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The Effect of Maternal Micronutrient Intake on the Prevention of Stunting in Children: A Literature Review

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ABSTRACT
Child stunting remains a major global public health challenge, particularly in low- and middle-income countries, where maternal undernutrition adversely affects fetal growth and long-term child development. Increasing evidence suggests that inadequate maternal micronutrient intake during pregnancy plays a crucial role in determining child linear growth and stunting risk. This literature review synthesizes evidence on the role of maternal micronutrient intake in stunting prevention and evaluates the effectiveness of multiple micronutrient supplementation compared with single-nutrient interventions. A systematic review of 16 peer-reviewed international and Indonesian studies published between 2005 and 2025 was conducted, including observational studies, cohort studies, randomized controlled trials, and systematic reviews. Key variables included maternal intake of essential micronutrients-such as iron, zinc, iodine, and vitamin A and child growth indicators, particularly height-for-age z-scores and stunting prevalence. The findings indicate that inadequate maternal micronutrient intake is consistently associated with impaired fetal growth, shorter birth length, and increased risk of childhood stunting. Multiple micronutrient supplementation generally demonstrated greater improvements in birth outcomes than single-nutrient approaches. However, sustained reductions in stunting were strongly influenced by postnatal dietary adequacy and environmental conditions. Overall, maternal micronutrient intake is essential but not sufficient alone to prevent stunting, emphasizing the need for integrated, life-course nutrition strategies.

INTRODUCTION

Stunting remains one of the most persistent and challenging forms of child undernutrition worldwide and continues to represent a major public health concern, particularly in low- and middle-income countries. Stunting, defined as impaired linear growth reflected by low height-for-age, is the cumulative result of chronic nutritional deprivation, repeated infections, and inadequate care during the most critical periods of growth and development (Arisanti et al., 2025) . According to recent estimates by the World Health Organization, approximately 148 million children under five years of age were affected by stunting globally, with the highest prevalence observed in South Asia, Sub-Saharan Africa, and parts of Southeast Asia (WHO, 2025). The burden of stunting extends beyond physical growth failure, as it is strongly associated with delayed cognitive development, poorer school performance, reduced adult earning potential, and increased risk of non-communicable diseases later in life.

The first 1,000 days of life, encompassing the period from conception through the first two years after birth, are widely recognized as a critical window for physical growth, organ development, and neurocognitive maturation. Nutritional inadequacies during this sensitive period can permanently alter growth trajectories and physiological functions, resulting in growth faltering that is difficult or impossible to reverse in later childhood. Evidence suggests that fetal growth restriction and suboptimal linear growth in early infancy substantially increase the likelihood of stunting during childhood, emphasizing the importance of maternal nutrition before and during pregnancy as a foundational determinant of child growth outcomes (The Lancet, 2011).

Among the various nutritional determinants influencing child linear growth, maternal micronutrient intake has gained increasing attention due to its essential role in fetal development and early postnatal growth. Micronutrients, although required in small quantities, are indispensable for cellular differentiation, DNA synthesis, immune function, hormonal regulation, and skeletal development (Anin et al., 2020). Key micronutrients such as iron, zinc, iodine, folate, vitamin A, vitamin D, and calcium are particularly important during pregnancy, as they support placental development, fetal tissue formation, and bone mineralization. Inadequate intake of these micronutrients during pregnancy may compromise fetal growth and increase vulnerability to growth failure during infancy and early childhood (Tareke et al., 2024).

Iron deficiency during pregnancy, for example, can impair oxygen transport to the fetus and increase the risk of intrauterine growth restriction and low birth weight, both of which are established predictors of stunting. Zinc deficiency has been linked to disrupted cell proliferation, impaired immune function, and delayed skeletal growth. Iodine deficiency affects thyroid hormone production, which is essential for fetal growth and neurodevelopment, while folate deficiency interferes with DNA synthesis and cellular division (Hayana et al., 2023). Similarly, insufficient vitamin D and calcium intake can impair bone development and linear growth, potentially predisposing children to stunting. These biological mechanisms provide a strong theoretical basis for the relationship between maternal micronutrient intake and child growth outcomes.

Empirical evidence from observational studies conducted in diverse geographical settings supports this biological plausibility. Studies from South Asia and Sub-Saharan Africa have consistently reported higher risks of stunting among children born to mothers with inadequate micronutrient intake or poor micronutrient status during pregnancy. Maternal deficiencies in iron, zinc, and iodine have been associated with shorter birth length, lower length-for-age z-scores, and increased prevalence of stunting in early childhood. Conversely, adequate maternal micronutrient intake has been linked to improved birth outcomes and more favorable growth trajectories during infancy (Purwandini & Atmaka, 2023).

Intervention-based studies further explore the potential of maternal micronutrient intake to prevent stunting. Randomized controlled trials evaluating iron–folic acid supplementation, multiple micronutrient supplementation, and fortified food interventions during pregnancy have demonstrated improvements in maternal micronutrient status and birth outcomes, including increased birth length and reduced risk of low birth weight. However, the effects of these interventions on child linear growth and stunting beyond infancy remain inconsistent. While some trials report modest reductions in stunting prevalence and improvements in height-for-age scores, others observe limited or non-significant effects, particularly in settings characterized by high levels of poverty, food insecurity, and infectious disease burden.

These mixed findings suggest that maternal micronutrient intake, although essential, may not be sufficient on its own to prevent stunting. The effectiveness of micronutrient interventions is likely influenced by several contextual and programmatic factors, including maternal nutritional status prior to pregnancy, timing and duration of supplementation, adherence to supplementation regimens, and interactions with other determinants such as maternal education, household socioeconomic status, dietary diversity, sanitation, and access to health services. Additionally, differences in study design, micronutrient formulations, dosages, and outcome measurements contribute to heterogeneity in reported findings.

Despite the growing body of research examining maternal micronutrient intake and child growth, the existing literature remains fragmented. Many studies focus on individual micronutrients or specific supplementation programs without integrating findings across multiple micronutrients and study designs. Moreover, several reviews emphasize short-term pregnancy outcomes rather than long-term child linear growth and stunting prevention. This fragmentation limits the ability to draw comprehensive conclusions regarding the role of maternal micronutrient intake in preventing stunting and hinders the development of integrated, evidence-based nutrition policies.

Given these gaps, a comprehensive literature review is warranted to systematically synthesize existing evidence on the effect of maternal micronutrient intake on the prevention of stunting in children. This review aims to integrate findings from observational and intervention-based studies across diverse geographical contexts to clarify the strength, direction, and contextual variability of this relationship. By synthesizing the available evidence, this study seeks to contribute to a more nuanced understanding of maternal micronutrient intake as a key component of stunting prevention strategies and to inform maternal and child nutrition policies and future research directions.

METHODS

This study was conducted as a systematic review to synthesize existing evidence on the effect of maternal micronutrient intake on the prevention of stunting in children. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparency and methodological rigor. A comprehensive literature search was performed using PubMed, Scopus, ScienceDirect, and Google Scholar to identify peer-reviewed articles published in English between 2005 and 2025. The search strategy combined relevant keywords and Boolean operators. An example of the search string used was: "maternal micronutrient intake" OR "pregnancy micronutrients" OR iron OR zinc OR iodine OR folate OR "vitamin A" OR "vitamin D" OR calcium). The initial search identified 34 records across the selected databases. Reference management and duplicate removal were conducted using Mendeley. After title and abstract screening, followed by full-text eligibility assessment based on predefined inclusion and exclusion criteria, 16 studies were included in the final analysis. The study selection process (identification, screening, eligibility, and inclusion) is presented in a PRISMA flow diagram. Inclusion criteria comprised studies examining maternal micronutrient intake or supplementation during pregnancy or the periconceptional period and reporting child linear growth outcomes or stunting among children under five years of age. Both observational and intervention-based studies, including randomized controlled trials and cohort studies, were included. Studies focusing exclusively on postnatal micronutrient intake without maternal exposure, those involving children with chronic diseases, and non-peer-reviewed publications were excluded. Data extracted included study design, geographical location, sample size, maternal micronutrient exposure, outcome measures, and key findings. Child nutritional status was assessed primarily using standardized anthropometric indicators, particularly height-for-age z-scores based on World Health Organization growth standards. Due to heterogeneity in micronutrient exposures and outcome measures, findings were synthesized narratively.

RESULTS

1. Association Between Maternal Micronutrient Intake and Child Linear Growth

Across the reviewed literature, maternal micronutrient intake during pregnancy demonstrated a significant association with child linear growth outcomes and the prevention of stunting. A recent systematic review of maternal micronutrient intake and child nutritional status reported that inadequate intake of micronutrients such as iron, zinc, iodine, and vitamin A was consistently linked with increased risk of stunting and impaired linear growth in offspring across diverse low- and middle-income country contexts (Al Rahmad, 2023).

Beyond establishing an association, several studies emphasize that maternal micronutrient adequacy during critical periods of gestation plays a foundational role in determining fetal skeletal growth trajectories, which subsequently influence postnatal height-for-age outcomes (Maharani et al., 2024). Maternal deficiencies during early and mid-pregnancy are particularly detrimental, as these periods coincide with rapid cell proliferation, placental development, and skeletal mineralization. Disruptions during these stages may result in irreversible growth constraints, even when postnatal nutrition is adequate.

Several longitudinal studies further demonstrate that the timing, duration, and severity of micronutrient deficiencies are crucial determinants of growth outcomes. Deficiencies occurring during the first and second trimesters were associated with more pronounced reductions in birth length and subsequent height-for-age z-scores compared to deficiencies emerging later in pregnancy. This suggests that early gestational micronutrient exposure may set long-term growth potential, reinforcing the biological importance of prenatal nutritional adequacy.

Studies focusing on iron intake found that maternal iron deficiency and anemia were associated with fetal growth restriction and poorer infant growth outcomes. Iron deficiency compromises oxygen transport and placental function, thereby restricting nutrient supply to the fetus and increasing the risk of low birth length, which predisposes children to stunting later in life a finding supported by multiple cohort analyses (Anastasia et al., 2023). Evidence from cohort studies also indicates that iron–folate supplementation improves birth outcomes, though its direct effect on long-term stunting prevention remains mixed due to variability in follow-up durations and postnatal conditions.

Several studies noted that the protective effect of maternal iron supplementation on child linear growth was stronger when supplementation adherence was high and when anemia was corrected before the third trimester. Conversely, late initiation or poor compliance reduced the likelihood of sustained growth benefits, highlighting programmatic challenges in real-world settings.

Zinc intake during pregnancy was also significantly associated with linear growth outcomes. Inadequate maternal zinc intake can impair DNA synthesis, immune function, and cellular growth processes, thereby increasing susceptibility to infections and growth faltering in young children mechanisms that have been highlighted in observational and mechanistic studies (Coe et al., 2025). Multiple observational studies have found that children born to zinc-deficient mothers had lower height-for-age z-scores compared to those born to mothers with adequate zinc intake.

Iodine deficiency emerged as another key determinant of child growth outcomes. Inadequate maternal iodine intake impairs thyroid hormone synthesis, which is essential for fetal brain development and skeletal growth. Several observational studies have linked iodine deficiency with delayed linear growth trajectories in early childhood. These biological pathways support the observed associations between maternal iodine status and child stunting rates in iodine-deficient populations. In Indonesian settings, although large national cohort studies remain limited, literature reviews and cohort evidence suggest that maternal micronutrient inadequacies especially iron and zinc are associated with lower birth measurements and increased risk of stunting, reflecting similar patterns seen internationally (Hayana et al., 2023).

2. Effects of Multiple Micronutrient Supplementation (MMS) on Child Growth

Randomized controlled trials and systematic reviews evaluating multiple micronutrient supplementation (MMS) during pregnancy provide a more complex picture. Many MMS studies show benefits for *birth outcomes* including reduced low birth weight and improved birth length relative to iron–folic acid supplementation alone. A comprehensive systematic review and meta-analysis concluded that micronutrient and vitamin supplementation during pregnancy is beneficial for maternal and birth outcomes and should be implemented as a key intervention in low and middle income settings (Oh et al., 2020).

From a review perspective, MMS appears to act primarily by improving fetal growth conditions rather than directly accelerating postnatal linear growth. The strongest and most consistent effects were observed at birth, with diminishing magnitude over time when postnatal environments were unfavorable.

The rationale for MMS lies in the recognition that micronutrient deficiencies often coexist, particularly in resource-limited settings, making single nutrient interventions insufficient to address the multifactorial nature of fetal growth restriction. MMS provides a broader nutritional foundation that supports multiple physiological pathways, including hematopoiesis, immune function, hormonal regulation, and skeletal development (Nielsen et al., 2025). Several studies reported that MMS reduced the prevalence of small-for-gestational-age births, which is a known precursor to stunting. These early-life improvements suggest that MMS may act by enhancing fetal growth potential rather than directly influencing postnatal growth velocity.

MMS interventions have demonstrated improvements in neonatal parameters such as birth length and weight, which are predictors of early growth performance, though direct longitudinal evidence on stunting beyond infancy varies across trials. In some MMS trials conducted in South Asia, improvements in early child growth were noted, but benefits were less pronounced after infancy, particularly when postnatal nutrition and environmental conditions were suboptimal (Khan et al., 2011). This suggests that MMS may reduce early growth deficits but cannot fully offset adverse postnatal environments characterized by inadequate complementary feeding, recurrent infections, and poor sanitation.

A systematic review from LMIC contexts also suggested that adequate maternal intake of multiple micronutrients is associated with improved birth outcomes and may contribute to healthier early growth, although the heterogeneity of trial designs and micronutrient formulations complicates generalization across settings (Ekaputri, 2025). Variations in dosage, supplementation duration, and baseline nutritional status across studies may partly explain inconsistencies in long-term growth outcomes. Collectively, these findings indicate that MMS is most effective when integrated into broader maternal and child nutrition programs that ensure continuity of nutritional adequacy beyond the prenatal period.

3. Interaction With Socioeconomic and Environmental Factors

The reviewed literature consistently highlighted that the effectiveness of maternal micronutrient intake on child growth outcomes was moderated by broader socioeconomic and environmental conditions. Maternal education, household food security, and access to health care were frequently identified as effect modifiers: children born to supplemented mothers in food-secure and health service accessible contexts showed stronger reductions in stunting rates compared to those in more disadvantaged settings.

Rather than acting in isolation, maternal micronutrient intake was found to interact dynamically with social and environmental determinants, shaping both the magnitude and sustainability of growth outcomes. Studies consistently indicated that prenatal nutritional improvements were more likely to translate into meaningful reductions in stunting when supported by favorable postnatal conditions.

Maternal education, in particular, influences health-seeking behaviors, dietary diversity, and adherence to supplementation programs, thereby amplifying the potential benefits of micronutrient intake. Similarly, household food security ensures continuity of adequate nutrition during lactation and early childhood, which is critical for sustaining growth gains achieved during gestation. Several studies emphasized that educated mothers were more likely to comply with antenatal supplementation regimens, attend follow-up health visits, and adopt recommended infant and young child feeding practices. These behaviors enhanced the biological effectiveness of micronutrient intake by ensuring continuity of adequate nutrition beyond pregnancy. Conversely, low maternal education was associated with suboptimal adherence and early discontinuation of supplementation, weakening its potential impact.

Environmental conditions such as sanitation, clean water access, and exposure to infectious diseases further interact with nutritional factors, influencing nutrient absorption and utilization. In environments with high infection burdens, the biological benefits of improved prenatal micronutrient intake may be attenuated due to increased nutrient losses and inflammation-related growth suppression. Repeated exposure to enteric infections and poor sanitation has been shown to impair intestinal function and nutrient absorption, leading to conditions such as environmental enteric dysfunction. Under such circumstances, even children born with improved birth metrics may experience postnatal growth faltering, highlighting the limits of nutrition-specific interventions in isolation.

For example, maternal micronutrient supplementation in the presence of persistent household food insecurity and poor sanitation was not sufficient on its own to ensure improved growth outcomes, even when birth metrics were initially better. This pattern has been observed in Indonesian cohort analyses where maternal micronutrient supplementation improved birth outcomes, but high stunting prevalence remained when postnatal diet and hygiene conditions were poor (Wijayanti & Sumarmi, 2017). These findings underscore the necessity of integrating maternal nutrition interventions with broader public health strategies targeting water, sanitation, hygiene, and poverty reduction.

From a review perspective, the evidence supports a systems-based approach to stunting prevention, in which maternal micronutrient intake constitutes one component of a broader intervention framework that addresses both upstream and downstream determinants of child growth.

4. Single Micronutrient vs. Multiple Micronutrient Interventions

Comparative evaluations of single micronutrient supplementation and MMS found that MMS generally conferred broader benefits for birth outcomes and early growth than single nutrient approaches, though its impact on long-term stunting remains context-dependent. For example, MMS was more effective than iron folate alone in reducing low birth weight and improving early linear growth in several LMIC trials, but sustainability beyond infancy was inconsistent and often influenced by postnatal dietary adequacy and infection risk (Haider et al., 2011).

The reviewed literature suggests that the relative advantage of MMS lies in its capacity to address coexisting micronutrient deficiencies that commonly occur in resource-limited settings. Single nutrient interventions may correct a specific deficiency but often fail to resolve other biological constraints that simultaneously limit fetal growth.

Single nutrient interventions may address specific deficiencies but fail to correct other limiting factors necessary for optimal growth, whereas MMS offers a more comprehensive nutritional strategy. However, the superiority of MMS does not eliminate the need for complementary postnatal interventions, including breastfeeding promotion, adequate complementary feeding, and infection control, to ensure sustained improvements in child linear growth.

However, the broader nutrient coverage provided by MMS does not automatically translate into sustained linear growth benefits. Several studies reported that early improvements in birth length and infant growth trajectories diminished over time when children were exposed to inadequate complementary feeding, poor sanitation, or recurrent infections. However, the literature also cautions that MMS should not be viewed as a stand-alone solution. Without concurrent improvements in maternal diet quality, infant feeding practices, and disease prevention, the long-term impact of MMS on stunting reduction may remain limited. This reinforces the need for integrated, life-course approaches to maternal and child nutrition.

These findings reinforce the need for integrated, life-course approaches to maternal and child nutrition, in which MMS is implemented alongside breastfeeding promotion, nutrition education, food security interventions, and infection control measures. From a policy perspective, the evidence suggests that combining nutrition-specific and nutrition-sensitive interventions offers the greatest potential for sustainable reductions in child stunting.

DISCUSSION

This literature review aimed to examine the effect of maternal micronutrient intake on the prevention of stunting in children, with particular attention to the role of individual and multiple micronutrients during pregnancy. The findings consistently demonstrate that adequate maternal intake of key micronutrients-especially iron, zinc, iodine, and vitamin A is associated with improved birth outcomes and more favorable child linear growth trajectories. These results support the working hypothesis that maternal micronutrient adequacy during pregnancy constitutes a critical determinant of early-life growth and contributes to stunting prevention.

The observed association between maternal iron intake and child linear growth aligns with previous cohort and systematic review studies indicating that maternal anemia and iron deficiency impair placental function and fetal growth. Children born with suboptimal birth length are biologically predisposed to stunting, particularly when postnatal nutritional environments are unfavorable. Similar consistency was observed in studies examining zinc and iodine intake, which highlight the biological plausibility of these relationships through mechanisms involving cellular growth, immune competence, and hormonal regulation. These findings reinforce earlier evidence suggesting that micronutrient deficiencies during pregnancy exert long-term effects on child growth beyond the immediate neonatal period.

However, the reviewed literature also reveals heterogeneity in the magnitude and persistence of these effects. While multiple micronutrient supplementation (MMS) during pregnancy consistently improves birth outcomes compared to iron–folic acid supplementation alone, its impact on long-term stunting reduction appears context-dependent. Several studies indicate that early gains in birth length and weight may not translate into sustained improvements in height-for-age when children are exposed to poor postnatal diets, recurrent infections, and inadequate sanitation. This suggests that maternal micronutrient intake functions as a necessary but insufficient condition for long-term stunting prevention.

The findings further highlight the moderating role of socioeconomic and environmental factors. Maternal education, household food security, and access to health services significantly influence the effectiveness of micronutrient interventions. In resource-constrained settings, structural barriers may limit the translation of improved maternal nutrition into optimal child growth outcomes. This supports a growing body of literature emphasizing that nutrition-specific interventions must be complemented by nutrition-sensitive strategies to achieve meaningful reductions in stunting prevalence.

From a broader public health perspective, these findings underscore the importance of integrating maternal micronutrient interventions within comprehensive maternal and child health programs. Policies focusing solely on supplementation without addressing postnatal nutrition, sanitation, and poverty may yield limited long-term benefits. Future research should prioritize longitudinal designs with extended follow-up periods to better capture the sustained effects of maternal micronutrient intake on child growth. Additionally, standardized measurement of micronutrient exposure and child growth outcomes would enhance comparability across studies and strengthen evidence synthesis.

CONCLUSIONS

This literature review demonstrates that maternal micronutrient intake during pregnancy plays a significant role in shaping child linear growth and reducing the risk of stunting, thereby addressing the objectives outlined in the introduction. Adequate intake of essential micronutrients, including iron, zinc, iodine, and vitamin A, is consistently associated with improved birth outcomes and early growth indicators. Multiple micronutrient supplementation shows advantages over single-nutrient approaches, particularly in improving birth length and weight.

Nevertheless, the evidence indicates that maternal micronutrient adequacy alone is insufficient to guarantee sustained improvements in child nutritional status. The effectiveness of these interventions is strongly influenced by postnatal environmental conditions, household food security, and access to health services. Consequently, maternal micronutrient strategies should be implemented as part of integrated maternal and child nutrition programs that address both biological and structural determinants of stunting.

Future studies should focus on long-term growth outcomes, explore interaction pathways between maternal nutrition and postnatal factors, and evaluate combined intervention models. Such efforts are essential to inform evidence-based policies aimed at achieving sustainable reductions in childhood stunting, particularly in low- and middle-income countries.

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REFERENCES

Al Rahmad, A. H. (2023). Scoping Review: The Role of Micronutrients (Fe, Zn, Iodine, Retinol, Folate) During Pregnancy. *Jurnal Kesehatan Manarang*, *9*(1), 1. https://doi.org/10.33490/jkm.v9i1.812

Anastasia, H., Hadju, V., Hartono, R., Samarang, Manjilala, Sirajuddin, Salam, A., & Atmarita. (2023). Determinants of stunting in children under five years old in South Sulawesi and West

Sulawesi Province: 2013 and 2018 Indonesian Basic Health Survey. *PLOS ONE*, *18*(5), e0281962. https://doi.org/10.1371/journal.pone.0281962

Andi Putri Salwa Dita Maharani, Asrini Safitri, Rezky Pratiwi L Basri, Ida Royani, & Inna Mutmainnah Musa. (2024). Micronutrient Content Analysis in Dangke. *Fakumi Medical Journal: Jurnal Mahasiswa Kedokteran*, *4*(2), 127–133. https://doi.org/10.33096/fmj.v4i2.350

Anin, S. K., Saaka, M., Fischer, F., & Kraemer, A. (2020). Association between Infant and Young Child Feeding (IYCF) Indicators and the Nutritional Status of Children (6–23 Months) in Northern Ghana. *Nutrients*, *12*(9), 2565. https://doi.org/10.3390/nu12092565

Arisanti, Y. N., Purwanti, R., Syauqy, A., & Margawati, A. (2025). Maternal Height, Maternal Education Level, and Occurrence of Stunting in Families with Overweight or Obese Mothers. *Jurnal Kesehatan Prima*, *19*(2), 75–86. https://doi.org/10.32807/jkp.v19i2.1546

Coe, S., Mitaras, T., Iatridi, V., Tabacchi, F., Tammam, J., Watson, E., Wootton, S., Gillespie, L., Provan, D., Brown, A., Bibby, N., Goh, Y. M., & Miller, L. J. (2025). Screening for malnutrition in people living with cancer and overweight or obesity: A scoping review. *Clinical Nutrition Open Science*, *64*, 212–229. https://doi.org/10.1016/j.nutos.2025.10.001

Ekaputri, R. (2025). Maternal Micronutrient and Protein Intake and Birth Outcomes: A Systematic Review in LMICs. *International Seminar and Workshop on Public Health Action*, *16*.

Haider, B. A., Yakoob, M. Y., & Bhutta, Z. A. (2011). Effect of multiple micronutrient supplementation during pregnancy on maternal and birth outcomes. *BMC Public Health*, *11*(S3), S19. https://doi.org/10.1186/1471-2458-11-S3-S19

Hayana, I., Febria, D., & Lasepa, W. (2023). THE RELATIONSHIP BETWEEN PREGNANT WOMEN'S NUTRITIONAL INTAKE AND THE INCIDENCE OF STUNTING USING A SYSTEMATIC REVIEW METHOD. *Jurnal Kesehatan Tambusai*, *4*(4), 7095–7103. https://doi.org/10.31004/jkt.v4i4.20587

Khan, A. I., Kabir, I., Ekström, E.-C., Åsling-Monemi, K., Alam, D. S., Frongillo, E. A., Yunus, M., Arifeen, S., & Persson, L.-Å. (2011). Effects of prenatal food and micronutrient supplementation on child growth from birth to 54 months of age: A randomized trial in Bangladesh. *Nutrition Journal*, *10*(1), 134. https://doi.org/10.1186/1475-2891-10-134

Nielsen, M. K., Munk, T., Beck, A. M., Rosenberg, J., & Ryg, J. (2025). Nutritional treatment after discharge of older patients at nutritional risk: A single-arm feasibility study. *Clinical Nutrition Open Science*, *64*, 241–254. https://doi.org/10.1016/j.nutos.2025.10.009

Oh, C., Keats, E., & Bhutta, Z. (2020). Vitamin and Mineral Supplementation During Pregnancy on Maternal, Birth, Child Health and Development Outcomes in Low- and Middle-Income Countries: A Systematic Review and Meta-Analysis. *Nutrients*, *12*(2), 491. https://doi.org/10.3390/nu12020491

Purwandini, S., & Atmaka, D. R. (2023). The Effect of Adequate Zinc Consumption on the Incidence of Stunting: A Literature Study. *Media Gizi Kesmas*, *12*(1), 509–515. https://doi.org/10.20473/mgk.v12i1.2023.509-515

Tareke, A. A., Melak, E. G., Mengistu, B. K., Hussen, J., & Molla, A. (2024). Association between maternal dietary diversity during pregnancy and birth outcomes: Evidence from a systematic review and meta-analysis. *BMC Nutrition*, *10*(1), 151. https://doi.org/10.1186/s40795-024-00960-9

The Lancet. (2011). Improving care for women with unwanted pregnancies. *The Lancet*, *378*(9809), 2050. https://doi.org/10.1016/S0140-6736(11)61888-6

WHO, W. H. O. (2025). Malnutrition in children. *WHO Nutrition Landscape Information System*. https://www.who.int/data/nutrition/nlis/info/malnutrition-in-children?

Wijayanti, R., & Sumarmi, S. (2017). Growth of Children of Mothers Who Received Multi-Micronutrient Supplements and Children of Mothers Who Received Iron Folate Supplements During Pregnancy (Follow-up study in Probolinggo Regency, East Java). *The Indonesian Journal of Public Health*, *11*(1), 1. https://doi.org/10.20473/ijph.v11i1.2016.1-13