Journal of e-Science Letters
Review Article | ISSN 3041-5454

Nutritional requirements during pregnancy a comprehensive review

Aiman Arshad, Saleema Muqadas, Farhat Javid, Asma Saghir Khan*

Department of Home Economics, Food and Nutrition Division, Mirpur University of Science and Technology (MUST), Mirpur, Azad Jammu and Kashmir, Pakistan

ABSTRACT

Pregnancy is an important stage in a woman's life that requires proper nutrition and healthy lifestyle practices to support both the mother and the developing baby. During this period, a woman's body goes through several hormonal, physical, and metabolic changes which increase nutritional needs. Common problems such as nausea, tiredness, vomiting, and digestive discomfort may also affect eating habits. Since the fetus completely depends on the mother for nourishment, maintaining a balanced and healthy diet is very important throughout pregnancy. Adequate nutrition during pregnancy helps in fetal growth, development of maternal tissues, and preparation for breastfeeding after delivery. Nutrients such as proteins, carbohydrates, fats, vitamins, and minerals are all essential for maintaining a healthy pregnancy. Protein is necessary for the development of fetal tissues and the placenta, while carbohydrates provide energy required for daily activities and body functions. Healthy fats, especially omega-3 fatty acids, contribute to the proper development of the baby's brain and eyes. Micronutrients including iron, folic acid, calcium, vitamin D, and iodine also play a major role in supporting maternal and fetal health. Deficiency of these nutrients during pregnancy can increase the risk of complications such as low birth weight, premature delivery, poor fetal growth, and other health problems. Therefore, pregnant women are advised to consume a nutritious and balanced diet to meet the increased nutritional demands of pregnancy. Maternal lifestyle and body weight can also influence pregnancy outcomes. Maintaining a healthy body weight before conception, gaining appropriate weight during pregnancy, and engaging in light physical activity may reduce the risk of complications such as gestational diabetes and high blood pressure. Following healthy dietary recommendations can improve both maternal well-being and infant health outcomes. Pregnancy also provides a valuable opportunity to encourage healthy eating habits and positive lifestyle changes. Proper nutritional awareness and guidance can help women achieve healthier pregnancies and support the long-term health of both mother and child.

Keywords: *maternal nutrition, Balance diet, fetal development, micronutrients, macronutrients, deficiencies, Hydration level, omega-3 fatty acids.*

Introduction

The growth of fetal rely on the mother's nutrition. Mother's health also depends upon proper intake of nutrition. During pregnancy it's very necessary for mothers to take proper nutrition which decreases the chances of high blood pressure and gestational diabetes. Mother's diet is very important for baby growth and development. A healthy mother's lifestyle promotes better growth of fetal and necessary for the mother's health [1]. During pregnancy many physical, hormonal and metabolic changes occur in female body. Women suffer from nausea, fatigue, vomiting etc.

Citation: Aiman Arshad, Saleema Muqadas, Farhat Javid, Asma Saghir Khan (2026). Nutritional requirements during pregnancy a comprehensive review. *Journal of e-Science Letters.*
DOI: https://doi.org/10.51470/eSL.2026.7.2.18

Received: 02 February 2026
Revised: 08 March 2026
Accepted: 05 April 2026
Available: May 01 2026

Corresponding Authors: **Asma Saghir Khan**
Email: **asma.sagheer@must.edu.pk**

© 2026 by the authors. The license of Journal of e-Science Letters. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/)

Maternal diet is very crucial for fetal growth and development, that's why mother's diet is very important healthy diet of mother and proper intake of nutrients i.e, protein, iron, folate, calcium and vitamins are vital. For healthy pregnancy it's important for mothers to maintain proper BMI and ensure light physical activity. Many changes occur during Pregnancy such as physiological, metabolic changes female body prepare itself for proper lactation. In rural areas and low income countries, shortage of nutrients affects more than two billion people worldwide. Women would not take enough nutrition due to poor diet that effect fetal growth and development and cause many problems after delivery [2]. The risk of chronic diseases also increases in later life. That's why it's very important for mothers to take balance diet and maintain healthy lifestyle.

Protein is very important for the development of maternal tissues, formation of placenta and fetal growth. The main source of energy is carbohydrates [3]. Carbohydrates are also important for digestive health. For the development of fetal brain and eye fats mostly omega-3 fatty acids are very crucial. Fats also cause proper absorption of vitamins.

Micronutrients:

- Minerals
- Vitamins
- Are required in small quantity but important for:
- metabolism
- Growth
- And development.

Pregnancy is a special opportunity to promote healthy habits. Different physiological changes are involved during pregnancy, including:

- Gestational weight
- Metabolic adaptations

Increased nutrient demands, where both insufficient and too much weight gain can lead to harmful fetal and maternal outcomes. It is important to increase nutritional requirements during pregnancy, like increases in energy and specific nutrients, with emphasis on:

- Vitamin D
- Folate
- Iodine
- DHA

And also follow a balance diet.

Physiological changes during pregnancy

Pregnancy brings many changes to human body, its physiology and its metabolism. Placenta releases many hormones that bring a change in how nutrients are used, stored and transported in the human body. It helps to store large number of nutrients; your body absorbs them better and decreases their loss through urine. Metabolism speeds up, so the basal metabolic rate increases, blood volume goes up and body stores more fat [4]. It also increases the level of triglycerides in blood. In late pregnancy, the body also holds on nitrogen, decreases the synthesis of urea and use proteins and amino acids for the growth of fetus. Calcium absorption increases, some calcium is released from bones into the blood, and more calcium is passed in urine hormones also relax smooth muscles which affect the stomach, intestines and urinary tract.

Components of weight gain are

1. Fetus– about 28%
2. Maternal fat stores – about 26%
3. Extracellular fluid – about 9%
4. Breasts– about 8%
5. Amniotic fluid_ about 8%
6. Uterus– about 8%
7. Blood– about 7%
8. Placenta– about 6%

Weight gain during pregnancy is not just the baby but also includes extra fat deposition, blood, fluids and amniotic fluid. Gaining too much weight can lead to a bigger baby having large birth weight and higher chances of C-section, gestational diabetes and hypertension. On the other hand, insufficient weight gain results in low birth weight and early delivery Since there are no proper guidelines of UK about weight gain so doctors use the US guidelines based on BMI before pregnancy [5]. By 34-36 weeks of pregnancy, blood volume increases to 50 percent Pregnancy have natural resistance to insulin and send large amounts of glucose to the fetus but if body is unable to produce enough insulin, gestational diabetes occurs. Body's ability to absorb iron and calcium increases during pregnancy and loss of some micronutrients through urine becomes less to meet the demands of body.

Energy Requirements During Pregnancy

Energy requirements during pregnancy are uncertain due to changes in fat deposition and physical activity. To estimate energy requirements in underweight, normal-weight, and overweight pregnant women.

Energy expenditure is measured using BMR, doubly labeled water (TEE), and body composition methods.

BMR increased throughout pregnancy.
TEE and physical activity showed small changes.
Energy deposition differed by BMI.
Higher fat gain in high-BMI women.
Overall energy requirements increased in pregnancy.
Energy requirements increased especially in the 2nd and 3rd trimesters.
~350–500 kcal/day increase in normal-BMI women.
Pregnancy increases energy needs due to higher BMR and tissue deposition.
Reduced physical activity did not fully compensate for increased energy needs.

Macronutrients

Macronutrients like (protein, carbohydrates, and fats are important during pregnancy because they help support both the mother's body and the baby's growth. Protein is needed for the baby's development, as well as for forming the placentas and supporting changes in the mother's body. Carbohydrates are the main source of energy, and it's better to choose complex carbs, (like whole grains) because they provide consistent energy and help with digestion. Fats are also important, especially omega-3 fatty acids, which support the baby's brain and eye development and help the body digest these vitamins [6]. Research shows that what mother eats can affect a baby's growth. For example, higher carbohydrate intake is often linked to higher birth weight, while higher fat intake may be linked to lower birth weight [7]. Eating too much high sugar (high options support more normal growth. On average, pregnant women must consume around 78 g of protein per day, which is slightly higher than the recommended 60–70 g. Carbohydrate intake averages about 262 g per day, which is above the recommended 175g, while fat intake around 74 g per day, which falls within the healthy range. However, the type of fat matters. Taking too much saturated fats like from processed or fatty animal foods, can increase the risk of obesity and health problems for the child later in life. So, it's better to focus on healthier fats and maintain a balanced diet overall.

Micronutrients

During pregnancy, the need of nutrients is very important for health of women but it has been found that mostly women do not take enough nutrients during their pregnancy which effect growth and development of fetal and cause many health issues during adulthood like diabetes, heart problems, and high blood pressure [8]. Their energy intake is not sufficient to meet the required standards which leads to many health problems.

Essential micronutrients are:

- Iron
- Iodine
- Zinc
- Calcium
- Folate
- Vitamin D
- Vitamin A
- Vitamin B 12
- Copper

Micronutrients deficiencies
Almost two billion people suffer due to deficiencies of micronutrients.

iron deficiency
Mostly women are iron deficient during pregnancy which leads to anemia. Higher risk of iron deficiency has been reported in obese women because of inflammation.

Vitamin D deficiency
Vitamin D deficiency has been reported in villages I, e 17.3% in pregnant women in Bangladesh.
Many risk factors like early pregnancy, anemia, multiple pregnancy also increase deficiency of vitamin D, iron deficiency.

Hydration during pregnancy
Enough fluid intake is important for improving maternal hydration status.
Large number of pregnant women experience dehydration during second trimester due to insufficient fluid intake.
Amino fluid index (AFI) is directly linked with the total fluid intake.

Main source of total fluid intake is plain water
- Contributing 78.8% to 100%
- Dairy products provided:
- 4.1% total fluid intake.
- Sugar Rich beverages contributing:
- 1.9%

Nutritional requirements during pregnancy
Pregnancy doesn't mean that you must eat for two, it never means overeating can help you in pregnancy. Quality of food is more important than quantity of food because metabolism becomes fast during pregnancy and body absorbs more nutrients and becomes efficient at using energy [9]. During pregnancy, some nutrients are required in larger amounts to meet the body's need and for proper growth and development of fetus.
These are:

1. Energy _200kcal/day
2. Protein_more than 6g/day
3. folate_more than 400 micrograms/day supplement in the first 12 weeks of pregnancy then the amount is decreased to 100microgram/day
4. others_thiamine more than 0.1g/ day

During pregnancy, the requirement doesn't increase but the body's ability to absorb nutrients from food increases hence more calcium and iron is absorbed. Healthy balanced diet is necessary for both maternal and fetal health. Healthy diets during pregnancy should include fruits, vegetables, whole grains, proteins rich food, dairy products, adequate water intake and vitamin supplements.
Women who are adhered to smoking, alcohol and unhealthy habits often follow fewer dietary patterns that can cause harm to both mother and baby. Healthy diets not only depend on the quantity of food or quality, but it also depends on BMI, activity and the trimester. Timings of food also matters .In pregnancy fiber rich food are highly recommended. Women should balance sugar intake and fatty foods during pregnancy to avoid complications.

Energy requirements of the body change from time to time during pregnancy as the highest energy demand is in 2nd and 3rd trimester [10]. A very minimal change in energy requirements occurs during first trimester. Carbohydrates are the main energy source. They play a vital role in fetal growth and development. Moreover, it also provides energy for maternal activities. Fiber rich carbohydrates help in digestion, maintaining gut health and bowel movement. Proteins are the building blocks for growth of fetus. They are important for the proper development of babies and their deficiency can risk malnutrition in babies and low birth weight. Lipids are another significant source of energy, necessary for the proper functioning of pregnancy hormones. It also provides essential fatty acids. Most essential fatty acids include omega-3 and omega-6 for the brain and eye development [11]. Pregnancy increases the demand for nutrients because of increase in blood volume, maternal tissue growth and the development of fetus.

(Iron, zinc, calcium, magnesium, protein, iodine, folate vitamin B requirement increases the most)

References

1. Ho, A., Flynn, A. C., & Pasupathy, D. (2016). Nutrition in pregnancy. Obstetrics, Gynaecology & Reproductive Medicine, 26(9), 259–264.
2. Joshi, S., Sharma, L., Barde, L., Tare, M., Baheti, D., Dama, G., & Tare, H. (2023). The nutritional needs of mothers and babies: a review. Int J Pharm Qual Assur, 14(2), 421–425.
3. King, J. C. (2000). Physiology of pregnancy and nutrient metabolism. The American Journal of Clinical Nutrition, 71(5), 1218S–1225S.
4. Butte, N. F., Wong, W. W., Treuth, M. S., Ellis, K. J., & Smith, E. O. B. (2004). Energy requirements during pregnancy are based on total energy expenditure and energy deposition. The American Journal of Clinical Nutrition, 79(6), 1078–1087.
5. Ahmed, F. (2022). Micronutrients and pregnancy. Nutrients, 14(3), 585.
6. Khammarnia, M., Ansari-Moghaddam, A., Kakhki, F. G., Clark, C. C. T., & Barahouei, F. B. (2024). Maternal macronutrient and energy intake during pregnancy: a systematic review and meta-analysis. BMC Public Health, 24(1), 478.
7. Song, Y., Zhang, F., Lin, G., Wang, X., He, L., Li, Y., Zhai, Y., Zhang, N., & Ma, G. (2023). A study of the fluid intake, hydration status, and health effects among pregnant women in their second trimester in China: a cross-sectional study. Nutrients, 15(7), 1739.
8. Hart, K. H., Hill, A. J., Gonzalez, J. T., de la Hunty, A., Gallagher, A. M., & Stanner, S. A. (2025). Diet in pregnancy: a review of current challenges and recommendations. A British Nutrition Foundation briefing paper. Nutrition Bulletin, 50(3), 365–410.
9. Chouli, M., Bothou, A., Kyrkou, G., Kaliarnta, S., Dimitrakopoulou, A., & Diamanti, A. (2025). An updated review of popular dietary patterns during pregnancy and lactation: trends, benefits, and challenges. Metabolism Open, 25, 100353.
10. Parvez, S., & Fatima, G. (2025). Importance of macronutrients and micronutrients in pregnancy: dietary patterns and guidelines for maternal and fetal health. Journal of Traditional Medicine and Chinese Medicine. DOI: 10.47363/JTMCM/2025(3)123.
11. Prasad, H. A., & Sylvester, S. K. K. (2025). Nutritional deficiencies and requirements during pregnancy. Asian Journal of Applied Science and Technology (AJAST), 9(1), 129–144.