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Determinants of stunting in urban and rural areas of Indonesia: A systematic review

Determinan stunting berdasarkan wilayah perkotaan dan pedesaan di Indonesia: Tinjauan literatur sistematik

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Abstract

Stunting, a chronic form of undernutrition, is linked to impaired growth, delayed cognitive development, and adverse health and economic outcomes across the life course. Environmental, socioeconomic, and behavioral variations between urban and rural settings contribute differently to stunting risk, although the evidence remains fragmented. This study systematically reviewed the determinants of stunting in urban and rural Indonesia to provide a comprehensive and contextual understanding. The review followed the PRISMA guidelines, with searches conducted in PubMed, Scopus, and Web of Science restricted to the past ten years. The methodological quality of the eligible studies was appraised using the Joanna Briggs Institute (JBI) Critical Appraisal Tools. From 659 initial records, 11 studies met the inclusion criteria: 4 focused on urban settings, 4 on rural settings, and 3 covered both. The prevalence of stunting in rural areas of Indonesia reached 53,3%, compared to 34,9% in urban areas. Rural stunting is primarily associated with structural and service-related limitations, including inadequate health services, sanitation, and maternal education. In contrast, urban stunting was more strongly associated with behavioral factors, particularly unhealthy dietary practices such as excessive snack consumption. These findings highlight the need for context-specific interventions, prioritizing structural improvements in rural areas and promoting healthier dietary behaviors in urban areas.

Keywords: Determinants of malnutrition, public health nutrition, stunting, urban–rural disparities

Abstrak

Stunting merupakan malnutrisi kronis, berkaitan dengan keterlambatan pertumbuhan fisik dan perkembangan kognitif, serta dampak kesehatan dan ekonomi yang merugikan sepanjang siklus kehidupan. Variasi lingkungan, sosial-ekonomi, dan perilaku antara wilayah perkotaan dan pedesaan memberikan kontribusi yang berbeda terhadap risiko stunting, meskipun bukti yang tersedia masih terfragmentasi. Penelitian ini meninjau secara sistematis determinan stunting di wilayah perkotaan dan pedesaan di Indonesia untuk memberikan pemahaman yang lebih komprehensif dan kontekstual. Tinjauan dilakukan berdasarkan pedoman PRISMA dengan pencarian literatur pada basis data PubMed, Scopus, dan Web of Science, terbatas pada publikasi sepuluh tahun terakhir. Kualitas metodologis artikel yang memenuhi kriteria inklusi dinilai menggunakan *Joanna Briggs Institute (JBI) Critical Appraisal Tools*. Dari 659 artikel yang diidentifikasi, 11 artikel memenuhi kriteria: 4 berfokus pada wilayah perkotaan, 4 pada pedesaan, dan 3 mencakup keduanya. Prevalensi stunting di wilayah pedesaan Indonesia mencapai 53,3% dibandingkan 34,9% di wilayah perkotaan. Stunting di pedesaan terutama dipengaruhi oleh keterbatasan struktural dan layanan, termasuk keterbatasan layanan kesehatan, sanitasi, dan pendidikan ibu. Sebaliknya, stunting di perkotaan lebih banyak dipengaruhi oleh faktor perilaku, khususnya praktik makan yang tidak sehat seperti konsumsi jajanan berlebihan. Temuan ini menegaskan pentingnya intervensi yang

kontekstual, dengan memprioritaskan perbaikan struktural di pedesaan serta mendorong perilaku makan sehat di perkotaan

Kata Kunci: Determinan malnutrisi, disparitas urban–rural, gizi masyarakat, stunting

Introduction

The success of a country's development is measured by the quality of the nutritional status of its human resources, according to Sustainable Development Goals (SDGs) 2,2, which aims to eliminate all form of malnutrition and ensure adequate nutrition, particularly among vulnerable groups (Badan Kebijakan Pembangunan Kesehatan, 2023). Despite global progress, stunting remains a major concern, with a prevalence projected to remain above the 2030 target of 13,5% (UNICEF et al., 2023). In Indonesia, the issue is equally pressing, as national prevalence rates remain higher than the reduction targets set in the National Medium-Term Development Plan, highlighting a persistent gap between policy aspirations and actual achievements (Peraturan Presiden Republik Indonesia Nomor 12 Tahun 2025 Tentang Rencana Pembangunan Jangka Menengah Nasional Tahun 2025-2029, 2025). The national target of achieving a stunting prevalence of 14,2% by 2029 is still far from realization, as the Indonesian Nutritional Status Survey 2024 recorded a prevalence of 19,8% (Kementrian Kesehatan RI, 2025). The magnitude of stunting in Indonesia is of great concern; therefore, the problem of stunting is a matter of great focus in prevention and control both nationally and regionally by identifying its determinants.

Stunting, defined as a height-for-age below −2SD, reflects long-term growth and developmental impairment caused by chronic undernutrition and repeated infections (Atamou et al., 2023). Its consequences are far-reaching, including delayed physical and cognitive development, reduced productivity, and increased vulnerability to noncommunicable diseases (Haq et al., 2022; Rohloff & Flom, 2023). According to the WHO framework, the determinants of stunting are maternal and household factors, inadequate feeding practices, food insecurity, and exposure to infections (Stewart et al., 2013). National data similarly emphasize the role of maternal nutrition, frequency of antenatal care, exclusive breastfeeding, and access to hygiene facilities (Badan Kebijakan Pembangunan Kesehatan, 2023).

Beyond these established determinants, evidence suggests that geographical disparities, particularly between urban and rural areas, play a critical role in shaping stunting outcomes (Gusnedi et al. 2023; Tadesse et al. 2023). Several studies in Indonesia indicate that children living in rural areas have a significantly higher risk of stunting than those in urban settings, with prevalence rates up to 53,3% in rural areas versus 34,9% in urban areas, and rural toddlers are about 1.7 times more likely to be stunted (Beal et al., 2018; Nursanyoto et al., 2023; Widyaningsih et al., 2022a). Toddlers in rural areas are more vulnerable, primarily because of inequities in food availability and accessibility, which limit the fulfillment of nutritional needs during both pregnancy and early childhood (Ali et al., 2019; Widyaningsih et al., 2022). In addition, disparities in maternal behavioral factors are associated with lower education levels and access to information on child-feeding practices in rural areas (Simbolon et al., 2024; Tadesse et al., 2023). Conversely, urban areas demonstrate more diverse food consumption patterns, up to 22% higher, driven by greater food access and stronger purchasing power (Kolliesuah et al., 2023).

Although these disparities have been recognized, systematic evidence on the differences in the determinants of stunting between urban and rural Indonesia remains limited. This review aimed to examine and compare the determinants of stunting across these settings to provide a clearer understanding that can inform more targeted and effective public health nutrition interventions.

Methods

Study Design

This study is a systematic literature review that identifies and synthesizes evidence on the determinants of stunting in Indonesia categorized by rural and urban areas. The review followed the PRISMA 2020 guidelines (Figure 1) and was not registered in the PROSPERO.

Search Strategy

A systematic literature search was conducted in PubMed, Scopus, and Web of Science databases for articles published between January 1, 2015, and February 12, 2025. The following search terms were used: ("stunting" OR "stunted" OR "linear growth") AND ("Indonesia") AND ("determinant" OR "factor") AND ("urban" OR "perkotaan" OR "rural" OR "pedesaan").

Selection Process

The inclusion criteria were: 1) quantitative studies using primary or secondary data; 2) reports of statistical associations between potential determinants and stunting prevalence in children between the ages of 0-59 months; 3) conducted in Indonesia; 4) published in English or Indonesian; and 5) the study site was clearly described and classified as rural or urban in accordance with the Central Statistics Agency Regulation No. 120/2020 on the classification of villages in Indonesia. The exclusion criteria were as follows: 1) non-report publications (theses and dissertations) and 2) articles that did not have full-text access.

Data Extraction

Eligible studies were imported to the Covidence application to facilitate reference management and data extraction. Extracted information included the study design, population, setting, determinants assessed, and key findings. Screening and eligibility assessments were independently conducted by three reviewers (the first author and two supervisors). Discrepancies were resolved through discussion until a consensus was reached.

Quality Assessment

The methodological quality of each study was evaluated using the Joanna Briggs Institute (JBI) Critical Appraisal Tools, applying the 8-item checklist for cross-sectional studies and the 10-item checklist for case-control studies. Assessments were independently conducted by two reviewers, and discrepancies were resolved through consensus. Inter-rater agreement was discussed, but not formally quantified.

Data Synthesis

The findings were synthesized using narrative synthesis with thematic grouping according to the WHO conceptual framework of stunting determinants and contextualized within the urban–rural classification.

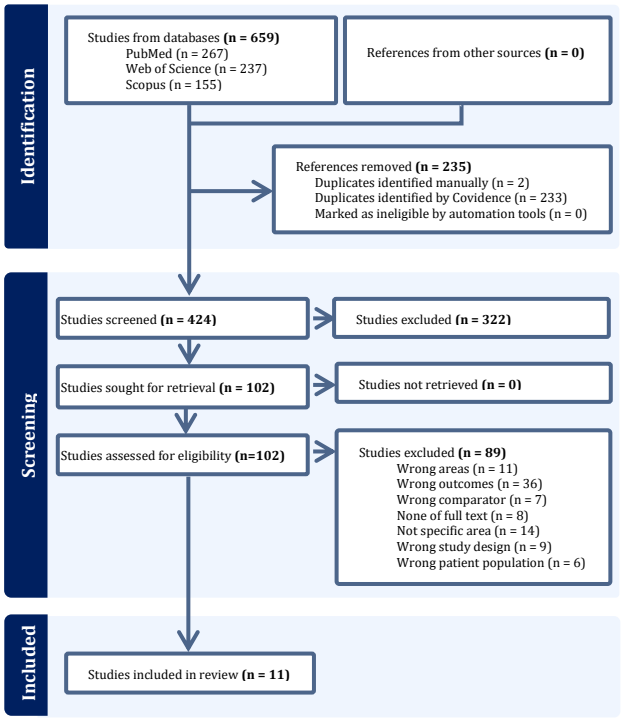

Figure 1. Flow diagram of the process to identify and screen included studies (PRISMA)

Result and Discussion

A total of 659 articles were identified using Scopus, Web of Science, and PubMed. After screening and applying the inclusion criteria, 11 studies were included in the review, four focused on urban areas, four on rural areas, and three compared both. Ten studies employed cross-sectional designs, and three used case-control methods. Quality appraisal using the JBI tools indicated that all articles met acceptable methodological standards.

The reviewed studies examined various stunting determinants, categorized into child-related factors (sex, birth weight, exclusive breastfeeding, feeding practices, immunization history, infection history, vitamin A consumption, age, and childbirth history), maternal factors (education, pregnancy status, ANC visits, and birthplace), socioeconomic conditions (economic status, caregiver and family members, access to health facilities), and environmental sanitation.

Table 4. Summary article review

Author (years)	Location	Sample	Result
Hermawan et al., 2023	Sub District of Way Gubak and Karang Maritim in Bandar Lampung (Urban)	262 under-five children	Not exclusive breastfeeding (OR = 3,57, p = 0,002) not consuming vitamin A (OR = 17,5, p = 0,001) incomplete basic immunization (OR = 5,57, p = 0,001), unplanned pregnancy (OR = 10,55, p = 0,001), and irregular ANC visits <4 times (OR = 4,97, p = 0,001)
Kusumajaya, Mubasyiroh, et al.,2023	Bali (Urban)	846 children aged 0-59 months	Maternal education level (p = 0,002), ANC history (p = 0,042), extended family (p = 0,024), low maternal education (aOR = 1,92; 95% CI: 1,24–2,97), lack of extended family support (aOR = 1,55; 95% CI: 1,07–2,26), History of never being weighed (aOR = 0,40; CI 95%: 0,18-0,85)
Permatasari, Chairunnisa, et al., 2023	Central Jakarta, North Jakarta, and East Jakarta (Urban)	460 children aged 0-59 months	Low family income (OR = 1,832; 95% CI: 1,187–2,830, p = 0,008), low birth weight (OR = 2,130; 95% CI: 1,111–4,086, p = 0,032), incomplete immunization history (OR = 1,890; 95% CI: 1,150–3,107, p = 0,016), and unbalanced nutrition practice (OR = 1,976; 95% CI: 1,263–3,093, p = 0,004)
Rahman et al., 2017	Petobo village in Palu, Central Sulawesi (Urban)	144 children aged 7-24 months (case: 36 stunting; 108 non-stunting)	Family income <1,650,000 (OR = 6,24; 95% CI: 2,37–16,39, p = 0,000), not exclusively breastfeeding (OR = 4,33; 95% CI: 1,67–11,27, p = 0,002), and low environmental sanitation (OR = 4,60; 95% CI: 1,74–12,21, p = 0,001)
Hadi et al., 2021	14 villages in rural Eastern Indonesia	408 children aged 6–24 months	Sex (Male): OR = 1,5 (95% CI: 0,98–2,33), Exclusive breastfeeding: OR = 0,82 (95% CI: 0,52–1,30), Age <12 months: OR = 0,20 (95% CI: 0,13–0,33), Cared by biological mother: OR = 0,38 (95% CI: 0,14–1,03), Low household expenditure: OR =1,66 (95% CI: 0,96–2,91)
Novianti et al., 2023	Ciawi Public Health Center, Tasikmalaya, West Java (Rural)	212 children aged 6-23 months (case: 106 stunting; 106 non-stunting)	Lack of sanitation facilities (OR = 5,4, p = 0,028), and inappropriate feeding practices (OR = 0,557, p = 0,037), with multivariate analysis showing these factors predict 22% of stunting cases
Nursanyoto et al., 2023	Rural area in Bali	529 children under 5	Children weighed less than eight times per year (OR = 2,03; 95% CI: 1,00–4,13, p = 0,05)
Sartika et al., 2021	Sambas, West Kalimantan (Rural)	559 children aged 0-11 months	Low birth weight (p = 0,001), child age (p = 0,013), diarrhea (p = 0,001), complete immunization coverage (p = 0,040), income per capita below the median (p = 0,023), Low birth weight <2500g (aOR = 4,12; 95% CI: 1,71–9,91, p = 0,002), diarrhea in the last 2 weeks (aOR = 3,28; 95% CI: 1,61–6,65, p = 0,001), and

			incomplete immunization (aOR = 2,43; 95% CI: 1,03–5,76, p = 0,043), Multivariable analysis incomplete immunization (aOR = 2,65; 95% CI: 1,14–6,18) as significant predictors of stunting
Siramaneerat et al., 2024	Urban and rural areas of 13 provinces in Indonesia	2,428 children aged 24-59 months	General risk factors: Age of the child (OR = 0,978; 95% CI: 0,969–0,987, p < 0,001), birth weight 2,5–3,99 kg had a 50% lower stunting risk compared to <2,5 kg (OR = 0,495; 95% CI: 0,364–0,671, p < 0,001) Urban areas: Increasing child age (OR = 0,973; 95% CI: 0,962–0,985), increasing maternal age (OR = 0,967; 95% CI: 0,946–0,989), and births in community health centers had higher stunting risk than hospitals (OR = 2,328; 95% CI: 1,568–3,454) Rural areas: Increasing child age (OR = 0,986; 95% CI: 0,974–0,999), and birth weight 2,5–3,99 kg had lower stunting risk (OR = 0,497; 95% CI: 0,331–0,749)
Siswati et al., 2022	Urban and rural areas in Indonesia	38,246 children aged 0-59 months	General risk factor: Low economic status (aOR = 1,42; 95% CI: 1,28–1,57, p < 0,001) Rural areas: Poor WASH conditions increased the risk of severe stunting (aOR = 1,45; 95% CI: 1,12–1,87, p = 0,003), and families with more than nine members had higher risk (aOR = 1,66; 95% CI: 1,07–2,56, p = 0,024) Urban areas: Having more than three children increased the risk of severe stunting (aOR = 1,64; 95% CI: 1,27–2,13, p = 0,001)
Widyaningsih et al., 2022	13 provinces in Indonesia (Urban and rural)	3,887 children aged 0-59 months	Urban areas: Consumption of unhealthy snacks contributed to 31,70% of stunting cases, and low birth weight accounted for 11,45% of the risk Rural areas: Low maternal education was the main contributing factor to stunting (20,83%), while poor sanitation was the primary cause of infection (12,11%). Access to health and nutrition services was also limited and difficult to reach (34,19%)

Table 5. Synthesis of Determinants of Stunting by Urban and Rural

Category of determinant	Urban area	Rural area	Synthesis Findings
Child factor			
Sex	No relationship	Sex (Male) - OR = 1,5	Rural only (Limited evidence)
Birth weight	Low birth weight - OR = 2,130, p = 0,032 - Low birth weight accounted for 11,45% of the risk	Low birth weight <2500g - aOR = 4,12, p = 0,002 - Birth weight 2,5–3,99 kg - OR = 0,497	Consistent: LBW increases risk, stronger effect in rural (Strong evidence)
Exclusive breastfeeding	Not exclusive breastfeeding - OR = 3,57, p = 0,002	Exclusive breastfeeding - OR = 0,82	Stronger association in urban areas

	- OR = 4,33, p = 0,002		(Moderate evidence)
Feeding practices	Unbalanced nutrition practice - OR = 1,976, p = 0,004) Consumption of unhealthy snacks contributed to 31,70% of stunting cases	Inappropriate feeding practices - OR = 0,557, p = 0,037	Significant in both settings (Strong evidence)
Immunization history	Incomplete immunization - OR = 5,57, p = 0,001 - OR = 1,890, p = 0,016	Incomplete immunization - aOR = 2,65	Consistent across settings: stronger effect in urban (Strong evidence)
Vitamin A consumption	Not consuming vitamin A - OR = 17,5, p = 0,001),	No relationship	Urban only (Limited evidence)
Age	Increasing child age - OR = 0,973	Age <12 months - OR = 0,20 (95% CI: 0,13–0,33), Increasing child age - OR = 0,986	Protective direction in both (Moderate evidence)
Infection history	None of the included studies reported this determinant in urban settings	Diarrhea in the last 2 weeks - aOR = 3,28, p = 0,001	Rural only (Limited evidence)
Child weighing history	History of never being weighed - aOR = 0,40	Children are weighed less than eight times per year - OR = 2,03, p = 0,05	Inconsistent: rural under-weighing more risk, urban estimate inverse (Limited evidence)
Maternal Factor			
Education	Low maternal education - aOR = 1,92	Low maternal education was the main contributing factor to stunting 20,83%	Consistently associated (Strong evidence)
Pregnancy status	Unplanned pregnancy - OR = 10,55, p = 0,001),	No relationship	Urban only (Limited evidence)
ANC visits	Irregular ANC visits <4 times - OR = 4,97, p = 0,001 - p = 0,042	No relationship	Urban only (Limited evidence)
Birth place	Births in community health centers had a higher stunting risk than hospitals - OR = 2,328	No relationship	Urban only (Limited evidence)
Socioeconomic conditions			
Economic status	Low family income - OR = 1,832, p = 0,008 - OR = 6,24, p = 0,000	Low household expenditure - OR =1,66	Consistent in both settings (Strong evidence)
Caregiver and family members	Lack of extended family support - aOR = 1,55 Having more than three children increased the risk of severe stunting - aOR = 1,64, p = 0,001)	Cared for by biological mother - OR = 0,38 Families with more than nine members had a higher risk - aOR = 1,66, p = 0,024)	Both settings, different forms (Moderate evidence)
Access to health facilities	No relationship	Access to health and nutrition services was also	Rural only barrier (Strong evidence)

		limited and difficult to reach (34,19%)	
Environmental sanitation	Low environmental sanitation - OR = 4,60, p = 0,001)	Lack of sanitation facilities - OR = 5,4, p = 0,028 Poor WASH conditions increased the risk of severe stunting - aOR = 1,45, p = 0,003 - while poor sanitation was the primary cause of infection (12,11%)	Consistent: stronger in rural areas (Strong evidence)

Stunting is a condition of failure to grow, which is identified from the measurement of height/length and age of children with z-score values ≤ -2 standard deviations (Peraturan Mentri Kesehatan Republik Indonesia Nomor 2 Tahun 2020 Tentang Standar Antropometri Anak, 2020; World Health Organization, 2024). The cause of stunting is often preceded by inadequate weight gain or weight faltering; if not optimally intervened, it will inhibit the linear growth rate in children because the body will focus on maintaining its condition and manifest as chronic malnutrition (Keputusan Menteri Kesehatan Republik Indonesia Nomor HK.01.07/MENKES/1928/2022 Tentang Pedoman Nasional Pelayanan Kedokteran Tata Laksana Stunting, 2022). In addition, stunting is associated with inadequate psychosocial stimulation (World Health Organization 2024). Stunting is a chronic malnutrition caused by multifactorial interactions (Rosenstock & Yet, 2024; Verma & Prasad, 2021).

According to the WHO framework, stunting is primarily caused by inadequate complementary feeding, lack of exclusive breastfeeding, infectious diseases, and maternal or household factors, with indirect influences from political, economic, educational, sociocultural, health, and environmental factors (de Onis et al., 2013; Goudet et al., 2019; Stewart et al., 2013). A systematic review conducted by Beal et al. (2018), which utilized the WHO conceptual framework, identified several key determinants of stunting in Indonesia. The identified risk factors include male sex, preterm birth, lack of exclusive breastfeeding, short maternal stature, low maternal educational attainment, low household socioeconomic status, residence in households with unimproved sanitation and untreated drinking water, limited access to healthcare services, and rural residence (Beal et al., 2018).

Most studies have shown that stunting is more common in rural areas than in urban areas (Siramaneerat et al., 2024; Siswati et al., 2022). This is associated with the availability and access to both food and services, as well as the gap in education levels, which has an impact on the knowledge, attitudes, and behavior of mothers and families (Simbolon et al., 2024; Tadesse et al., 2023; Widyaningsih et al., 2022). The following is the relationship between factors influencing the incidence of stunting in both rural and urban areas based on the literature review.

Child Factor

Sex

Sex was often associated with the incidence of stunting. The results showed that the sex of the children in urban areas had no relationship with the incidence of stunting. Likewise, in the scope of rural areas, most of them show that there is no relationship sex with the incidence of stunting (Nursanyoto et al., 2023; Sartika et al., 2021).

However, there are studies in rural areas with children aged 6-24 months that show an association between the risk of stunting 1.5 times higher in boys than girls, with an OR = 1,5; 95%CI = 0,98-2,33 (Hadi et al., 2021). Boys are more susceptible to stunting due to their faster growth, higher energy needs, early complementary feeding, and weaker immunity influenced by testosterone. In contrast, girls' slower growth, greater fat reserves, and stronger immune systems offer protection against malnutrition and infections (Thompson, 2021).

Birth Weight

In urban areas, research shows a relationship between birth weight and stunting incidence

with a 2,13 times higher risk in children with a birth weight of <2500 grams of becoming stunted (Permatasari et al., 2023). The same in rural areas, which shows a risk of 4,12 times greater stunting if the child has a history of low birth weight (Sartika et al., 2021). The results of a study by Widyaningsih et al (2022) comparing areas, found that children in urban areas who were born with a low birth weight were more at risk of stunting, which contributed 11.45% to the difference in stunting between urban and rural areas (Widyaningsih et al., 2022b).

Based on research, children born > 2500 g have an underdeveloped digestive system that affects the ability to absorb the nutrients ingested and impacts the child's non-optimal growth and development (Siramaneerat et al., 2024).

Exclusive breastfeeding

Children living in urban areas are 2,28 to 14,2 times more likely to be stunted (Hermawan et al., 2023). In addition, if the determinants of exclusive breastfeeding are adjusted for other factors, the risk of becoming stunted is 4,33 times higher (Rahman et al., 2017). Among children in rural areas, exclusive breastfeeding was associated with 18% lower odds of stunting (OR = 0,82), suggesting a protective effect, although this association was not statistically significant (95% CI: 0,52–1,30) (Hadi et al., 2021).

Breast milk contains nutrients and antibodies and can be absorbed in the baby's body more easily, making it very useful in supporting the growth and immunity of children and preventing stunting (Hermawan et al., 2023; Rahman et al., 2017). Exclusive breastfeeding positively contributes to maternal and infant psychological well-being by enhancing physical closeness and emotional bonding during the feeding process.

Immunization History

Immunization for toddlers is a mandatory program from the Indonesian government adjusted to the child's age; therefore, immunization status is categorized as complete (Peraturan Menteri Kesehatan Republik Indonesia Nomor 12 Tahun 2017 Tentang Penyelenggaraan Imunisasi, 2017). Based on research by Hermawan et al. (2023) conducted in urban areas, immunization status has already been linked to stunting and in this case, children not receiving basic immunizations are 5,57 times more likely to suffer from stunted growth (Hermawan et al., 2023). In addition, the risk is great after adjusting for other determinants the chance of children becoming stunted is 2,3 times greater if the basic immunization is incomplete (Permatasari et al., 2023).

Meanwhile, research conducted in rural areas with a population of children aged 0-11 months, children are 1,92 times more likely to become stunted compared to children who have received complete basic immunizations (Sartika et al., 2021). Immunization aims to increase immunity against a disease so that it can reduce the impact of the disease and protect children from infectious diseases, thus reducing the risk of stunting (Hermawan et al., 2023).

Vitamin A Consumption

Research has shown the relationship between vitamin A consumption and stunting incidence, particularly in urban areas, with a 17,5 times greater risk of stunting if children do not consume vitamin A (Hermawan et al., 2023). It is different in rural areas, which do not show a relationship between vitamin A consumption and stunting incidence (Nursanyoto, Kusumajaya, Mubasyiroh, Sudikno, et al., 2023; Sartika et al., 2021).

However, vitamin A is very important in improving the child's immune system, so that it is not susceptible to recurrent infectious diseases, which are the direct cause of stunting events (Hermawan et al., 2023).

Age

Based on research conducted in urban areas, only one study has shown a relationship between child age and stunting (Siramaneerat et al., 2024). This is another case of research conducted in rural areas that mostly shows a relationship between age and stunting incidence (Hadi et al., 2021; Sartika et al., 2021).

Thus, the findings show that the age of the children has a high contribution to stunting. This shows that stunting is more common in older children because it occurs when toddlers experience malnutrition during the first 1000 days of life, so the assumption is that stunting begins to appear when the baby is two years old. It is also associated with an increase in children's nutritional needs as they grow owing

to increased physical activity (Hadi et al., 2021; Sartika et al., 2021; Siramaneerat et al., 2024).

History of Infection

Studies have shown that a history of infection is related to the incidence of stunting in rural areas (Sartika et al., 2021). Infections in rural areas are primarily attributed to poor sanitation, which contributes to 12,11% of the cases (Widyaningsih et al., 2022b). Infectious diseases are a direct cause of nutritional status, and diseases such as diarrhea contribute to the incidence of stunting by disrupting the absorption of nutrients and electrolytes, especially zinc, which is essential for the growth of toddlers and causes growth regression (Mutiarasari et al., 2021).

Infection interferes with nutritional status through decreased appetite, impaired intestinal absorption, and increased catabolism, and nutritional direction is maximized for immunity and not to support growth (de Onis & Branca, 2016; Campisi et al., 2017).

Child Weighing History

The history of child growth monitoring is associated with the incidence of stunting in rural settings and is inconsistent in urban settings. Monthly weighing as a growth monitoring of children less than eight times a year increases the risk of stunting by 2.03 times, and analysis of the Population Attributable Fraction (PAF) shows that 3,5% of stunting cases can be prevented by monthly weighing in rural areas (Nursanyoto et al., 2023).

Child weighing aims to monitor growth patterns as a preventive measure against stunting, particularly in LMICs where the burden of undernutrition remains high (Kusumajaya et al., 2023). The monthly weighing of toddlers is effective and important to prevent stunting by monitoring growth, educating families, and ensuring access to primary health services if a child's growth and development disorders are detected.

Child Feeding Practices and Eating Habits

Nutritional imbalance in young children, such as age-inappropriate feeding, limited dietary diversity, and inadequate intake, have been shown to contribute to growth faltering (Permatasari et al., 2023). Evidence from both urban and rural contexts has consistently demonstrated an association between feeding practices and stunting, although the underlying mechanisms differ. In rural areas, appropriate feeding practices have been found to reduce the risk of stunting by 44,3% (OR = 0,557) (Novianti et al., 2023). Nonetheless, these practices are often constrained by low dietary diversity, cultural beliefs, economic limitations, and restricted access to nutrient-rich foods, which increases the risk of stunting (Astuti et al., 2024; Mandara et al., 2024). Similar patterns have been observed in other LMICs, where inadequate access to animal-source foods and micronutrients results in diets dominated by staple grains (Choudhury et al., 2025; Jubayer et al., 2023).

Conversely, in urban settings, the primary challenge relates to ongoing nutritional transitions. Children's diets are increasingly characterized by frequent consumption of unhealthy snack foods high in sugar, salt, and fat, which displace nutrient-dense foods and lower the overall diet quality, thereby contributing to stunting (Supadmi et al., 2024; Widyaningsih et al., 2022b). This transition is reinforced by aggressive food marketing, shifting cultural norms, and time constraints among working mothers, which drive greater reliance on processed and convenient foods (Pries et al. 2019; Supadmi et al. 2024).

Maternal Factors

Mother's Education

Most research conducted in urban areas shows that maternal education correlates with the incidence of stunting in children, with a 1.92 times higher risk of stunting if the mother has low education (Kusumajaya et al., 2023).

However, Widyaningsih et al. (2022), who compared urban and rural areas, showed that low maternal education is the main factor that causes stunting in rural areas (20,83%). Maternal education plays an important role in children's nutritional status, and educated mothers tend to have a better understanding of hygiene, nutrition, and childcare (Kusumajaya et al., 2023). Higher levels of education improve health literacy, disease recognition skills, and access to nutritional information and health services, which contribute to preventing stunting (Hermawan et al., 2023). The difference between urban and rural areas shows that mothers in urban areas have more access to

education, health information, and economic resources; therefore, their children are better protected from stunting than those living in rural areas (Widyaningsih et al., 2022b).

Furthermore, maternal nutritional knowledge influences household dietary diversity because mothers with a greater understanding of nutrition are more inclined to offer well-balanced and nutrient-rich meals.

Pregnancy Status

Based on the results of research conducted in rural areas, there is no relationship between pregnancy status and stunting incidence (Nursanyoto, Kusumajaya, Mubasyiroh, Sudikno, et al., 2023). In urban areas, there is a significant relationship with the risk of having a stunted child, 10.55 times greater if the pregnancy status is undesirable (Hermawan et al., 2023).

Pregnancy planning is one of the factors that ensure that a mother is physically and psychologically prepared to meet the demands of pregnancy. However, when a pregnancy is unplanned, the mother is prone to experiencing health problems because of the absence of follow-up treatment and the desire to terminate the pregnancy, which can significantly affect fetal growth (Hermawan et al., 2023). An unwanted pregnancy will lead to unpreparedness for the provision of nutrition and exclusive breastfeeding (Santosa et al., 2022).

Antenatal Care History (ANC)

Based on several studies conducted in urban and rural areas, only urban areas show a relationship between maternal ANC history and stunting incidence (Hermawan et al., 2023; Kusumajaya, Sudikno, et al., 2023). Meanwhile, research conducted in rural areas has not shown a significant relationship.

However, the frequency and regularity of antenatal care (ANC) visits, along with adherence to ANC service standards, are significantly associated with stunting prevention, as they help in the early detection and management of various pregnancy-related problems (Hermawan et al., 2023). Extensive antenatal care coverage plays a critical role in improving maternal health and nutritional status while also supporting optimal fetal growth and development. Evidence from studies conducted in several low- and middle-income countries (LMICs) indicates that mothers who attend at least four antenatal care visits (ANC4+) and have at least one visit with a skilled healthcare professional are associated with a lower risk of stunting (Vaivada et al., 2020).

Birthplace

Based on a study that examined multilevel stunting determinants in urban and rural areas, it was shown that children born in community health centers in urban areas had a much higher likelihood of stunting 2,32 times (95% CI: 1,568–3,454) than children born in hospitals (Siramaneerat et al., 2024). The gap in prenatal services between community health centers and home and hospital deliveries is associated with an increased risk of stunting.

Limited access to health services, lack of resources, and poor hygiene and sanitation standards increase exposure to infections and growth disorders in infants. In addition, the varying skills of healthcare workers in dealing with labor complications can exacerbate the risk of adverse births. Delays in access to medical interventions in babies born outside the hospital further increase the likelihood of stunting (Siramaneerat et al. 2024).

Socioeconomic and Family Factors

Caregivers and Family Members

The presence of other family members has a beneficial effect on preventing stunting. Families, particularly those with multiple dependents, can contribute significantly to childcare, especially in caring for infants and young children. In households with three or more dependents, including children under five, the incidence of stunting tends to be lower, likely due to more shared responsibilities and resources for childcare and nutrition (Kusumajaya et al., 2023). Based on research conducted in urban areas, there is no relationship between the number of family members and the incidence of stunting (48,49,62).

Meanwhile, in rural areas, if the number of family members is more than nine, the risk of stunting increases (aOR = 1,66 (95% CI: 1,07–2,56, p = 0.024) (Siswati et al., 2022). Households in urban areas with more than three children increased the risk of severe stunting (AOR = 1,64 (95% CI: 1,27–2,13, p = 0,001) (Siswati et al., 2022). Research by Hadi et al.

(2021) shows that children cared for by their biological mothers are 2,5 times less likely to experience stunting, as they are more likely to receive exclusive breastfeeding than those cared for by other household members (Hadi et al., 2021).

Economic Status (Family Income and Family Expenditure)

Most studies conducted in both regions show that there is a relationship between economic status, family income, and stunting incidence (Permatasari et al., 2023; Rahman et al., 2017; Sartika et al., 2021). The level of risk in urban areas is 6,24 if they have an income below 1.650.000 rupiah (Rahman et al., 2017). times higher in rural areas, the chance is 1,68 times more risky (Sartika et al., 2021). Low income restricts access to protein and micronutrient-rich foods, which impacts child growth and increases the risk of stunting (Sartika et al., 2021). A rural study found that stunting risk was the highest among children in middle-expenditure households, while those in the lowest quintile relied more on breastfeeding, and the highest quintile had better access to protein-rich foods (Hadi et al., 2021).

In contrast, studies in urban areas indicate that stunting is more prevalent among high-income families, largely due to parental employment and reliance on alternative caregivers, which may compromise the quality of child-feeding practices (Permatasari et al., 2023). Moreover, the urban nutrition transition has shifted dietary patterns, higher socioeconomic status, greater purchasing power, increasing access to energy-dense snacks, displacing nutrient-rich foods, and contributing to stunting (Supadmi et al., 2024; Widyaningsih et al., 2022b).

Access to Health Facilities

A study comparing the determinants of stunting in urban and rural areas found that access to health and nutrition services in rural areas is limited and often difficult to reach (Widyaningsih et al., 2022b), which is concerning given that most children under five reside in rural areas where access to health facilities remains highly constrained. Multivariate logistic analysis revealed that children residing in urban areas are less likely to experience stunting than their rural counterparts, primarily due to improved access to healthcare services, sanitation, and other essential resources in urban settings (Siramaneerat et al., 2024).

Environmental Factors

Environmental Sanitation

Environmental sanitation influences the health and nutritional status of individuals. Research shows that there is a relationship between environmental sanitation and the incidence of stunting among toddlers in urban and rural areas (Rahman et al., 2017; Siti Novianti et al., 2023). Poor sanitation in rural areas has a 5,4 times greater risk for stunted children (Novianti et al., 2023). Meanwhile, studies conducted in urban areas showed a 4,6 times higher risk after adjusting for other determinants (Rahman et al., 2017). In addition, based on research that compares determinants that occur in urban and rural areas, sanitation conditions only appear as determinants in rural areas, with the results of research on whether poor water and sanitation conditions (WASH) increase the risk of stunting (AOR = 1,45 (95% CI: 1,12–1,87, p = 0,003) (Siswati et al., 2022).

Children living in environments with inadequate sanitation are at a higher risk of stunting. Lack of access to clean water and proper sanitation facilities elevates the likelihood of infectious diseases, which diverts the body's energy from growth processes to fighting illness. As a result, the essential nutrients required for growth are poorly absorbed, contributing to stunting. Evidence indicates that poor water, sanitation, and hygiene (WASH) conditions significantly negatively affect child growth and development, not only due to prolonged exposure to enteric pathogens, but also due to broader social and economic factors (Rahman et al., 2017).

Strengths and Limitations

This review has several strengths, including a comprehensive search strategy, adherence to PRISMA guidelines, use of the WHO conceptual framework, application of Indonesia's official rural–urban classification to enhance policy relevance, and critical appraisal using JBI tools. However, limitations such as study heterogeneity, predominance of cross-sectional designs, potential publication bias, language restrictions, and inconsistent reporting of

determinants restrict the causal interpretation. Despite these constraints, this review provides valuable insights into the determinants of stunting and highlights research gaps that warrant further investigation to inform policy development.

Conclusion

This review confirms that stunting remains more prevalent in rural than in urban areas, with determinants varying by context: poor sanitation, limited access to health services, and low maternal education are dominant in rural settings, whereas unhealthy dietary patterns and processed food consumption are key drivers in urban areas. By addressing these objectives, the review advances knowledge by explicitly comparing rural and urban determinants using a standardized framework, thereby providing evidence for context-specific strategies.

Practical implications include strengthening Posyandu quality, sanitation, and maternal nutrition education in rural areas; in urban areas, community-based nutrition education; regulation of processed food marketing; and promotion of primary health service utilization. Embedding these tailored interventions into existing national programs such as *the Gerakan 1000 HPK* and *Program Indonesia Sehat* may enhance the equity and sustainability of stunting reduction efforts in Indonesia.

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