locally sourced legumes. This finding supports the utilization of pigeon pea as an underused food resource with potential applications in functional snack development. Incorporating pigeon pea flour into snack products may contribute to improving dietary quality among adolescents while promoting sustainable use of local agricultural commodities. This study provides a descriptive overview of maternal demographic characteristics and nutrition-related knowledge, attitudes, and practices (KAP) among households with stunted toddlers in Gunung Batu Village, Bogor City. A key finding is that all toddlers in the sample were classified as stunted, despite most mothers demonstrating fairly good levels of nutrition-related knowledge, attitudes, and practices. This highlights that stunting is a multifactorial condition and cannot be explained solely by maternal cognitive and behavioral factors, particularly in urban settings.

Maternal Demographic Characteristics

The mean maternal age in this study was 30.7 years, placing most respondents within the productive reproductive age group. Similar age distributions among mothers of stunted children have been reported in Indonesian studies conducted in West Java, Central Java, Aceh, and East Nusa Tenggara (Marzuki & Tahrim, 2024; Saputra et al., 2023; Sari et al., 2025). International evidence from Bangladesh, Nepal, and Ethiopia likewise shows that stunting frequently occurs among children of mothers in their late twenties to early thirties, suggesting that maternal age alone is not a protective factor against chronic undernutrition (Basnet et al., 2021; Headey et al., 2021; Tyas et al., 2019).

Most mothers in this study had completed senior high school or vocational education and were predominantly housewives. This pattern aligns with findings from other urban and semi-urban Indonesian settings, where mothers of stunted children often have moderate educational attainment but limited economic independence (Lestari & Solikah, 2022; Siagian et al., 2024; Sihotang et al., 2023). In contrast, studies from Malaysia, Vietnam, and Peru suggest that higher maternal education is generally associated with lower stunting prevalence, particularly when supported by stable household income and food security (Bayked et al., 2024; Headey et al., 2021; Victora et al., 2021). These findings indicate that education alone may be insufficient to prevent stunting without adequate socioeconomic support, especially in low-income urban households.

Maternal Knowledge

Most mothers in this study demonstrated a fair to good level of nutritional knowledge. This finding aligns with recent studies in Indonesia reporting adequate maternal knowledge among mothers of stunted toddlers, especially in areas with active nutrition counseling programs (Irfan et al., 2024; Siagian et al., 2024). Similar patterns have been observed in Bangladesh and Vietnam, where mothers possessed good theoretical knowledge of child nutrition, yet still had stunted children (Basnet et al., 2021; Simanjuntak et al., 2019; Umwali, 2020).

Meta-analyses and analytical studies from low- and middle-income countries consistently show that poor maternal knowledge significantly increases the risk of stunting, with odds ratios ranging from 2.0 to 2.5 (Black et al., 2013; Novitasari & Wanda, 2020b). The contrast between these analytical findings and the present descriptive results suggests that knowledge alone does not automatically translate into improved nutritional outcomes. External constraints, such as food affordability, time limitations, and household decision-making dynamics, may restrict the application of maternal knowledge in daily practice.

Maternal Attitudes

All respondents in this study were categorized as having fairly good attitudes toward toddler nutrition and stunting prevention. Positive maternal attitudes reflect awareness, concern, and willingness to engage in healthy feeding and caregiving practices. Similar findings have been reported in urban Indonesian studies, where mothers expressed strong agreement with nutrition messages delivered through Posyandu and Puskesmas activities (Marzuki & Tahrim, 2024; Mursyidah, 2024; Saputra et al., 2023; Sitompul et al., 2025).

Evidence from analytical studies in Southeast Asia and Africa indicates that positive attitudes alone are insufficient to prevent stunting when structural barriers persist (Akombi et al., 2017; Headey et al., 2021; Ruel et al., 2017). Research in urban slums in India, the Philippines, and Nigeria found that mothers with positive attitudes still struggled to provide adequate diets due to food insecurity, poor sanitation, and inconsistent access to health services (Black et al., 2013; Victora et al., 2021). These findings support the results of the present study, suggesting that favorable attitudes may be constrained by contextual limitations beyond maternal control.

Maternal Practices

Most mothers in this study demonstrated fairly good nutritional practices, which with several studies that identify poor feeding practices as a major contributor to stunting. Research from rural Indonesia, Cambodia, and Myanmar has reported inadequate complementary feeding frequency, low dietary diversity, and early cessation of breastfeeding as dominant risk factors (Basnet et al., 2021; Umwali, 2020; Victora et al., 2021).

The discrepancy suggests that in Gunung Batu Village, stunting may not be primarily driven by inappropriate feeding practices alone. Similar findings have been reported in urban Malaysian and Peruvian contexts, where even appropriate feeding practices failed to prevent stunting in the presence of recurrent infections, overcrowded housing, and poor environmental sanitation (Bayked et al., 2024). These results emphasize that while maternal practices are necessary, they are not sufficient conditions for optimal child growth.

Study Limitations and Recommendations for Future Research

This study has several limitations. First, its descriptive design and the absence of a non-stunted comparison group limit causal inference and prevent quantification of associations between maternal factors and stunting. Second, the small sample size (N = 54) reduces statistical power and precludes multivariate analysis to control for confounding variables. Third, data on knowledge, attitudes, and practices were collected through self-reported questionnaires, which may be subject to recall and social desirability bias. Finally, important

determinants such as household income, food security, environmental sanitation, infection history, and paternal involvement were not assessed.

Future research should adopt analytical or mixed-methods designs, include both stunted and non-stunted children, and apply multivariate modeling to disentangle the relative contributions of maternal, household, and environmental factors. Qualitative studies exploring barriers to applying nutritional knowledge in urban settings may also yield valuable insights. Such evidence is essential to guide integrated, multisectoral stunting prevention strategies that move beyond behavior change alone and address the broader structural determinants of child undernutrition in urban areas.

Implications for Local Policy and Practice

The findings of this study have important implications for stunting prevention in Bogor City. While maternal education and behavior-focused interventions remain valuable, they should be complemented by broader strategies addressing socioeconomic conditions, food access, sanitation, and the quality of health services. Local stunting reduction programs should integrate nutrition education with social assistance, environmental health improvements, and strengthened primary health care. Future research in urban areas of Bogor City should adopt analytical designs to examine the interaction between maternal factors and structural determinants of stunting. Such evidence is essential to support more targeted, context-specific, and sustainable prevention strategies at the city level.

CONCLUSIONS

This study found that most mothers of stunted toddlers in Gunung Batu Village were in the productive age group, had completed senior high school or vocational education, and were predominantly housewives. The majority demonstrated fairly good levels of knowledge, attitudes, and practices related to toddler nutrition. Nevertheless, all toddlers in the sample were classified as stunted. These findings suggest that adequate maternal knowledge, attitudes, and practices alone are not sufficient to prevent stunting. The results underscore the need for further analytical research incorporating a broader range of variables to better understand the factors associated with stunting in urban areas of Bogor City. Such evidence is essential to inform the development of comprehensive, context-appropriate, and sustainable stunting prevention strategies.

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