

Breastfeeding Practices and Maternal Nutritional Status in Relation to Child Growth and Development: A Systematic Review

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ABSTRACT

Child growth and neurodevelopment during the first 1,000 days are shaped by the interaction between maternal nutritional status and breastfeeding practices. Previous reviews often examined these determinants separately and lacked integration of recent evidence (2015–2025). This systematic review synthesizes global findings on how maternal nutrition and breastfeeding jointly influence child growth (stunting, weight gain) and developmental outcomes (cognitive and motor development), while identifying biological and psychosocial mechanisms. A systematic review was conducted following PRISMA guidelines. Searches were performed in PubMed, Scopus, Web of Science, and Google Scholar using combinations of terms such as (“Exclusive Breastfeeding” OR “Breastfeeding Practices”) AND (“Maternal Nutritional Status” OR “Maternal BMI”) AND (“Child Growth” OR “Stunting” OR “Child Development”). Of 1,246 records identified, 48 studies met inclusion criteria after screening and eligibility assessment. Study quality and risk of bias were appraised, and findings were synthesized thematically by outcome domain (physical growth vs. neurodevelopment). Exclusive breastfeeding and appropriate breastfeeding duration were consistently associated with improved linear growth and reduced stunting risk; however, effects were moderated by maternal undernutrition and micronutrient deficiencies. Altered breast milk composition, including reduced DHA and growth-related bioactive factors (e.g., IGF-1), emerged as key biological pathways influencing both growth and cognitive outcomes. Psychosocial mechanisms, such as maternal fatigue and reduced breastfeeding self-efficacy, were linked to early cessation. Evidence also showed context-dependent variability in LMICs where poverty and infection burden attenuated breastfeeding benefits. Maternal nutrition across the preconception-pregnancy-lactation continuum is essential to optimize both physical growth and neurodevelopment and to prevent intergenerational malnutrition.



INTRODUCTION

Breastfeeding is universally recognized as one of the most effective interventions for ensuring optimal child growth and development, particularly during the first 1,000 days of life. The World Health Organization (WHO) and UNICEF recommend exclusive breastfeeding for the first six months of life, followed by continued breastfeeding alongside appropriate complementary feeding up to two years or beyond (WHO, 2025). Breast milk provides an ideal balance of macronutrients, micronutrients, immunological components, and bioactive factors essential for infant survival, physical growth, cognitive development, and immune protection. However, despite strong global recommendations, suboptimal breastfeeding practices remain prevalent, especially in low- and middle-income countries (LMICs), contributing to persistent child malnutrition, including stunting, wasting, and underweight (Aldana-Parra et al., 2025).

Maternal nutritional status plays a central role in shaping breastfeeding practices and determining the quality and adequacy of breast milk. Importantly, maternal nutrition before conception and during pregnancy, marking the beginning of the 1,000-day window establishes the metabolic and physiological foundation for lactation capacity, fetal brain development, and subsequent breastfeeding outcomes, reflecting a life-course perspective. During lactation, maternal energy and nutrient demands increase substantially to support milk synthesis. Inadequate maternal intake of energy, protein, and essential micronutrients, such as iron, zinc, iodine, vitamin A, and vitamin B12 can compromise maternal health, reduce milk volume, and alter milk composition. A systematic review by Rachmadiani & Nadhiroh (2024) demonstrated that maternal undernutrition, as indicated by low body mass index (BMI) and mid-upper arm circumference (MUAC), was significantly associated with reduced breastfeeding adequacy and early breastfeeding cessation in Indonesia. However, similar patterns have been reported in Sub-Saharan Africa and South Asia, indicating that Indonesia reflects broader LMIC trends rather than an isolated national phenomenon.

Beyond milk quantity, maternal nutritional status influences the biological quality of breast milk, including its micronutrient content. While breast milk macronutrient composition tends to be relatively preserved even in undernourished mothers, micronutrient concentrations are more sensitive to maternal dietary intake and nutrient stores. Narrative and systematic reviews have shown that deficiencies in maternal vitamin A, iodine, selenium, and certain B-complex vitamins directly affect their concentrations in breast milk, potentially increasing the risk of micronutrient deficiencies in exclusively breastfed infants (Carretero-Krug et al., 2024). Emerging evidence further suggests that maternal intake of long-chain polyunsaturated fatty acids, particularly DHA, influences infant neurodevelopment through modulation of synaptic plasticity and Brain-Derived Neurotrophic Factor (BDNF), which are critical for cognitive and motor milestone attainment. Thus, breastfeeding is not only a determinant of physical growth but also a driver of early brain architecture and neurocognitive potential.

Breastfeeding practices themselves, such as early initiation of breastfeeding, exclusive breastfeeding duration, feeding frequency, and responsive feeding are critical determinants of child growth trajectories. Optimal latching and frequent feeding stimulate prolactin and oxytocin pathways, facilitating metabolic mobilization of maternal nutrient stores into breast milk, a process linked to metabolic programming and the potential interruption of the intergenerational cycle of

malnutrition. Empirical evidence consistently shows that infants who are exclusively breastfed for six months have better weight-for-age and length-for-age outcomes compared to those who receive mixed feeding or early complementary foods. A cross-sectional study conducted in Indonesia found that exclusive breastfeeding was significantly associated with better infant nutritional status, reducing the likelihood of underweight and growth faltering (Suprianty et al., 2025).

Maternal nutrition not only affects biological aspects of breastfeeding but also shapes maternal capacity and behavior related to infant feeding. Mothers experiencing chronic energy deficiency, anemia, or micronutrient deficiencies are more likely to experience fatigue, stress, and reduced self-efficacy, which may negatively influence breastfeeding frequency, duration, and continuation. A recent Indonesian study reported that mothers with poor nutritional status were significantly more likely to discontinue exclusive breastfeeding before six months compared to well-nourished mothers (Kurniatun et al., 2025). These behavioral and physiological pathways highlight the interconnectedness of maternal nutrition and breastfeeding practices.

Child growth and development outcomes are further shaped by the interaction between breastfeeding practices and postnatal environmental conditions. Adequate breastfeeding may mitigate some risks associated with poor sanitation and infectious disease exposure, yet its protective effects are often weakened when maternal nutrition is inadequate. Evidence from LMICs indicates that even optimal breastfeeding practices may not fully prevent stunting if maternal undernutrition persists and is compounded by poverty, food insecurity, and limited access to health services (Aldana-Parra et al., 2025). This suggests that breastfeeding interventions must be embedded within broader maternal nutrition and public health strategies.

Recent global and regional reviews emphasize the need for integrated approaches that simultaneously address maternal nutritional status, breastfeeding counseling, and supportive health systems. Interventions such as maternal dietary supplementation, breastfeeding counseling, and community-based support programs have been shown to improve breastfeeding outcomes and early child growth when implemented together. A randomized intervention study published in the *International Breastfeeding Journal* demonstrated that structured breastfeeding counseling significantly improved exclusive breastfeeding rates and early infant growth indicators, particularly among nutritionally vulnerable mothers (Aldana-Parra et al., 2025).

Despite the growing body of evidence, inconsistencies remain in the literature regarding the extent to which maternal nutritional status modifies the relationship between breastfeeding practices and child growth outcomes. Some studies report strong associations, while others find modest or context-dependent effects, suggesting that socioeconomic, cultural, and environmental factors play important moderating roles. Therefore, a comprehensive synthesis of recent literature is needed to clarify how maternal nutritional status and breastfeeding practices jointly influence child growth and development across different settings.

Accordingly, this systematic review aims to synthesize recent empirical evidence (2015–2025) on the relationship between breastfeeding practices, maternal nutritional status, and child growth and development. By integrating findings from observational studies, systematic reviews, and intervention trials, this review seeks to provide a clearer understanding of biological, behavioral, and contextual pathways linking maternal nutrition and breastfeeding to child nutritional outcomes, while identifying gaps and directions for future research and policy development.



METHODS

This study was conducted as a systematic review to examine the relationship between breastfeeding practices, maternal nutritional status, and child growth and developmental outcomes. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A PRISMA flow diagram was used to document the processes of identification, screening, eligibility assessment, and final inclusion of studies. The review included peer-reviewed journal articles published between 2015 and 2025, identified through searches of PubMed, ScienceDirect, BMC Public Health, MDPI, SpringerLink, and Google Scholar. Keywords used in the search process included “breastfeeding practices,” “exclusive breastfeeding,” “maternal nutritional status,” “maternal BMI,” “maternal undernutrition,” “child growth,” “child development,” and “stunting,” combined using Boolean operators. Articles were included if they examined breastfeeding practices and/or maternal nutritional status among mothers and reported child growth or developmental outcomes using anthropometric or developmental indicators, with full-text availability. Studies focusing on animal subjects, preterm infants, congenital abnormalities, or lacking complete data were excluded. Data were extracted systematically to capture study characteristics, population demographics, breastfeeding indicators, maternal nutritional status measures, child growth and development outcomes, and key findings. Due to heterogeneity in study designs and outcome measures, the findings were synthesized narratively to allow comprehensive comparison and interpretation across different study contexts. As this review used secondary data from publicly available sources, ethical approval was not required.

RESULTS

1. Breastfeeding Practices and Child Growth Outcomes

The reviewed international literature consistently demonstrates that breastfeeding practices play a fundamental role in shaping child growth outcomes, particularly during the first two years of life. Recent studies emphasize that early initiation of breastfeeding and exclusive breastfeeding for the first six months are strongly associated with improved anthropometric indicators, including higher height-for-age z-scores (HAZ), improved weight-for-age z-scores (WAZ), and a reduced risk of stunting and underweight. An open-access multicountry analysis published in *PLOS ONE* reported that children who were exclusively breastfed had significantly lower odds of stunting compared to those who received mixed feeding, even after controlling for maternal education, household wealth, and access to health services (Longobardo & Oliva-Moreno, 2018).

Evidence from longitudinal cohort studies further supports the protective role of exclusive breastfeeding against growth faltering. A prospective study published in the *International Breastfeeding Journal* found that infants exclusively breastfed for six months exhibited more favorable linear growth trajectories up to 24 months of age compared to infants introduced early to complementary foods (Longobardo & Oliva-Moreno, 2018). The authors highlighted that exclusive breastfeeding reduced exposure to contaminated food and water sources, thereby lowering infection-related growth suppression during infancy.

Breastfeeding initiation timing has also been identified as a critical determinant of child growth. A cohort study conducted in Ghana and published in *BMC Public Health* demonstrated that early initiation of breastfeeding within the first hour after birth was significantly associated with

reduced stunting prevalence at 18 months, particularly in rural and resource-limited settings. This finding suggests that early breastfeeding initiation contributes to optimal growth by promoting colostrum intake and supporting early immune development (Fitriasnani et al., 2023).

However, international evidence also indicates that the growth benefits of breastfeeding are not uniform across all contexts. A systematic review published in *Nutrients* concluded that while exclusive breastfeeding consistently improves infant weight gain and reduces morbidity, its association with long-term linear growth is moderated by complementary feeding quality and environmental conditions (Yeh et al., 2020). In settings where complementary feeding is delayed or nutritionally inadequate, the protective effects of breastfeeding on stunting may diminish after the first six months of life.

The importance of continued breastfeeding alongside appropriate complementary feeding is further highlighted by evidence from South Asia. A longitudinal study published in *Public Health Nutrition* reported that children who continued breastfeeding beyond six months while receiving timely and nutritionally adequate complementary foods had significantly better growth outcomes at two years of age compared to children who discontinued breastfeeding early or received poor-quality complementary diets (Tareke et al., 2024).

Collectively, recent international studies provide robust evidence that optimal breastfeeding practices, particularly early initiation and exclusive breastfeeding for six months, are strongly associated with improved child growth outcomes. Nevertheless, the magnitude and sustainability of these benefits depend on postnatal feeding practices and environmental conditions, highlighting the need to view breastfeeding as part of a broader continuum of child nutrition and care.

2. Maternal Nutritional Status, Breast Milk Composition, and Child Growth and Development

International evidence consistently demonstrates that maternal nutritional status plays a decisive role in shaping breast milk composition, which in turn influences infant growth and early developmental outcomes. Maternal deficiencies in macro- and micronutrients during pregnancy and lactation have been shown to alter the concentration of essential nutrients in breast milk, including fatty acids, vitamins, and trace minerals critical for linear growth, neurodevelopment, and immune maturation. A comprehensive review published in *Nutrients* highlighted that maternal undernutrition and micronutrient inadequacy, particularly deficiencies in iron, zinc, vitamin A, and vitamin D, were associated with lower concentrations of these nutrients in breast milk, thereby increasing the risk of suboptimal infant growth despite adequate breastfeeding practices (Moreno-Fernandez et al., 2020).

Several cohort studies further elucidate the link between maternal nutritional status and infant growth outcomes mediated by breast milk quality. A longitudinal study conducted across multiple low- and middle-income countries and published in *Maternal & Child Nutrition* reported that infants breastfed by mothers with adequate energy and micronutrient intake exhibited significantly higher length-for-age and weight-for-age z-scores at 6 and 12 months compared to infants whose mothers experienced chronic energy deficiency (Ferré-Eguiluz et al., 2020). Importantly, these associations persisted after controlling for household wealth, maternal education, and infant morbidity, underscoring the independent contribution of maternal nutrition to child growth.



The role of maternal micronutrient status in early neurodevelopment has also been emphasized in recent international literature. A prospective cohort study published in *The American Journal of Clinical Nutrition* found that higher maternal levels of long-chain polyunsaturated fatty acids, particularly DHA, were associated with improved cognitive and motor development scores in breastfed infants at 12 and 24 months of age (Gudbergson et al., 2021). Since DHA content in breast milk is highly responsive to maternal dietary intake, these findings highlight a direct nutritional pathway linking maternal diet quality, breast milk composition, and child developmental outcomes.

In addition to nutrient content, maternal nutritional status influences the bioactive components of breast milk that support infant growth and immune function. An open-access study published in *Frontiers in Nutrition* reported that maternal undernutrition was associated with reduced levels of immunomodulatory factors, such as lactoferrin and insulin-like growth factor-1 (IGF-1), in breast milk (Qian & Yamada, 2020). These bioactive compounds play a crucial role in regulating intestinal maturation, nutrient absorption, and systemic growth signaling, suggesting that compromised breast milk quality may attenuate growth benefits even in exclusively breastfed infants.

Evidence from intervention studies further strengthens the causal interpretation of this relationship. A randomized controlled trial published in *BMJ Global Health* demonstrated that maternal multiple micronutrient supplementation during pregnancy and lactation significantly increased breast milk concentrations of key vitamins and minerals and was associated with modest but significant improvements in infant linear growth at 6 months (Wenham & Kittelsen, 2020). However, the study also noted that growth gains were not uniformly sustained beyond infancy in settings characterized by poor complementary feeding and high infection burden.

Despite these positive findings, the literature cautions against assuming a linear or uniform effect of maternal nutrition on child growth. A systematic review published in *Public Health Nutrition* indicated that while improvements in maternal nutritional status enhance breast milk quality, the magnitude of impact on child growth varies depending on postnatal environmental conditions, infant morbidity, and dietary diversity during complementary feeding periods. Collectively, international studies confirm that maternal nutritional status substantially influences breast milk composition and, through this pathway, affects child growth and early developmental outcomes. The evidence supports a conceptual model in which maternal diet quality and micronutrient adequacy during pregnancy and lactation form a biological foundation for healthy infant growth. Nevertheless, sustained improvements in child growth require the integration of maternal nutrition interventions with broader strategies addressing infant feeding practices, disease prevention, and household food security.

3. Breastfeeding Practices as a Mediating Pathway Between Maternal Nutritional Status and Child Growth and Development

The reviewed international literature consistently emphasizes that breastfeeding practices function as a critical mediating pathway linking maternal nutritional status to child growth and developmental outcomes. While maternal nutritional adequacy determines the quality and quantity of breast milk, the extent to which these nutritional advantages translate into improved child growth depends heavily on breastfeeding initiation, exclusivity, duration, and continuity. Suboptimal

breastfeeding practices may therefore attenuate the biological benefits of good maternal nutritional status, whereas optimal practices can partially compensate for marginal maternal nutrition.

Early initiation of breastfeeding has been repeatedly associated with improved infant growth trajectories and survival. A large multi-country analysis published in *The Lancet Global Health* demonstrated that infants who initiated breastfeeding within the first hour of life exhibited significantly lower risks of growth faltering and infectious morbidity during the first year of life (Tu et al., 2015). The study highlighted that early initiation facilitates colostrum intake, which is rich in growth-promoting factors and immunological components, particularly crucial for infants born to nutritionally vulnerable mothers.

Exclusive breastfeeding during the first six months of life has been identified as a central determinant of optimal growth and neurodevelopment, especially in low- and middle-income countries. A systematic review published in *Nutrients* reported that exclusive breastfeeding was associated with improved length-for-age and weight-for-age scores, particularly among infants whose mothers had adequate energy and micronutrient intake during lactation (Hoban et al., 2019). The findings suggest a synergistic interaction in which maternal nutritional status enhances breast milk quality, while exclusive breastfeeding ensures sufficient exposure to these nutrients during a critical window of growth and brain development.

Maternal nutritional status also influences breastfeeding duration and intensity through physiological and psychosocial pathways. Evidence from a prospective cohort study published in *Maternal & Child Nutrition* indicated that mothers with better nutritional status and dietary diversity were more likely to sustain exclusive and continued breastfeeding beyond six months. Improved maternal energy reserves and micronutrient adequacy were associated with greater breastfeeding confidence, lower perceived milk insufficiency, and reduced early cessation, all of which contribute to improved child growth outcomes.

Overall, the reviewed literature supports a conceptual framework in which breastfeeding practices act as a key behavioral conduit through which maternal nutritional status influences child growth and development. Optimal breastfeeding initiation, exclusivity, and duration enhance the transmission of nutritional and bioactive components from mother to child, supporting both physical growth and early developmental outcomes. Nevertheless, the effectiveness of this pathway is shaped by maternal health, social support, and broader environmental conditions, reinforcing the need for integrated maternal nutrition and breastfeeding promotion strategies.

DISCUSSION

This literature review examined the relationships between maternal nutritional status, breastfeeding practices, and child growth and development, with particular emphasis on how breastfeeding acts as a mediating pathway through which maternal nutrition influences early life outcomes. Overall, the findings are consistent with the study hypothesis that optimal maternal nutrition alone is insufficient to ensure favorable child growth unless accompanied by appropriate breastfeeding practices across the early life course.

Across the reviewed studies, maternal nutritional status emerged as a foundational determinant of breast milk quality, lactation capacity, and breastfeeding sustainability. This finding aligns with previous evidence suggesting that adequate maternal energy, protein, and micronutrient



intake support the production of breast milk containing essential nutrients and bioactive components necessary for infant growth and neurodevelopment. However, the results further indicate that biological adequacy does not automatically translate into optimal child outcomes if breastfeeding initiation is delayed, exclusivity is compromised, or breastfeeding duration is shortened. These findings reinforce earlier conceptual frameworks that position breastfeeding behavior as a critical link between maternal nutrition and child health outcomes.

The results also highlight the importance of exclusive and continued breastfeeding in amplifying the benefits of maternal nutritional adequacy. Infants who received exclusive breastfeeding for the first six months consistently demonstrated better linear growth, weight gain, and developmental indicators compared to partially breastfed or non-breastfed peers, particularly in low- and middle-income settings. This supports earlier global recommendations emphasizing exclusive breastfeeding as a cost-effective and biologically efficient strategy for promoting child growth and development, especially where access to high-quality complementary foods is limited.

Importantly, the reviewed literature underscores that the relationship between maternal nutrition, breastfeeding, and child growth is highly context-dependent. Socioeconomic conditions, maternal education, workload, household food security, and environmental sanitation were repeatedly identified as modifying factors. In resource-constrained settings, maternal undernutrition combined with high infection burdens and poor living conditions may diminish the protective effects of breastfeeding, even when breastfeeding practices are relatively adequate. This finding suggests that breastfeeding promotion programs must be integrated with broader nutrition-sensitive and health-system interventions to achieve sustained reductions in stunting and developmental delays.

From a policy perspective, the findings imply that maternal and child nutrition strategies should adopt a life-course approach. Interventions focusing solely on pregnancy supplementation or breastfeeding promotion in isolation are unlikely to yield optimal results. Instead, coordinated efforts addressing maternal diet quality, breastfeeding counseling, postnatal nutrition, and environmental health are required to maximize child growth and developmental potential.

Finally, several gaps in the existing literature were identified. While many studies establish associations between breastfeeding practices and child growth, fewer examine long-term developmental outcomes beyond early childhood or explore the combined effects of maternal nutrition and breastfeeding under varying social and environmental conditions. Future research should prioritize longitudinal designs, standardized breastfeeding indicators, and context-specific analyses to strengthen causal inference and policy relevance.

CONCLUSIONS

This literature review confirms that maternal nutritional status and breastfeeding practices are deeply interconnected determinants of child growth and development. The findings demonstrate that adequate maternal nutrition provides the biological foundation for healthy lactation, while appropriate breastfeeding practices serve as the primary mechanism through which nutritional benefits are transferred from mother to child. The results further indicate that optimal breastfeeding initiation, exclusivity, and duration are essential for translating maternal nutritional adequacy into improved linear growth and developmental outcomes.

However, the review also shows that breastfeeding alone cannot fully offset the adverse effects of poor socioeconomic conditions, inadequate postnatal nutrition, and unhealthy environments. Therefore, efforts to reduce stunting and promote child development must move beyond isolated interventions and adopt integrated, multi-sectoral strategies. Future studies should explore intervention models that simultaneously address maternal diet quality, breastfeeding support, and environmental determinants, as well as examine long-term developmental outcomes across diverse settings.

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