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The importance of family and community medicine in accurate nutrition and lifestyle change for a healthy pregnancy: a concise systematic review

Ana Kellen Padilha Correia de Lima[1,*]

[1] Family Physician at the General Hospital of Cuiabá / Unic - University of Cuiabá, Cuiabá, Mato Grosso, Brazil.

*Corresponding authors: Ana Kellen Padilha Correia de Lima.
Family Physician at the General Hospital of Cuiabá / Unic -
University of Cuiabá, Cuiabá, Mato Grosso, Brazil.
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Abstract

Introduction: Diet has a great impact on the outcome of pregnancy. Health professionals have an important role in monitoring anthropometric and laboratory tests, observing signs and symptoms resulting from nutritional deficiencies and excesses, and supplementation is therefore always used in a specific and individualized manner. Lifestyle monitoring is essential for a healthy pregnancy. **Objective:** A systematic review was carried out to present the precise nutrology importance and lifestyle changes in a healthy pregnancy. **Methods:** The PRISMA Platform systematic review rules were followed. The search was carried out from August to September 2025 in the Scopus, PubMed, Science Direct, Scielo, and Google Scholar databases. The quality of the studies was based on the GRADE instrument and the risk of bias was analyzed according to the Cochrane instrument. **Results and Conclusion:** A total of 102 articles were found, and 30 articles were evaluated in full, and 12 were included and developed in the present systematic review study. Considering the Cochrane tool for risk of bias, the overall assessment resulted in 24 studies with a high risk of bias and 22 studies that did not meet GRADE and AMSTAR-2. Most studies showed homogeneity in their results, with X^2=82.5%>50%. Pregnancy is a time with physiological and metabolic changes of great importance for the development of the fetus. Good nutrition pre-conception, during pregnancy, and lactation associated with lifestyle changes are predictive of better health for children in childhood and adulthood. In this process, the role of the health professional is important to monitor whether development is adequate. Adequate maternal intake of macronutrients and micronutrients can meet all recommended daily needs and, in this case, it will not be necessary to supplement with multivitamins. Nutritional deficiencies are common, especially in iron and vitamin D, and must be corrected before symptoms appear.

Keywords: Nutrology. Lifestyle. Pregnancy. Micronutrients. Macronutrients. Quality of life.

Introduction

In the context of women's health, pregnancy is a phase of life during which women are more concerned about nutrition and adopting a healthier lifestyle, focusing on their own Well-being and the proper development of the child [1]. Diet has a great impact on the outcome of pregnancy, being positive if there is adequate nutrition meeting the increased energy needs of the pregnant woman and the fetus, or negative if the pregnant woman has suffered from malnutrition or overnutrition [2].

In this sense, health professionals play an important role in monitoring anthropometric and laboratory tests, observing signs and symptoms resulting from nutritional deficiencies and excesses, providing guidance on dietary measures and introducing supplements when necessary, as well as providing guidance on lifestyle changes. Guidance should begin before conception and be followed during prenatal and postnatal care, thus facilitating a positive outcome [1,2].

When a pregnant woman eats an adequate and varied diet, both in terms of macronutrients and micronutrients, according to daily recommendations, supplementation with multivitamins may not be necessary. Therefore, supplementation should always be used in a specific and individualized manner. Iron and folic acid are two micronutrients that should be supplemented in all pregnant women. Folic acid, more specifically, should be started at least 3 months before conception. Thus, many women begin using it when they want to get pregnant. Other supplements will depend on the pregnant woman's diet **[1-4]**.

As a result of good nutrition, adequate weight gain is observed. This gestational weight gain should follow the BMI of the period prior to pregnancy. If the gain is unsatisfactory, guidance measures and analysis of the diet should be taken by the health professional who monitors this pregnant woman **[5,6]**.

Therefore, the present study carried out a systematic review in order to present the nutritional importance and lifestyle changes during pregnancy.

Methods

Study Design

This study followed an international model for systematic review, adhering to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. Available at: http://www.prisma-statement.org/?AspxAutoDetectCookieSupport=1. Accessed on: 09/15/2025. The methodological quality standards of AMSTAR-2 (Assessing the methodological quality of systematic reviews) were also followed. Available at: https://amstar.ca/. Accessed on: 09/15/2025.

Data Sources and Research Strategy

The literature search process was conducted from August to September 2025 and developed based on Scopus, PubMed, Lilacs, Ebsco, Scielo, and Google Scholar, covering scientific articles from various periods to the present day. The following descriptors (DeCS /MeSH Terms) were used: *"Nutrology. Lifestyle. Pregnancy. Micronutrients. Macronutrients. Quality of life"*, and using the Boolean operator "and" between MeSH terms and "or" between historical findings.

Study Quality and Risk of Bias

Quality was classified as high, moderate, low, or very low regarding the risk of bias, clarity of comparisons, precision, and consistency of analyses. The most evident highlight was for systematic review articles or meta-analyses of randomized clinical trials, followed by randomized clinical trials. Low quality of evidence was attributed to case reports, editorials, and brief communications, according to the GRADE instrument. The risk of bias was analyzed according to the Cochrane instrument through the analysis of the Funnel Plot (Sample size versus Effect size), using Cohen's d test.

Results and Discussion

Summary of Findings

A total of 102 articles were submitted to eligibility analysis, with 12 final studies selected to compose the results of this systematic review. The listed studies presented medium to high quality (Figure 1), considering the level of scientific evidence of studies such as meta-analyses, consensus, randomized clinical trials, and prospective and observational studies. Biases did not compromise the scientific basis of the studies. According to the GRADE instrument, most studies showed homogeneity in their results, with X^2=82.5%>50%. Considering the Cochrane tool for risk of bias, the overall evaluation resulted in 24 studies with a high risk of bias and 22 studies that did not meet the GRADE and AMSTAR-2 criteria.

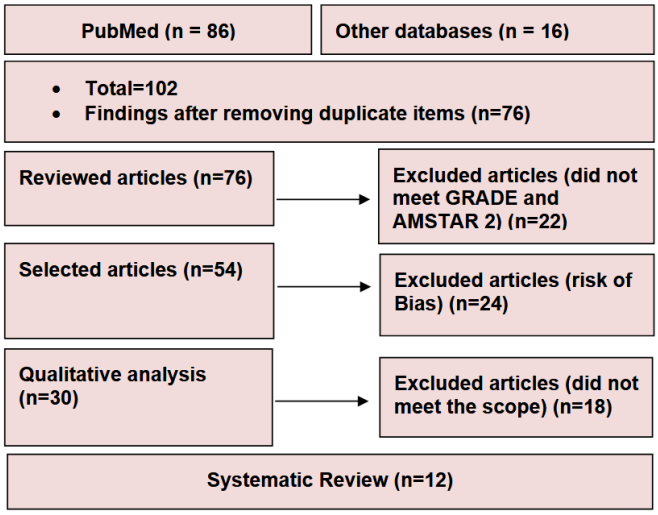

Figure 1. Flowchart showing the article selection process. Source: Own Authorship.

Figure 2 presents the results of the risk of bias of the studies using the Funnel Plot, showing the calculation of the Effect Size (Magnitude of the difference) using Cohen's Test (d). The precision (sample size) was determined indirectly by the inverse of the standard error (1/Standard Error). This graph had a symmetrical behavior, not suggesting a significant risk of bias, both between studies with small sample sizes (lower precision) that are shown at the bottom of the graph and in studies with large sample sizes that are presented at the top.

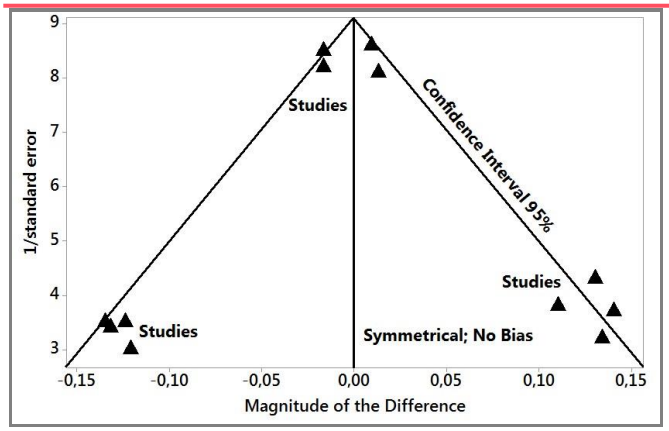

Figure 2. The symmetrical funnel plot does not suggest a risk of bias between the small sample size studies that are shown at the bottom of the graph. High confidence and high recommendation studies are shown above the graph (n=12 studies). Source: Own Authorship.

Main Outcomes – Nutrition, Pregnancy and Lifestyle

Pregnancy, a period of great physical and psychosocial changes for women, is marked by physiological adaptations in the pregnant woman's body. These affect the metabolism and functioning of maternal organs to provide adequate fetal growth and development **[1]**. In the cardiovascular system, there is an increase in heart rate associated with an increase in cardiac output. With peripheral vasodilation and a reduction in plasma proteins, mainly albumin, venous stasis and edema in the lower limbs are observed. There is also hemodilution and, consequently, physiological anemia. Thus, pregnant women frequently complain of dizziness, dyspnea, and fatigue **[1,2]**.

In the respiratory system, the growth of the fetus pushes the diaphragm, hindering lung expansion and causing dyspnea. There is also increased oxygen (O_2) consumption and increased carbon dioxide (CO_2) production, which are compensated for by hyperventilation with more efficient expiration. In the digestive system, slowed gastric emptying is observed, causing symptoms such as nausea, vomiting, gastroesophageal reflux, and constipation. Due to reduced gallbladder contraction, discomfort may also occur when consuming fatty foods, and there is a greater predisposition to the formation of cholelithiasis **[3,4]**.

In the urinary system, an increased glomerular filtration rate associated with physiological glycosuria is observed. There is also an increase in urinary frequency due to the mechanical pressure that the uterus exerts on the bladder and hormonal changes **[3]**. In terms of metabolism, there is an increase in the basal metabolic rate due to the needs of the fetus and the increased maternal consumption. To maintain the supply of glucose for the fetus, body fat is mobilized for use as an energy source for the mother. Thus, plasma levels of fatty acids and triglycerides are elevated. Although there is an increase in pancreatic beta cells, there is an increase in peripheral insulin resistance and, consequently, hyperglycemia and hyperinsulinemia. It is essential to monitor blood glucose levels and perform oral glucose tolerance tests to monitor and diagnose gestational diabetes early, which can impair the proper development of the fetus **[4,5]**.

Psychological changes are associated with hormonal changes and sociocultural factors. The patient often feels pressured and judged, in addition to worrying about the new responsibility that is to come. Often, at this time, she also experiences conflicts with the child's father. Thus, manifestations such as anxiety, bulimia, excessive weight gain, vomiting, and hyperemesis may be present **[6]**.

Having a healthy diet associated with physical activity and improved habits (predominantly plant-based diets, exercise, adequate sleep, stress management, moderation of alcohol use, smoking cessation, and emotional resilience) has a great positive impact on the health of all individuals at any stage of life in which it is adopted. However, the first 1100 days of a pregnant woman's diet, including 90 days before conception, 280 days of gestation, and the first two years of breastfeeding, which is equivalent to 730 days, are the most important in the process of human development and health. During this period, fetal organ development, metabolic programming, and other processes occur that will favor a child with a lower risk of chronic diseases such as obesity, diabetes, and cardiovascular diseases in the future **[7,8]**.

Many studies also show that a good lifestyle for both mother and father at least 3 months before conception improves male and female germ cells before conception and modifies the development of the embryo and fetus **[1]**. Thus, the change in the parents' genetic expression is transferred to the child; this is called epigenetic inheritance. This epigenetic inheritance can reduce the risk of the child developing some chronic diseases in adulthood. It is worth noting that there is no change in the genetic material itself, but rather in the way it is expressed **[2]**.

Since metabolic activity increases during pregnancy, leading to higher consumption of some nutrients than others, there is a need for increased and adequate dietary intake of micronutrients and macronutrients. Therefore, the amount consumed

from each food group should increase as recommended by the Dietary Guidelines **[2]**. Offering the general population a diet distributed in 3 to 6 daily meals with varied portions of vegetables, legumes, fruits, whole grains, dairy products, and proteins likely achieves the recommended daily intake for most nutrients. However, during pregnancy, some nutrients are consumed in greater quantities, requiring supplementation if increased consumption of foods rich in these nutrients alone is insufficient **[9]**.

The diet in most countries around the world is richly composed of ultra-processed foods and products with low nutritional value. In addition, it does not meet the recommended intake of several nutrients. Data from the US National Health and Nutrition Examination Survey (NHANES) show that the world population has consumed half the recommended amount of vegetables and total dairy products by pregnant and lactating women **[2]**. And data from the Household Budget Survey for the 2008-2009 biennium in Brazil show that the recommended food intake is not met by 90% of the Brazilian population. Therefore, the Academy of Nutrition and Dietetics considers micronutrient supplements necessary in pre-conception, pregnancy and breastfeeding **[1,2]**.

The increased metabolic rate during pregnancy can be assessed through calorimetry, bioimpedance or formulas adjusted to the level of physical activity and increased energy needs **[3]**. This increase in caloric intake varies between the trimesters of pregnancy and the pregnant woman's body mass index (BMI). Normally, in the first trimester of pregnancy, intake remains the same as in the pre-pregnancy period. In the second and third trimesters, most pregnant women will need to increase their caloric intake to promote adequate weight gain **[4]**.

The increase in calories during the second and third trimesters of pregnancy varies according to the pregnant woman's BMI before becoming pregnant. If she had a BMI in the normal range, it is recommended to increase between 340 and 450 kcal per day. If the pregnant woman had a BMI below normal, add even more calories to gain adequate weight. If overweight, add around 260 to 360 kcal per day. And if she is obese, it may be necessary for her not to increase the amount of calories to avoid weight gain during pregnancy **[4]**. According to the Ministry of Health, daily macronutrient recommendations can vary between 10-35% protein, 20-35% lipids, and 46-65% carbohydrates, with an energy intake greater than 1800kcal/day **[2]**.

The recommended weight gain during pregnancy is also related to the woman's BMI before pregnancy. It corresponds to 9% for the fetus, 14% for breast enlargement, 23% for fetal membranes and plasma fluid, 27% for maternal fat depot, and 27% for plasma volume 6. Excess weight gain is associated with the risk of macrosomia, large for gestational age (LGA), cesarean delivery, pregnancy-related hypertension, and gestational diabetes. If weight gain exceeds 0.68 kg per week, the professional needs to assess the pregnant woman's eating habits and the presence of pathological oedema, which may be associated with heart failure or nephropathy. Low gestational weight gain is associated with a higher risk of premature birth and small for gestational age (SGA) birth **[10]**.

For pregnant women who are overweight and/or obese with gestational weight gain below, but with adequate fetal growth observed on ultrasound, it is not necessary to increase food intake **[10,11]**. Weight gain recommendations for Asian populations are different from the criteria for the Western population **[11]**. Regarding micronutrients, each stage of pregnancy requires a greater amount of some specific nutrients. The main ones that should be consumed in greater quantities are: folate, vitamin B6, vitamin B12, vitamin A, vitamin D, vitamin C, vitamin E, calcium, iron, zinc, copper, iodine, selenium, choline and omega 3 **[12]**.

During consultations, the professional should perform laboratory tests, conduct anthropometric assessments, and observe clinical signs and symptoms of deficiency. Based on the assessment, supplementation should be prescribed. Multivitamins and minerals should be used by virtually all pregnant women, as a balanced and varied diet is not followed by most pregnant women and the world population. Specific supplements will be prescribed as needed. However, iron and folic acid should always be supplemented due to the high expenditure during pregnancy **[12]**.

The World Health Organization (WHO), the United Nations Children's Fund (UNICEF), and the World Food Programme (WFP) have developed recommendations for micronutrient supplementation in low-income regions to prevent maternal malnutrition. The most common micronutrient deficiencies are iron, vitamin A, calcium, and zinc. Supplementation should begin when there is a desire to become pregnant **[1]**.

Furthermore, iron is related to hematopoiesis, and there is an increase in its maternal need, especially in the 2nd and 3rd trimesters. Iron deficiency causes iron-deficiency anemia. For laboratory evaluation, ferritin is the main marker of

maternal iron reserve status, and its value should be greater than 30 mg/dL. It is present in beef, poultry, fish, liver, beans, lentils, chickpeas, and dark green leafy vegetables. All pregnant women should supplement with iron. In Brazil, a dose of 40 mg/day of elemental iron is recommended for up to 3 to 6 months after delivery. The WHO recommends a dose of 60 mg/day of elemental iron for 6 months. There are several forms of iron available on the market, which have different efficacy, absorption, and administration times **[1]**.

Also, vitamin B9 or folic acid is responsible for the closure and development of the neural tube, erythropoiesis, conversion of amino acids - homocysteine and methionine - and DNA synthesis. Folate obtained through food has an absorption rate of 50% in the enterocytes and is found in dark green leafy vegetables, asparagus, lentils, and chickpeas. Synthetic folate, present in multivitamins, has an absorption rate of 100% in the enterocytes. The daily requirement during pregnancy is 600 mcg, and supplementation is mandatory for all pregnant women. It is also recommended that supplementation be started whenever there is a desire to become pregnant or at least 3 months before conception. When there is a deficiency of methylfolate and methylcobalamin, there is an accumulation of homocysteine, and this hyperhomocysteinemia is associated with atherosclerosis, deep vein thromboembolism, pulmonary thromboembolism, cardiovascular disease, cancer, and type 2 diabetes mellitus **[1,2]**.

In addition, vitamin B12 or cobalamin acts in the maturation of red blood cells, in the metabolism of carbohydrates, lipids and proteins, and in the formation of the myelin sheath. It depends on intrinsic factor, hydrochloric acid and calcium to be absorbed in the ileum. In cases of bariatric surgery, alcoholism, celiac disease, atrophic gastritis, short bowel syndrome and metformin use, its absorption may be impaired. Low serum levels cause symptoms of tingling, altered sensitivity and weakness in the lower limbs. It is found in proteins of animal origin (offal, red meat, fish, poultry, eggs and dairy products). The recommended intake during pregnancy is 2.6 mcg and during lactation is 2.8 mcg. In vegan patients, supplementation is mandatory due to the low concentration and absorption in vegetables **[5]**.

Also, choline or vitamin B8 is not present in multivitamins for pregnant women in Brazil. However, in the US, the American Medical Association (AMA) already recommends choline in prenatal supplements **[9]**. It is part of the production of the lipoprotein phosphatidylcholine, a component of all cell membranes. The daily recommendation is 450mg. The main source is eggs, but it can also be found in smaller quantities in broccoli, flaxseed, and almonds.

Vitamin A or retinol is responsible for fetal and maternal vision and maintenance of the immune system. Its daily recommendation is approximately 750mcg. Its sources are yelloworange foods such as carrots, red peppers, tomatoes, and beef liver. Its excess, daily consumption greater than 7.5mg, is teratogenic, so it is recommended to advise pregnant women not to overdo it on beef liver consumption. Its deficiency can cause night blindness, maternal or fetal death, infections, and congenital malformations. The WHO recommends vitamin A supplementation in areas where more than 5% of women have a history of night blindness in their pregnancy **[7]**.

Vitamin B6 or pyridoxine is responsible for protein and glucose metabolism, as well as the synthesis of neurotransmitters - serotonin, dopamine, and norepinephrine. It is used in the treatment of hyperemesis gravidarum and in the prevention of pre-eclampsia. The daily recommendation is 1.9 mcg. Vitamin B1 or thiamine is responsible for cellular, cardiovascular, and fetal digestive tract development. Deficiency can occur in cases of alcoholism, malnutrition, frequent vomiting, and after bariatric surgery. Its deficiency is related to congenital defects, fetal death, and beriberi. The recommended daily intake during pregnancy and lactation is 1.4 mg **[10]**.

Vitamin C or ascorbic acid is responsible for stimulating maternal-fetal immune defenses and embryogenesis. The use of iron associated with vitamin C is recommended for greater iron absorption. The recommended daily intake is 83.3 mg during pregnancy and 118.3 mg during lactation. It is present in large quantities in oranges and acerola **[11]**. Vitamin D acts in the homeostasis of calcium and phosphorus for bone maintenance. Its synthesis is 90% from solar sources. There is a small amount of food. For prophylaxis, administer 1,000 to 2,000 IU per day to pregnant women. If the serum value is low, treatment during pregnancy should be with the use of 4,000 to 5,000 IU per day until reaching 40 ng/mL. During lactation, supplement up to 6,000 IU per day. Do not use weekly doses in pregnant women as they will not absorb in sufficient quantity. Vitamin E stimulates the immune system and, during pregnancy, prevents miscarriage and neurological abnormalities in the fetus. Its daily recommendation is 15 IU during pregnancy and 19 IU during lactation **[12]**.

Calcium is responsible for muscle contraction, insulin secretion, modulating hormonal reactions, and

has platelet activity. Its absorption is dependent on vitamin D, being more absorbed during pregnancy and lactation. Avoid consuming it with fiber, phytic acid, and oxalic acid because they decrease calcium absorption. The recommendation is 1150mg/day during pregnancy and breastfeeding. Its deficiency during pregnancy favors elevated blood pressure, pre-eclampsia, eclampsia, and premature birth **[12]**.

Iodine is used in the synthesis of T3 and T4 hormones. Its deficiency during pregnancy is related to increased perinatal mortality, miscarriage and stillbirths, congenital anomalies, and mental retardation (cretinism). In pregnant women, it causes hypothyroidism, goiter, and thyroid hypertrophy. The daily recommendation is 220mcg in pregnant women and 290mcg in lactating women. Iodine is mainly present in seafood. Due to the low consumption of seafood in non-coastal areas, Law No. 6,150/1974 makes the iodization of salt intended for human consumption mandatory. According to Anvisa, salt must be enriched with an iodine content equal to or greater than 15 milligrams per kilogram of salt, and should not exceed 45 milligrams per kilogram of salt. A recent problem is the removal of white salt and its replacement with Himalayan salt, which does not contain iodine. Thus, cases of hypothyroidism due to iodine deficiency have increased. Pregnant women should be aware of this. The WHO and the United Nations Children's Fund (UNICEF) recommend iodine supplementation (250 micrograms daily) for pregnant women in countries where less than 20% of families have access to iodized salt **[2-4]**.

Zinc has antioxidant and immunological functions. It is recommended that pregnant women consume 11 mcg per day and breastfeeding women 12 mcg per day. However, the WHO does not recommend supplementation. For now, it is only being used in research. Studies show that its deficiency may be related to spontaneous abortion, postpartum maternal hemorrhage due to atony, low birth weight, intrauterine growth retardation, premature birth, and delayed weight-for-height development in the child **[6]**.

Omega-3 (EPA and DHA) are polyunsaturated fatty acids (PUFAs) and have a role in preventing cardiovascular and immunological diseases. During pregnancy, they act in the formation of the fetal retina, improving infant vision, and in the development of the central nervous system, improving the child's psychomotor development. The recommendation is at least 200mg during pregnancy and in the first 3 months of breastfeeding. For pregnant women, the most important is DHA. It is found in salmon, sardines, chia, and flaxseed **[6]**.

The WHO does not recommend supplementation of vitamins B6, C, D, and E during pregnancy because there is still no evidence of benefit from supplementation. Ideally, foods rich in these nutrients should be added to avoid deficiencies **[1]**. It is worth noting that food has better absorption than supplementation. So, if the pregnant woman manages to have a healthy and varied diet that meets the daily values of nutrients, it is not necessary to supplement most of the nutrients mentioned. In addition to good nutrition, empirical anthelmintic treatment of the mother should be carried out in areas where helminths are endemic and anemia is prevalent. This will impact the reduction in the frequency of anemia in pregnancy.

In this context, maternal malnutrition is directly related to poor placental development, fetal growth restriction, low birth weight, and premature birth. The diagnosis can be made using both arm circumference and body mass index (BMI). Arm circumference reflects maternal fat stores and lean mass. The Sphere guidelines recommend that if the arm circumference is between 21 and 23 cm, the mother should be enrolled in supplemental feeding programs; if it is less than 21 cm, the mother should be classified as a humanitarian emergency **[1,2]**.

By assessing BMI, pregnant women with a BMI below 18.5 kg/m² are considered to have mild malnutrition. A BMI below 16.0 kg/m² is considered severe malnutrition and carries a high risk of low birth weight and premature birth. During the follow-up of malnourished pregnant women, the United Nations High Commissioner for Refugees suggests a mid-arm circumference greater than 23 cm or a BMI greater than 18.5 kg/m² as a criterion for discontinuation from the feeding program. If the pregnant woman's weight gain is unsatisfactory, even if she is eating adequately, the existence of diseases such as HIV, tuberculosis, tumors, blood dyscrasias, and other chronic diseases should be evaluated **[1,8]**.

Conclusion

It was concluded that pregnancy is a time of great importance for fetal development through physiological and metabolic changes. Good nutrition before conception, during pregnancy, and during lactation, combined with lifestyle changes, is predictive of better child health in childhood and adulthood. In this process, the role of the healthcare professional is important in monitoring whether development is adequate. Adequate maternal intake of macronutrients and micronutrients can meet all recommended daily needs, and in this case,

supplementation with multivitamins will not be necessary. Nutritional deficiencies are common, especially iron and vitamin D, and should be corrected before symptoms appear.

CRediT

Author contributions: **Conceptualization**; **Data curation**; **Formal Analysis**; **Investigation; Methodology**; **Project administration; Supervision**; **Writing - original draft**; **Writing-review & editing**- Ana Kellen Padilha Correia de Lima.

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Conflict of Interest

The authors declare no conflict of interest.

Similarity Check

It was applied by Ithenticate®.

Application of Artificial Intelligence (AI)

Not applicable.

Peer Review Process

It was performed.

References

1. World Health Organization. WHO antenatal care recommendations for a positive pregnancy experience. Nutritional interventions update: multiple micronutrient supplements during pregnancy. Geneva, Switzerland: World Health Organization; 2020. Accessed in August, 20, 2025.
2. National Academies of Sciences, Engineering, and Medicine, Health and Medicine Division, Food and Nutrition Board In: Harrison M, ed. Nutrition during pregnancy and lactation: exploring new evidence: proceedings of a workshop. Washington, DC: National Academies Press; 2020.
3. Stoody EE, Spahn JM, Casavale KO. The Pregnancy and Birth to 24 Months Project: a series of systematic reviews on diet and health. Am J Clin Nutr 2019;109:685–697S.
4. Raghavan R, Dreibelbis C, Kingshipp BL, et al. Dietary patterns before and during pregnancy and maternal outcomes: a systematic review. Am J Clin Nutr 2019;109:705– 728S.
5. Raghavan R, Dreibelbis C, Kingshipp BL, et al. Dietary patterns before and during pregnancy and birth outcomes: a systematic review. Am J Clin Nutr 2019;109:729– 756S.
6. Güngör D, Nadaud P, LaPergola CC, et al. Infant milk-feeding practices and diabetes outcomes in offspring: a systematic review. Am J Clin Nutr 2019;109:817–837S.
7. US Department of Agriculture. US Department of Health and Human Services. Dietary Guidelines for Americans, 2020–2025. 9th Edition. Dietary Guidelines for Americans. 2020. Available at: https://www.dietaryguidelines.gov/sites/default/files/202012/Dietary_Guidelines_for_Americans_2020-2025.pdf. Accessed September 22, 2025.
8. Dietary Guidelines Advisory Committee. Scientific report of the 2020 Dietary Guidelines Advisory Committee: advisory report to the Secretary of Agriculture and the Secretary of Health and Human Services. Dietary Guidelines for Americans. 2020. Available at: https://www.dietaryguidelines.gov/2020-advisory-committee-report. Accessed September 11, 2025.
9. Marshall NE, Abrams B, Barbour LA, Catalano P, Christian P, Friedman JE, Hay WW Jr, Hernandez TL, Krebs NF, Oken E, Purnell JQ, Roberts JM, Soltani H, Wallace J, Thornburg KL. The importance of nutrition in pregnancy and lactation: lifelong consequences. Am J Obstet Gynecol. 2022 May;226(5):607-632. doi: 10.1016/j.ajog.2021.12.035.
10. Koletzko B, Godfrey KM, Poston L, Szajewska H, van Goudoever JB, de Waard M, Brands B, Grivell RM, Deussen AR, Dodd JM, Patro-Golab B, Zalewski BM; EarlyNutrition Project Systematic Review Group. Nutrition During

Pregnancy, Lactation and Early Childhood and its Implications for Maternal and Long-Term Child Health: The Early Nutrition Project Recommendations. Ann Nutr Metab. 2019;74(2):93-106. doi: 10.1159/000496471.

11. Brown B, Wright C. Safety and efficacy of supplements in pregnancy. Nutr Rev. 2020 Oct 1;78(10):813-826. doi: 10.1093/nutrit/nuz101. Erratum in: Nutr Rev. 2020 Sep 1;78(9):782.
12. Huang LT. Maternal and Early-Life Nutrition and Health. Int J Environ Res Public Health. 2020 Oct 30;17(21):7982. doi: 10.3390/ijerph17217982.