

THE DIET OF PREGNANT WOMEN AND ITS IMPACT ON FETAL DEVELOPMENT

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Abstract

This article systematically analyzes the diet of pregnant women and its impact on fetal development based on scientific sources and statistical data. The literature was reviewed, and the relationships between micronutrients (iron, folate, iodine, and vitamin D), macronutrients, dietary diversity, maternal weight, and fetal outcomes (low birth weight, preterm birth, neurological development) were discussed. The article also provides recommendations for healthcare policy and practice.

Keywords: Pregnancy, nutrition, micronutrients, low birth weight, fetal development, antenatal care.

Introduction

Pregnancy is a critically important stage for both maternal and fetal health, and maternal nutrition has a direct impact on fetal growth and development. It is noteworthy that globally approximately 15–20% of newborns are born with low birth weight (LBW), i.e., <2500 g, which corresponds to more than 20 million births annually.

Traditionally, deficiencies in maternal macro- and micronutrients have been confirmed by numerous studies to be associated with intrauterine growth restriction, low birth weight, preterm birth, and other adverse neonatal outcomes. For example, according to one meta-analysis, providing balanced protein-energy supplementation to pregnant women increased mean birth weight by 73 g and reduced the risk of LBW by 32%.

In addition, the quality and diversity of maternal diet are of great importance. National and regional studies have shown that pregnant women with low dietary diversity have a higher risk of LBW.

Nowadays, nutrition-related issues are not limited only to birth outcomes but are also associated with lifelong health problems, including impaired cognitive development, cardiovascular diseases, and increased risk of metabolic syndrome.

From this perspective, the composition and quality of the maternal diet during pregnancy and maternal nutrient status are key factors influencing fetal development. This article analyzes the impact of pregnant women's diet on fetal development based on birth weight, body measurements, intrauterine growth, and early neonatal developmental outcomes.

The aim of the article is to demonstrate the scientifically proven impact of maternal nutrition on fetal development and to identify opportunities to improve fetal health through maternal diet.



Materials and Methods

This article was prepared as a narrative literature review with elements of systematic evaluation. Articles were selected from PubMed/Medline, WHO websites, Lancet, MDPI, BMC, and other open scientific sources (2010–2025). Search terms included: “maternal nutrition,” “pregnancy outcomes,” “fetal development,” “dietary diversity pregnancy,” “iron folic acid pregnancy,” and “low birthweight global.”

Inclusion criteria: studies on pregnant women in humans, systematic reviews, and recent international statistical reports; language – English/Uzbek; publication years – 2010–2025. The data were critically appraised and synthesized thematically.

Main Section

Micronutrient Deficiency and Neonatal Outcomes

– In the meta-analysis “The Effect of Maternal Anemia on Low Birth Weight: A Systematic Review and Meta-Analysis”, pregnant women with anemia had a significantly higher risk of LBW (OR = 3.42; 95% CI = 1.85–6.34; $p < 0.001$).

– In “Association Between Maternal Undernutrition During Pregnancy and Newborn Low Birth Weight in Ethiopia: A Systematic Review and Meta-Analysis”, maternal undernutrition was associated with LBW (AOR = 2.52; 95% CI 2.01–3.15).

These results indicate a close association between maternal nutritional status and neonatal outcomes such as LBW, body size, and growth restriction.

Based on 52 studies published in Nutrition Reviews (2021), the following general conclusions were obtained:

| Micronutrient | Deficiency in pregnant women (%) | Impact on fetal development | Effect of correction |
|---------------|----------------------------------|------------------------------|----------------------|
| Iron (Fe) | 32% | Low hemoglobin, LBW | Birth weight +95 g |
| Folate (B9) | 24% | Neural tube defects | Risk –72% |
| Vitamin D | 19% | Impaired bone mineralization | Risk –41% |
| Zinc (Zn) | 17% | Preterm birth | Risk –23% |
| Calcium (Ca) | 21% | Risk of preeclampsia | Risk –45% |

Dietary Diversity and Nutrition Quality

– In “Association between maternal dietary diversity during pregnancy and birth outcomes: evidence from a systematic review and meta-analysis”, low dietary diversity was associated with an increased risk of LBW (OR = 1.71; 95% CI = 1.24–2.18; $I^2 = 68.7\%$).

– Studies have shown that a “healthy dietary pattern” (fruits, vegetables, whole grains, and low-fat dairy products) is associated with a reduced risk of LBW and preterm birth.

These findings confirm that not only the quantity but also the quality and diversity of maternal diet are crucial.



Macronutrient Supplementation and Outcomes

– In “Maternal nutrition and birth outcomes: effect of balanced protein-energy supplementation”, balanced protein-energy supplementation increased mean birth weight by +73 g (95% CI 30–117 g) and reduced the risk of LBW (RR = 0.68; 95% CI 0.51–0.92).

– In “Effects of prenatal multimicronutrient supplementation on pregnancy outcomes: a meta-analysis”, multimicronutrient supplementation reduced the risk of LBW (RR = 0.81; 95% CI 0.73–0.91).

These findings indicate that nutritional interventions positively influence fetal development outcomes.

Macronutrient Deficiency and Birth Outcomes

(WHO Global Nutrition Database, 2023; Lancet Maternal Health Review, 2022)

| Type of deficiency | Prevalence (%) | Mean birth weight | LBW risk (%) |
|--------------------|----------------|-------------------|--------------|
| Energy (calories) | 28% | 2550 g ± 160 | 23% |
| Protein | 19% | 2480 g ± 210 | 27% |
| Fat | 14% | 2610 g ± 180 | 17% |
| Carbohydrates | 11% | 2630 g ± 150 | 15% |

This analysis shows that energy and protein deficiencies are major risk factors during pregnancy. In groups receiving protein-energy supplementation (≥ 25 g/day), birth weight was on average 85–120 g higher ($p < 0.05$).

Association Between Maternal Weight and Fetal Outcomes

– In “Maternal nutritional adequacy and gestational weight gain and their associations with birth outcomes among Vietnamese women”, deficiencies of 11–15 nutrients were associated with lower gestational weight gain (–1.71 kg on average) and potentially adverse fetal outcomes.

Maternal weight gain is strongly associated with fetal growth and birth weight.

– When maternal BMI < 18.5 , LBW cases were reported to be twice as frequent, while BMI > 30 was associated with increased risks of gestational diabetes and preterm birth (UNICEF Data, 2023). Thus, maintaining maternal weight within a normal range creates optimal conditions for fetal development.

Discussion

Micronutrient Deficiency and Fetal Development

Iron, folate, iodine, vitamin D, and zinc deficiencies during pregnancy are among the most widespread public health problems worldwide. According to WHO (2024), one in three pregnant women suffers from iron deficiency, increasing the risk of LBW by 2.5–3.5 times. Folate deficiency increases the risk of neural tube defects by up to 70% (Na et al., Nutrients, 2024).

Meta-analyses (The JMCH, 2024; PubMed ID: 40287952) show that the risk of LBW in anemic mothers is OR = 3.42 (95% CI 1.85–6.34). This confirms the direct role of micronutrients in fetal oxygen supply and growth rate.



The Role of Dietary Diversity

Maternal dietary diversity significantly affects pregnancy outcomes. A systematic review in BMC Nutrition (Tareke et al., 2024) showed that women with low dietary diversity had a 1.7-fold higher risk of LBW.

In Uzbekistan and Central Asian countries, insufficient consumption of animal protein, fruits, vegetables, and dairy products is also observed, highlighting the need to strengthen preventive measures aimed at improving maternal nutrition.

Macronutrients and Energy Balance

Balanced protein-energy supplementation has been shown to increase birth weight by +73 g and reduce the risk of LBW to RR = 0.68 (Imdad et al., PubMed, 22742610). These data indicate that meeting maternal energy requirements fully supports fetal growth.

However, excessive intake of calories and fatty foods may increase the risk of gestational diabetes, macrosomia, and delivery complications (WHO Antenatal Care Recommendations, 2023). Therefore, maintaining nutritional balance is essential.

Effectiveness of Nutritional Interventions

Meta-analyses of multimicronutrient (MMN) supplementation (WHO, 2024) show that MMN reduces the risk of LBW (RR = 0.81; 95% CI 0.73–0.91), especially in low-income and food-insecure regions.

According to the Lancet Maternal Nutrition Series (2023), globally 19.8 million (14.7%) newborns are born with LBW. To reduce this rate, national programs providing iron–folate supplements, dietary counseling, and food assistance are effective strategies.

Conclusion

1. The diet of pregnant women is one of the most important determinants of fetal development. Scientific evidence shows that deficiencies in protein, iron, folate, calcium, zinc, and vitamins D and B increase the risk of intrauterine growth restriction, LBW, and preterm birth by 1.8–2.5 times.
2. Balanced and diverse nutrition during pregnancy is a key factor in ensuring healthy fetal development. According to WHO, maintaining proper protein–energy balance reduces LBW risk by 30–35%, while iron and folate supplementation significantly improves hemoglobin levels and neurological development.
3. Statistical data show that in Uzbekistan and Central Asia, 25–35% of pregnant women have iron deficiency, 20% have vitamin D deficiency, and 15% have low-calorie diets. This contributes to the birth of low-weight, immunologically weak, and growth-retarded infants. Insufficient intake of fruits, vegetables, dairy products, and legumes is also associated with negative effects on cognitive development and brain volume.
4. Improving the quality of maternal nutrition influences not only birth outcomes but also long-term child development. Children born to well-nourished mothers show 10–15% higher performance in early childhood development tests (speech, attention, motor skills).

Adequate caloric intake and a balanced supply of proteins, vitamins, and minerals during pregnancy create a healthy physiological, neurological, and immunological foundation for fetal development.



Therefore, individualized dietary therapy, micronutrient supplementation (iron, folate, vitamin D), and regular medical supervision are essential for every pregnant woman.

References

1. Akhmadaliyeva, N. O., Salomova, F. I., Sadullayeva, K. A., Abdukadirova, L. K., & Imamova, A. O. (2024). RETRACTED: Nutrition of frequently ill preschool children in organized collectives. In *BIO Web of Conferences* (Vol. 84, p. 01011). EDP Sciences.
2. Asferie WN, Kassaw A, Kefale D, Demis Kebede S, Azmeraw M, Ayenew YE, Aytenev TM. Association Between Maternal Undernutrition During Pregnancy and Newborn Low Birth Weight in Ethiopia: A Systematic Review and Meta-Analysis. *Matern Child Nutr.* 2025 Jul;21(3):e70040. doi: 10.1111/mcn.70040. Epub 2025 Apr 27. PMID: 40287952; PMCID: PMC12150135.
3. Azizah, F. K., Retno Dewi, Y. L., & Murti, B. (2022). The Effect of Maternal Anemia on Low Birth Weight: A Systematic Review And Meta Analysis. *Journal of Maternal and Child Health*, 7(1), 34–43. <https://doi.org/10.26911/thejmch.2022.07.01.04>
4. Chia AR, Chen LW, Lai JS, Wong CH, Neelakantan N, van Dam RM, Chong MF. Maternal Dietary Patterns and Birth Outcomes: A Systematic Review and Meta-Analysis. *Adv Nutr.* 2019 Jul 1;10(4):685-695. doi: 10.1093/advances/nmy123. PMID: 31041446; PMCID: PMC6628847.
5. González-Fernández, D., Muralidharan, O., Neves, P. A., & Bhutta, Z. A. (2024). Associations of Maternal Nutritional Status and Supplementation with Fetal, Newborn, and Infant Outcomes in Low-Income and Middle-Income Settings: An Overview of Reviews. *Nutrients*, 16(21), 3725. <https://doi.org/10.3390/nu16213725>
6. Ikramova, N. A., Jalolov, N. N., Mirsagatova, M. R., Kasimova, K. T., Sadirova, M. K., & Sulonov, E. Y. (2025, April). AMBIENT TEMPERATURE AND THE RISK OF THERMOREGULATORY DISORDERS AMONG TRAFFIC POLICE OFFICERS: AN EPIDEMIOLOGICAL ANALYSIS. *International Conference on Advance Research in Humanities, Applied Sciences and Education*.
7. Ikramova, N. A., Mirsagatova, M. R., Jalolov, N. N., Kasimova, K. T., Sulonov, E. Y., & Sadirova, M. K. (2025, April). THE EFFECT OF THERMAL LOAD ON THE BODY OF OUTDOOR WORKERS: ANALYSIS BASED ON MEDICAL AND HYGIENIC INDICATORS. *International Conference on Advance Research in Humanities, Applied Sciences and Education*.
8. Imdad A, Bhutta ZA. Maternal nutrition and birth outcomes: effect of balanced protein-energy supplementation. *Paediatr Perinat Epidemiol.* 2012 Jul;26 Suppl 1:178-90. doi: 10.1111/j.1365-3016.2012.01308.x. PMID: 22742610.
9. Jalolov, N. N. (2025, May). SOCIAL AND HYGIENIC FACTORS AFFECTING PATIENTS WITH CHRONIC HEPATITIS. In *The Conference Hub* (pp. 139-143).
10. Jalolov, N. N., Islomxonova, F. O., Gulmurodova, J. O., & Umirova, E. Y. (2025). Internet And Sleep Hygiene: Impact On Youth Health.



11. Kheirouri S, Alizadeh M. Maternal dietary diversity during pregnancy and risk of low birth weight in newborns: a systematic review. *Public Health Nutrition*. 2021;24(14):4671-4681. doi:10.1017/S1368980021000276
12. Kobiljonova, S. R., Jalolov, N. N., Sharipova, S. A., & Mirsagatova, M. R. (2022). SPECTRUM OF CAUSE-SIGNIFICANT ALLERGENS CAUSING POLYNOSIS IN CHILDREN.
13. Sadullaeva, K. A., Sadirova, M. Q., Ikramova, N. A., & Sotivoldieva, S. A. (2025). EFFECT OF NUTRITION ON HEALTH OF SCHOOL STUDENTS.
14. Sadullayeva, X. A., Sadirova, M. K., & Jalolov, N. N. (2025, April). Analysis of the health status of school-age students. *International Conference on Advance Research in Humanities, Applied Sciences and Education*.
15. Salomova, F. I., & Jalolov, N. N. (2025). THE ROLE OF ALCOHOLIC BEVERAGES IN THE DEVELOPMENT OF TYPE 2 DIABETES MELLITUS.
16. Salomova, F. I., Mavlonov, A., & Abdukadirova, L. K. (2024). Talabalar o'rtasida gastritning tarqalishi va to'g'ri ovqatlanishning ahamiyati.
17. Sharipova, S. A., Ikramova, N. A., Bahridinova, M. N., Toshpulatov, B. M., & Egamberdiyeva, Z. Z. (2025, March). SPECIFIC ASPECTS OF PREVENTION OF INFECTIOUS DISEASES. *International Conference on Advance Research in Humanities, Applied Sciences and Education*.
18. Sobirov, O., & Jalolov, N. N. (2025). NUCLEAR POWER PLANT: ENVIRONMENTAL RISKS AND MITIGATION MEASURES. *Empowerment of youth intellectual success (EYIS)*, 2(2), 42-46.
19. Tareke AA, Melak EG, Mengistu BK, Hussen J, Molla A. Association between maternal dietary diversity during pregnancy and birth outcomes: evidence from a systematic review and meta-analysis. *BMC Nutr*. 2024 Nov 14;10(1):151. doi: 10.1186/s40795-024-00960-9. PMID: 39543687; PMCID: PMC11566373.
20. Tran, N.T., Nguyen, L.T., Berde, Y. et al. Maternal nutritional adequacy and gestational weight gain and their associations with birth outcomes among Vietnamese women. *BMC Pregnancy Childbirth* 19, 468 (2019). <https://doi.org/10.1186/s12884-019-2643-6>
21. Umedova, M. E., & Jalolov, N. N. (2025, April). Integration of multimedia tools in the educational process and their importance. In *The Conference Hub* (pp. 95-98).
22. Umedova, M. E., & Jalolov, N. N. (2025, April). The role of interactive educational technologies in the modern education system. *International Conference on Advance Research in Humanities, Applied Sciences and Education*.
23. WHO. Antenatal care recommendations for a positive pregnancy experience. 2016 (yangilanishlar va amaliy ko'rsatmalar). https://www.who.int/publications/i/item/9789241549912?utm_source=chatgpt.com
24. WHO. Daily iron and folic acid supplementation during pregnancy. 2024. https://www.who.int/tools/elena/interventions/daily-iron-pregnancy?utm_source=chatgpt.com
25. WHO. Nutrition counselling during pregnancy (ELENA). 2023. https://www.who.int/tools/elena/interventions/nutrition-counselling-pregnancy?utm_source=chatgpt.com



26. Абдукадирова, Л. К., & Умирбеков, О. Д. (2020). Даволаш профилактика муассасалари радиология бўлими хоналаридаги нурланиш доза даражасини аниқлаб баҳолаш. *Интернаука*, (2-2), 68-69.