

Maternal and Child Nutrition in the First 1,000 Days: A Narrative Review of Stunting Prevention Strategies

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ABSTRACT

Background: The first 1,000 days, spanning conception to a child's second birthday, represent a critical window during which nutritional deficits can cause irreversible impairment of linear growth, cognitive development, and long-term human capital. Stunting, the principal indicator of chronic undernutrition during this period, continues to affect more than 148 million children under five worldwide, with Indonesia recording a national prevalence of 21.6% in 2022, well above the World Health Organization's public health threshold. This narrative review synthesizes current evidence on the causes, consequences, and evidence-based interventions for stunting prevention within the first 1,000 days, with particular attention to the Indonesian context.

Methods: A non-systematic literature search was conducted in PubMed, the Cochrane Library, and Google Scholar for Lancet series papers, systematic reviews, meta-analyses of randomized controlled trials, and Indonesia-specific epidemiological studies published primarily within the last fifteen years.

Results: Evidence consistently supports a defined package of nutrition-specific interventions, including maternal balanced energy-protein and multiple micronutrient supplementation, promotion of early and exclusive breastfeeding, appropriate complementary feeding, and vitamin A and zinc supplementation, alongside nutrition-sensitive approaches such as water, sanitation, and hygiene improvement, kangaroo mother care, and social protection. In Indonesia, determinants of stunting include nonexclusive breastfeeding, low maternal height and education, household poverty, and inadequate sanitation, compounded by substantial regional disparities.

Conclusion: Sustained reduction of stunting requires the integrated, well-resourced delivery of proven nutrition-specific and nutrition-sensitive interventions throughout the first 1,000 days, accompanied by continued investment in maternal education, sanitation infrastructure, and social protection, particularly in high-burden regions of Indonesia.

Keywords: first 1,000 days; child nutrition; maternal; micronutrient supplementation; stunting prevention

A. BACKGROUND

The period spanning conception through a child's second birthday, commonly referred to as the “first 1,000 days,” represents a unique developmental window during which adequate nutrition, healthcare, and caregiving exert lifelong effects on growth, cognitive development, and disease risk⁽¹⁾. Maternal and child undernutrition during this period remains a major global health burden, contributing to an estimated 2.2 million child deaths and 21% of disability-adjusted life-years among children younger than five years⁽¹⁾. Stunting, defined as height-for-age more than two standard deviations below the World Health Organization growth reference median, is the principal indicator of chronic undernutrition and reflects the cumulative effects of inadequate nutrition, repeated infection, and insufficient psychosocial stimulation beginning in utero⁽¹⁾.

Globally, an estimated 148 million children under five years of age were stunted in 2022, with the highest absolute burden concentrated in South Asia and sub-Saharan Africa⁽²⁾. In Indonesia, the 2022 Indonesian Nutritional Status Survey (Survei Status Gizi Indonesia, SSGI) reported a national stunting prevalence of 21.6%, a marked decline from 37.2% in 2013 but still above the 20% threshold the World Health Organization considers a public health problem of high severity, with provincial prevalence ranging from 12.5% in DKI Jakarta to 35.3% in East Nusa Tenggara⁽³⁾. Beyond its immediate health consequences, stunting is associated with impaired cognitive development, reduced educational attainment, and diminished adult earning potential, with an estimated 200 million children under five years in developing countries failing to reach their developmental potential because of stunting and poverty^(4,5). Given the persistence of stunting as a major public health and economic concern, particularly in Indonesia, an updated synthesis of the evidence base for prevention is warranted.

This narrative review aims to: (1) summarize the global and Indonesian epidemiology of stunting; (2) describe the principal determinants of stunting during the first 1,000 days; (3) synthesize evidence on nutrition-specific and nutrition-sensitive interventions for stunting prevention; and (4) discuss implications for policy and programming in the Indonesian context.

B. METHODS

This article was prepared as a narrative literature review rather than a formal systematic review. A literature search was conducted in PubMed/MEDLINE, the Cochrane Library, and Google Scholar for articles published between 2016 and 2026, using combinations of the keywords “stunting,” “first 1000 days,” “maternal nutrition,” “complementary feeding,”

“micronutrient supplementation,” “breastfeeding,” “water sanitation hygiene,” and “Indonesia.” Priority was given to the Lancet Series on Maternal and Child Undernutrition, Cochrane systematic reviews, large cluster-randomized controlled trials, and Indonesia-specific epidemiological studies using nationally representative survey data. Findings were narratively synthesized and organized around epidemiology, determinants, nutrition-specific interventions, nutrition-sensitive interventions, and the Indonesian policy context, consistent with the scope of a literature-based review article.

C. RESULT AND DISCUSSION

The evidence reviewed here confirms that stunting is a multifactorial condition rooted in maternal undernutrition, suboptimal infant and young child feeding practices, recurrent infection, and household and environmental deprivation, with effects that begin before birth and continue to accumulate through early childhood^(1,6,7).

1. Global and Indonesian Epidemiology of Stunting

Global progress in reducing childhood stunting has been uneven. A reanalysis of 50 low- and middle-income countries found that the prevalence of stunting fell from 32.5% in 2000 to 21.9% in 2017, with more pronounced declines in middle-income than low-income countries, while 4.7% of children in low-income countries remained concurrently affected by both stunting and wasting, a condition associated with a 4.8-fold increase in mortality risk⁽⁶⁾. Notably, recent evidence indicates that stunting and wasting may already be present at birth and that the incidence of both conditions peaks within the first six months of life, reinforcing the importance of maternal nutrition during pregnancy as an entry point for prevention⁽⁶⁾.

Within Indonesia, the prevalence of stunting declined from 37.2% in 2013 to 30.8% in 2018 and further to 21.6% in 2022 according to the SSGI, driven by stronger political commitment and integrated programming across government levels⁽³⁾. Despite this progress, stunting prevalence varies considerably by province and remains classified as a chronic public health problem nationally, with rural areas recording substantially higher prevalence than urban areas in several systematic reviews of Indonesian data^(3,8). A national cross-sectional analysis of the 2023 Indonesia Health Survey, encompassing more than 78,000 children under five years, found a stunting prevalence of 19.69% and identified incomplete immunization status, consumption of water from unimproved sources, and ownership of a social protection card as factors independently associated with higher odds of stunting, alongside marked disparities between eastern and western Indonesia⁽⁹⁾.

2. Determinants of Stunting in the First 1,000 Days

A comprehensive review applying the World Health Organization's conceptual framework on child stunting to the Indonesian context found consistent evidence that nonexclusive breastfeeding during the first six months, low household socioeconomic status, premature birth, short birth length, and low maternal height and education are particularly important determinants of child stunting in Indonesia⁽⁸⁾. Children from households with both unimproved latrines and untreated drinking water were also found to be at increased risk, while community-level factors, particularly poor access to healthcare and rural residence, have been repeatedly associated with stunting across Indonesian studies⁽⁸⁾. These determinants align closely with the broader global evidence base, which identifies maternal undernutrition, inadequate complementary feeding practices, recurrent childhood infection, and household food insecurity as central proximate causes of stunting in low- and middle-income countries^(1,10).

Importantly, linear growth faltering does not cease at 24 months of age. Analysis of 51 nationally representative surveys found that while approximately 70% of the absolute height deficit accumulated by 60 months of age occurs during the first 1,000 days, the remaining 30% continues to accumulate between two and five years of age, indicating that interventions extending beyond the conventional 1,000-day window may be necessary to fully address cumulative growth faltering⁽⁷⁾.

3. Nutrition-Specific Interventions

A defined package of nutrition-specific interventions has been shown to be effective and cost-effective for stunting prevention when delivered at scale^(10,11). During pregnancy, balanced energy-protein supplementation for undernourished women has been shown in a Cochrane review to increase mean birth weight and reduce the risk of small-for-gestational-age birth by approximately 31%⁽¹²⁾. An individual participant data meta-analysis of 17 randomized trials involving more than 112,000 pregnant women found that antenatal multiple micronutrient supplementation containing iron and folic acid reduced the risk of low birth weight, preterm birth, and small-for-gestational-age birth compared with iron-folic acid supplementation alone, with the magnitude of benefit dependent on maternal adherence and iron dosage⁽¹³⁾.

Following birth, kangaroo mother care, comprising early and sustained skin-to-skin contact, exclusive breastfeeding, and early hospital discharge, has been shown in a Cochrane review to substantially reduce mortality, severe infection, and hypothermia among low-birth-weight infants compared with conventional neonatal care, while also supporting early breastfeeding establishment⁽¹⁴⁾. The Lancet Breastfeeding Series found that early initiation and exclusive breastfeeding for the first six months confer protection against child infections and

are associated with increases in measured intelligence, alongside probable reductions in later overweight and diabetes risk, underscoring breastfeeding's role as one of the most cost-effective interventions available for child survival and development⁽¹⁵⁾.

During the complementary feeding period, a systematic review found that nutrition education and counseling of caregivers in food-secure populations improved child linear growth, while the provision of complementary food, with or without education, produced larger gains in food-insecure populations⁽¹⁶⁾. Vitamin A supplementation for children aged six to fifty-nine months has been shown in a Cochrane review to reduce all-cause mortality by approximately 24% and to lower the incidence of diarrhoea, supporting its continued recommendation by the World Health Organization in vitamin A-deficient populations⁽¹⁷⁾. Zinc supplementation has likewise demonstrated benefits for reducing diarrhoeal and respiratory morbidity in children, although its direct effect on linear growth has been more modest and inconsistent across trials⁽¹⁸⁾. Taken together, this well-defined package of nutrition-specific interventions, spanning maternal supplementation, breastfeeding promotion, complementary feeding support, and micronutrient supplementation, has consistently demonstrated effectiveness across diverse settings and remains the cornerstone of stunting prevention programming^(10,11,12-17).

4. Nutrition-Sensitive Interventions

Nutrition-sensitive interventions, which address the underlying and contextual determinants of undernutrition, complement direct nutrition-specific approaches. A Cochrane review of interventions to prevent stunting among children living in urban slums in low- and middle-income countries highlighted the importance of combining nutrition education, food supplementation, and water, sanitation, and hygiene (WASH) improvements to address the unique determinants of undernutrition in dense urban informal settlements⁽¹⁹⁾. However, large cluster-randomized controlled trials in rural Bangladesh and Kenya found that improved household water quality, sanitation, and handwashing interventions, whether delivered alone or in combination with nutritional counseling, did not significantly improve child linear growth or reduce diarrhoea incidence beyond modest effects, despite high intervention adherence, suggesting that household-level WASH improvements alone may be insufficient to overcome environmental enteric dysfunction and growth faltering in high-burden settings^(20,21). These modest and sometimes null effects observed for household-level WASH interventions in large trials illustrate that nutrition-sensitive approaches do not uniformly translate into improved linear growth outcomes, and that the pathways linking environmental conditions to growth

faltering, such as environmental enteric dysfunction, may require more intensive or community-level interventions than household-level water and sanitation upgrades alone^(20,21).

5. Economic and Developmental Consequences of Stunting

Beyond its direct health consequences, stunting carries substantial economic costs across the life course. An influential framework estimated that nutrition interventions to reduce stunting yield benefit-cost ratios ranging from approximately 3.6 to 48 across high-burden countries, reflecting downstream gains in cognitive development, educational attainment, and adult productivity⁽⁵⁾. The Lancet Child Development Series estimated that more than 200 million children under five years in developing countries fail to reach their developmental potential because of poverty, stunting, and inadequate cognitive stimulation, with affected children more likely to perform poorly in school and to have lower adult incomes, perpetuating intergenerational cycles of poverty⁽⁴⁾. These findings reinforce that stunting prevention should be regarded not solely as a health priority but as a strategic investment in national human capital and economic development.

6. Implications for Indonesia

Indonesia's National Strategy for the Acceleration of Stunting Prevention, formalized under Presidential Regulation No. 72 of 2021, has targeted convergent delivery of specific (nutrition-specific) and sensitive (nutrition-sensitive) interventions focused on the period before birth and on children aged 6 to 23 months, in line with global evidence on the first 1,000 days⁽³⁾. A literature review of the program's specific nutritional interventions concluded that components such as iron-folic acid and micronutrient powder supplementation, breastfeeding promotion, and growth monitoring have contributed to measurable reductions in stunting prevalence, although implementation gaps persist across provinces with greater poverty and weaker health system capacity⁽²²⁾. Given the documented role of household sanitation, maternal education, and social protection coverage as determinants of stunting in Indonesia, continued progress will likely depend on sustained multisectoral coordination that extends beyond the health sector to encompass water and sanitation infrastructure, education, and social protection programming, particularly in provinces with persistently high prevalence such as East Nusa Tenggara^(3,8,9).

The Indonesian experience illustrates both the promise and the limitations of current approaches. The substantial decline in national stunting prevalence over the past decade reflects meaningful progress attributable to political commitment and program scale-up, yet the persistence of stark provincial disparities and a national prevalence that remains above the World Health Organization threshold indicate that further acceleration will require addressing

structural determinants such as maternal education, household poverty, and water and sanitation access that are not fully resolved by health-sector interventions alone^(3,8,9). The finding that linear growth deficits continue to accumulate after 24 months of age further suggests that Indonesia's current programmatic focus on the period before birth and the 6 to 23 month window, while evidence-based and appropriately prioritized, may benefit from continued nutritional and developmental support extending into the preschool years^(7,22).

Limitations of the current evidence base include the predominance of efficacy trials conducted in research settings that may not fully reflect real-world program delivery, substantial heterogeneity in intervention design and population characteristics across studies, and a relative scarcity of Indonesia-specific randomized controlled trials evaluating the comparative effectiveness of nutrition-specific versus nutrition-sensitive interventions when delivered in combination. Future research priorities should include rigorous evaluation of Indonesia's national stunting reduction strategy using robust quasi-experimental or randomized designs, further investigation of community-level environmental interventions beyond household WASH, and continued attention to social protection and maternal education as upstream determinants of child linear growth.

D. CONCLUSION

Stunting during the first 1,000 days remains a significant public health and economic challenge globally and in Indonesia, where national prevalence, despite meaningful decline, continues to exceed the World Health Organization's public health threshold amid substantial regional disparities. The evidence supports a defined package of nutrition-specific interventions, including maternal balanced energy-protein and multiple micronutrient supplementation, kangaroo mother care, breastfeeding promotion, appropriate complementary feeding, and vitamin A and zinc supplementation, complemented by nutrition-sensitive approaches addressing sanitation, maternal education, and social protection. Sustained and equitable reduction of stunting in Indonesia will require continued multisectoral investment, extended programmatic attention beyond the conventional 1,000-day window, and rigorous local evaluation to guide context-specific policy and programming.

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