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THE RELATIONSHIP BETWEEN MATERNAL DIETARY DIVERSITY SCORE DURING PREGNANCY AND INFANT NUTRITIONAL OUTCOMES: A LITERATURE REVIEW

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Abstract

Background: Maternal nutrition during pregnancy is crucial for fetal development and long-term infant health. Dietary diversity is commonly used as an indicator of diet quality, reflecting the adequacy of macro- and micronutrient intake. This study aimed to examine the association between the Maternal Dietary Diversity Score (MDDS) during pregnancy and infant health outcomes. **Methods:** This study was a systematic literature review of 11 articles. This article was sourced from scientific journal articles on Google Scholar, ScienceDirect, and PubMed for original observational studies published between 2015 and 2025. **Results:** The majority of research was carried out utilizing cohort, cross-sectional, or case-control designs in developing nations in Asia and Africa. Research continuously shows that a more varied diet for mothers is linked to better birth outcomes, especially higher birth weight and a lower chance of low birth weight (LBW). Additionally, a number of studies found that babies born to mothers who varied their diets were less likely to have low birth weights. **Conclusions:** MDDS is crucial for preventing LBW and supporting the baby's long-term growth and immunity. The quality of food choices and focused nutrition education are equally as important as the quantity of food groups.

Keywords: Maternal dietary diversity, Birth weight, Infant outcomes, Pregnancy nutrition

Introduction

Nutritional issues among pregnant women remain a major public health concern worldwide, especially in developing countries. The mother's nutrition during pregnancy is vital for fetal growth and development. It directly affects birth outcomes such as birth weight, birth length, and the risk of Low Birth Weight (LBW). Poor nutrition during pregnancy can lead to maternal health problems and can have lasting effects on both the mother and the child.[1] One important measure of nutritional intake quality in pregnant women is dietary diversity. Dietary diversity shows how well both macronutrient and micronutrient needs are met during pregnancy. Pregnant women who eat a variety of foods usually have better access to essential nutrients than those who have a limited diet. However, many areas, particularly among low-income groups, still experience low dietary diversity. [2,3]

Previous research has found a link between maternal dietary diversity and birth outcomes. Studies in various African and Asian countries show that lower dietary diversity in mothers is associated with a higher risk of LBW, small-for-gestational-age infants, and growth issues in early childhood. Other factors, like household food security, maternal nutritional status, and access to healthy food, also play a significant role in the quality of what mothers eat during pregnancy. [4–6]

While many studies have looked at the connection between maternal dietary diversity and birth outcomes, results vary due to different social, economic, and cultural factors. Moreover, there are few thorough reviews that specifically explore how maternal dietary diversity impacts various birth outcomes in developing nations. Thus, this study is crucial for examining the relationship between maternal dietary diversity during pregnancy and birth

outcomes, helping to establish a solid foundation for creating better nutritional programs for pregnant women.

Method

This formative review was conducted to enrich the explanation and overview on how the Maternal Dietary Diversity Score (MDDS) during pregnancy affects infant health outcomes. o gather relevant evidence, we searched three major electronic databases—Google Scholar, ScienceDirect, and PubMed. We focused on articles published between 2015 and 2025 and used combinations of keywords such as maternal dietary diversity, pregnancy nutrition, dietary diversity score, infant health outcomes, birth weight, and pregnancy outcomes. We limited our selection to articles published in English to ensure consistency in interpretation. Only articles published in English were considered. Our search yielded a large number of records, including 940 articles from Google Scholar, 296 from ScienceDirect, and 37 from PubMed. We then carefully screened these articles to identify the studies most relevant to the objectives of this review.

The selection process was conducted in stages to ensure data integrity. After screening titles and removing duplicates, we identified 25 potential studies from various databases (Google Scholar, Science Direct, and PubMed). This number was then narrowed down through an in-depth full-text review, until 11 final studies were selected that met all eligibility criteria. We then summarized this evidence in the form of a narrative synthesis to map how maternal

dietary diversity affects infant health across research contexts.

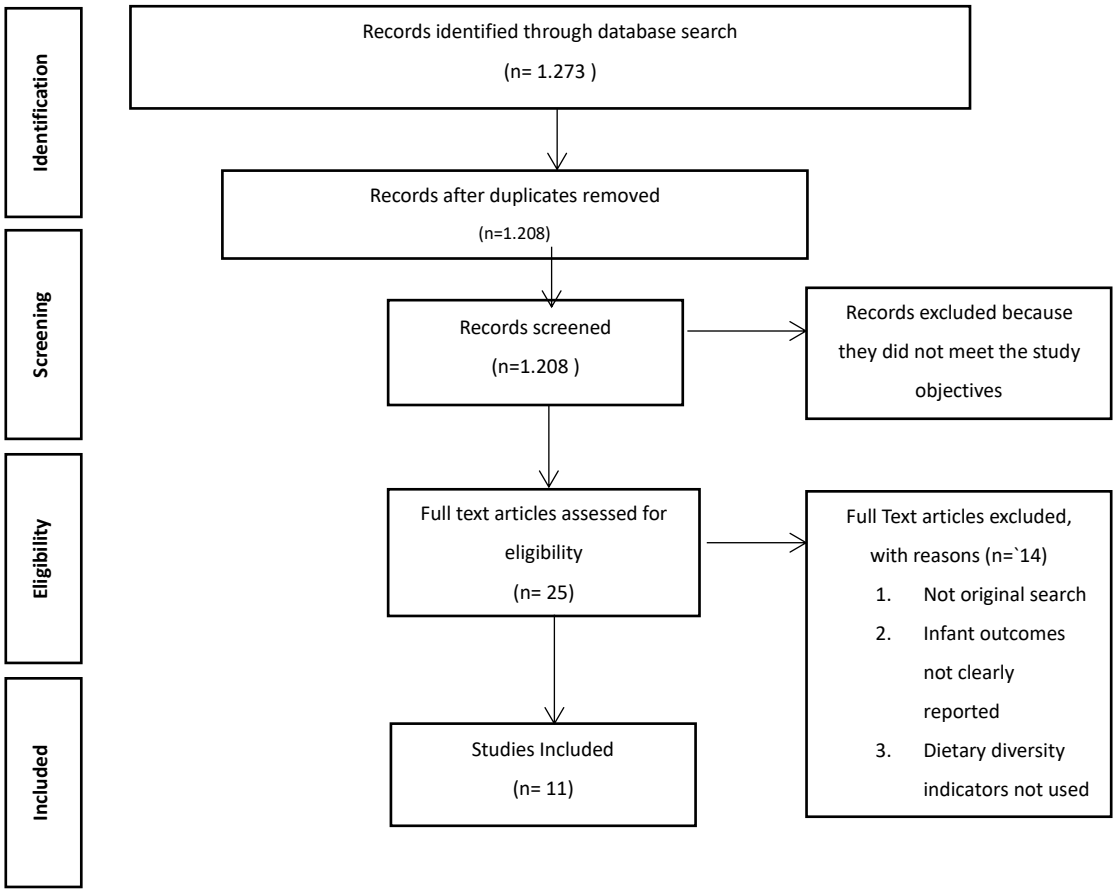

Figure 1. Flowchart of Literature Search and Study Selection

Results and Discussion

This review comprise studies conducted across diverse geographical regions, with a primary focus on developing nations in Africa and Asia. The research centered on pregnancy period and the respective infant outcomes, utilizing various study designs including prospective cohorts, cross-sectional studies, and case-control analyses. To measure maternal dietary variety, most researchers employed the FAO's Minimum Dietary Diversity for Women (MDD-W) which categorizes intake into 10 distinct food groups alongside the Dietary Diversity

Score (DDS). The infant health outcomes analyzed across these studies include birth weight, gestational age at birth, and nutritional status during early infancy.

Association between Maternal Dietary Diversity and Birth Weight

The majority of the evidence points to a significant positive correlation between a high Maternal Dietary Diversity Score (MDDS) and improved birth weight outcomes. Most of the literature supports the hypothesis that a more varied diet during pregnancy reduces the risk of Low Birth Weight (LBW). For instance, a case-control study in India by Sharma et al (2021) demonstrated that mothers with low dietary diversity faced a substantially higher risk of delivering LBW infants compared to those with diverse diets. [7] Similarly, research in Ghana by Quansah & Boateng (2020) revealed that women in the low dietary diversity group were four times more likely to have LBW infants.[8] Furthermore, a study in Ethiopia by Wondemagegn et al (2022) found that food diversification significantly increased average birth weights and was inversely associated with the risk of poor birth outcomes.[9]

However, the relationship is not always statistically consistent when rigorous controls for diet quality or socioeconomic variables are applied. A study in urban Tanzania by Yang et al (2021) found that the MDD-W score was not significantly associated with LBW or Gestational Weight Gain (GWG). Instead, their findings highlighted that the Prime Diet Quality Score (PDQS) which prioritizes the type of healthy foods consumed rather than just the number of food groups. this kind of type had a much stronger association with reduced LBW risk. These differing results suggest that while the number of food groups consumed is a vital indicator of micronutrient intake, specific food quality and the mother's baseline nutritional status may play

a more dominant role in determining birth weight in certain regional contexts.[10]

Impact on Infant Nutritional Status and Growth

Maternal health is the foundation for fetal growth in early life. Nutritional intake during pregnant suggested by many studies to be most important aspects influence maternal health. Maternal health status is influenced by maternal dietary diversity. A higher MDDS score reflects better nutritional adequacy, particularly in iron, protein, zinc, folate, and other essential micronutrients needed during pregnancy. Adequate nutritional intake supports optimal weight gain during pregnancy, reduces the risk of maternal anemia, and improves placental development and vascularization. A better maternal hematological status can ensure better oxygen transport to the fetus, while adequate protein and energy intake supports maternal tissue expansion and nutrient transfer to the fetus. Emerging evidence further suggests that maternal nutrition also influences early-life gut microbiota development. Changes in maternal gut microbiota during late pregnancy are partly shaped by dietary patterns, and microbial metabolites—such as short-chain fatty acids—may play a role in fetal immune and metabolic programming. This indicates that the impact of maternal diet extends beyond birth outcomes and may contribute to longer-term child health.[11] Therefore, maternal dietary diversity primarily strengthens the mother's physiological resilience, which in turn creates a favorable environment for fetal growth and development.

Research shows that a high dietary diversity score (MDDS) improves the mother's biological nutritional status, directly creating an ideal environment for fetal growth. Al-Hassan (2025) further confirms this by finding that a varied diet not only supports fetal physical development but also helps mothers maintain a pregnancy to term. By adjusting growth

measurements for gestational age, it is clear that diverse nutrition ensures the baby grows proportionally for its age.[12] Findings in Tanzania support this idea, where a high-quality diet was shown to reduce the risk of small-for-gestational-age (SGA) by 20%. This means that dietary diversity ensures the fetus does not lack the "raw materials" to reach its maximum growth potential in the womb. [10,13]

This remarkable impact of maternal diet continues even after the baby is born. A study in Uganda revealed that babies of mothers with the most diverse diets had a 30% lower risk of being underweight between 3 and 12 months of age. Interestingly, although maternal diet significantly influences child weight in the first year, this factor does not directly change the incidence of stunting or wasting.[14] Although maternal dietary diversity (MDD) has been shown to be protective for infant weight, this study interestingly shows that this relationship was not found for stunting (shortness) or wasting (extremely thin). This is because stunting and wasting have more complex roots than simply nutritional intake in the womb. Stunting specifilcally, reflects long-term, chronic nutritional problems influenced by many factors beyond pregnancy, such as maternal genetic height, recurrent childhood infections, and poor access to sanitation and clean water. Meanwhile, wasting is more often triggered by acute conditions, such as sudden illness or a drastic energy deficiency shortly after birth.

Here in lies the difference: weight-for-age (underweight) is much more sensitive to the mother's energy and protein intake during pregnancy, so the effects of maternal nutritional "savings" are immediately apparent on the baby's scales. Conversely, to prevent stunting or extremely thin babies, maternal diet alone is not enough. Furthermore, we need to recognize the limitations of measuring dietary diversity itself. The MDD score only measures the number

of food groups consumed, but does not account for the portion sizes or how well the mother's body absorbs these nutrients (bioavailability). Consuming a wide variety of foods in too small portions may be sufficient to maintain weight, but the causes of stunting can also be influenced by the environment.

Maternal dietary diversity reflects the overall quality of maternal nutritional intake during pregnancy and the postpartum period. Adequate maternal nutrition supports fetal growth and reduces the risk of adverse birth outcomes. Interestingly, a unique study by Jung et al (2023) in Bangladesh reported that maternal micronutrient status such as iron and zinc, obtained from a diverse diet during pregnancy, was significantly associated with the child's immune status. These findings suggest that the infant's immune system may be partly programmed by the quality of maternal nutrition from the prenatal period.[15] In addition to fetal development, the mother's nutritional intake can also affect the baby's health through breastfeeding. Previous studies have shown that maternal diet can influence the composition of breast milk, particularly the micronutrient and fatty acid profiles of certain nutrients that are important for infant growth and immune development. This pathway suggests that increasing maternal dietary diversity may support infant health not only through prenatal nutrition but also through breastfeeding after birth.[16]

Ultimately, a diverse maternal diet is a tremendous foundation, but it cannot work alone. Nutrition interventions during pregnancy must be closely integrated with child health programs, improved environmental sanitation, and appropriate parenting practices after birth to break the chain of stunting and wasting. A balance between maternal intake during pregnancy and the infant's growth and development environment is key to long-term health.

Research conducted by Beressa et al (2025) in demonstrated that integrating nutrition education with the Health Belief Model effectively increased maternal dietary diversity scores. This awareness and behavioral change then became a bridge that significantly increased infant birth weight. This demonstrates that the solution to nutritional problems goes beyond simply providing food; it must build mothers' confidence and understanding that every food choice on their plate is an investment in their child's future.[17]

Maternal nutrition plays a key role in determining the future health of the baby. There is a strong association between a high Maternal Dietary Diversity Score (MDDS) and increased birth weight. Through high dietary diversity, pregnant women can meet the surge in iron, folic acid, and zinc needed to support fetal cell growth. Researchers such as Sharma et al (2021) and Wondemagegn et al (2022), This study confirmed that the diversity of pregnant women's diets directly reflects their level of micronutrient adequacy. Consuming a variety of food groups—from cereals to animal proteins—ensures the fetus receives a consistent supply of iron, folic acid, calcium, and zinc. The availability of these nutrients is crucial for driving fetal cell growth and maintaining placental health. In short, a varied diet integrates adequate energy and protein intake to ensure optimal fetal development.[10,12]

However, when mothers switch to a diet low in variety or processed foods, the risk of micronutrient deficiencies increases sharply. A diet that is not diverse is often high in carbohydrates or processed foods which causes a deficiency of needed micronutrients or is known as “hidden hunger”, where the fetus lacks the specific building blocks needed for its growth resulting in low birth weight or a baby that is small for gestational age. For example, the lower risk of anemia in pregnant women associated with a diverse diet is due to increased

intake of iron-rich foods (from meat, nuts, and dark green vegetables) and bioavailable supplements such as vitamin C (from fruits and vegetables). Micronutrient deficiencies, such as iron deficiency anemia, are common during pregnancy, especially in resource-limited settings, and have well-documented detrimental effects on maternal health and fetal development. Addressing this anemia problem through dietary diversity directly contributes to a healthier maternal physiological condition, which is a prerequisite for optimal fetal growth. This 'hidden hunger' deprives the fetus of the raw materials needed for growth, often resulting in low birth weight.[12]

An important point to discuss arises from the findings of Yang et al (2021) in urban Tanzania, where the MDD-W (number of food groups) showed no significant association with birth outcomes, while the PDQS (Primary Diet Quality Score) did. This suggests that in certain contexts, particularly urban environments where ultra-processed foods are readily available, simply consuming from "different food groups" is not sufficient. The quality of these food groups—choosing nutrient-rich whole foods over nutrient-poor options—is a significant factor in determining birth weight and preventing preterm birth. This nuance suggests that future public health guidelines should emphasize “Healthy Diversity” rather than simply “Variety.”

One of the most compelling findings of this review is that the impact of maternal diet stretches well beyond the delivery room. Research by Madzorera et al (2020) in Uganda suggests that maternal nutrition "programs" infant growth trajectories, offering a protective effect against being underweight for up to one year after birth.[14] Furthermore, a study by Jung et al (2023) in Bangladesh introduced a functional dimension to this relationship: maternal micronutrient status during pregnancy was a significant predictor of child immune status. This

suggests that a lack of dietary diversity during pregnancy may result in permanent epigenetic or physiological changes, making babies more susceptible to infections and growth disorders in early childhood.[15]

Interventions based on the Health Belief Model can effectively increase maternal dietary diversity. Research by Beressa et al (2025) in Ethiopia showed that increasing dietary diversity depends not only on food security or economic access, but also on behavioral change and targeted nutrition education. Understanding the link between food intake and a child's future encourages pregnant women to be more conscious about choosing a diverse diet. When mothers realize that every mouthful is an investment in their baby's health, they are naturally more committed to adopting a nutritious diet. Therefore, we need to incorporate structured nutrition education into routine antenatal care (ANC) services. This step is not simply an additional procedure, but a crucial strategy to ensure the quality of life for babies from birth.

Although there is strong evidence supporting a link between maternal dietary diversity and birth weight, research gaps remain. Most studies prioritize birth weight as the primary outcome, while fewer examine gestational age, even though preterm birth is a leading cause of neonatal death. Additionally, researchers need more longitudinal studies to determine whether the immune and metabolic benefits of maternal dietary diversity continue into childhood and adolescence.

Conclusion

Our review concludes that dietary diversity during pregnancy is a crucial foundation for healthy fetal growth and postpartum infant immune development. These findings suggest in

which a varied nutritional intake directly mitigates the risk of low birth weight and supports better fetal maturity. Given the important role of maternal knowledge, public health policies need to shift to more practical, empowerment-based educational strategies. By ensuring that pregnant women consistently consume a variety of food groups, we are taking the most fundamental preventative step to improve the health of future generations.

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Conflict of Interest

The Author declares there is no conflict interest of this publication.

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