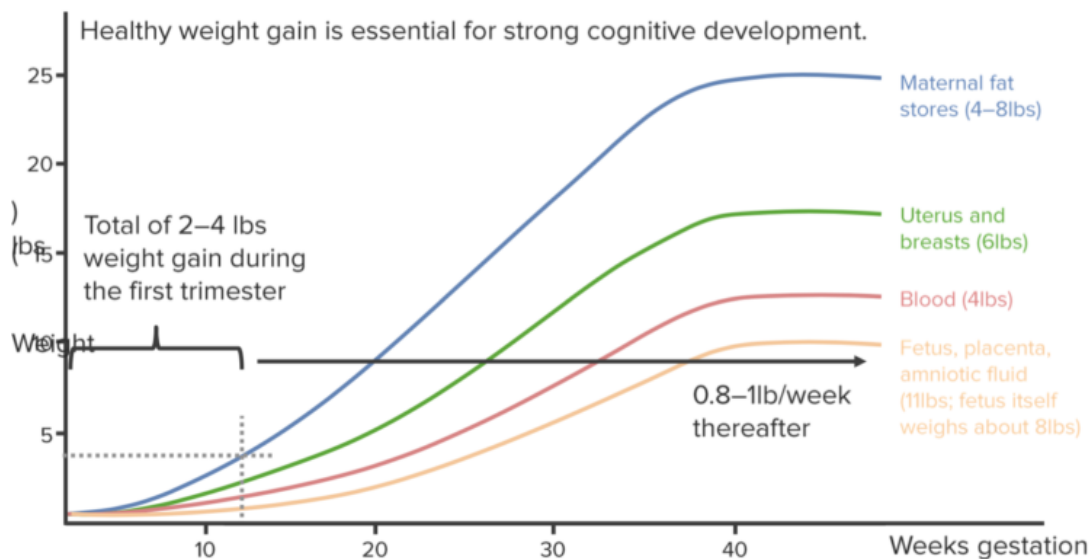


Pregnancy Nutrition

[See online here](#)

All women during pregnancy have an increased demand for nutrient supply. When the nutrient intake is compromised, the body uses the stored nutrients, and that makes a pregnant woman weak. Energy demands are the highest in the third trimester of pregnancy. Certain nutrient deficiencies are associated with congenital disabilities and other complications. The increase in energy requirements is due to the increase in body weight of a pregnant woman, the energy needs of the fetus, and physiological changes occurring in the events of pregnancy. There is about 20 percent increase in caloric needs, 50 percent increase in micronutrients, and an additional 350-450 calories are required during 2nd and 3rd trimester. Energy requirements increase up to 12 percent and BMR increases on an average of 10-15 percent.



Nutrition in Pregnancy

Many women experience a successful pregnancy without meeting the recommended energy intake guidelines. This is because different **adaptive strategies** can be used to cater to increased energy demands during pregnancy:

- By **reducing exertion**, energy demands can be lowered
- **Increasing absorption** of nutrients
- **Reducing the basic metabolic rate**
- **Reducing diet-induced thermogenesis**
- Using already **stored fat**

Although these strategies may help in the presence of sub-optimal nutritional status, there is a **physiologic limit** to adjusting nutrient metabolism, and hence the growth and development of the fetus may be affected. If a pregnant woman is under-nourished,

nutrient supply is physiologically driven more to the mother and **fetal growth** is therefore compromised to a greater extent.

Weight loss through dieting is not recommended during pregnancy even if the mother is morbidly obese. Medicines for weight management should be avoided during both conception and pregnancy.

There are no increased energy demands in the first trimester. Only **340 kcal of extra energy** is required in the second trimester, and **additional energy requirements of 452 kcal** are needed in the third trimester. However, there are **significant variations** in the energy requirements based on **weight before pregnancy** and **individual body height**.

Weight gain during pregnancy is due to a combination of the following:

- **Water** (about 62%)
- **Fat mass** (about 30%)
- **Protein** (about 8%)

Adequate **plasma volume expansion** is directly related to a favorable pregnancy outcome. The recommended total weight gain in pregnant women, based on pre-pregnancy body mass index (BMI) (kg/m^2), is outlined in the table below.

Low (BMI < 19.8)	12.5–18.0 kg
Normal (BMI 19.8–26.0)	11.5–16.0 kg
High (BMI 26.0–29.0)	7.0–11.0 kg
Obese (BMI > 29.0)	6.0 kg

For multiple births, the need for nutrients and calories for pregnant women is higher than for those who are carrying a single fetus (40–45 kcal per day).

Protein

There is a **higher demand** for protein during pregnancy to support weight gain and fetal growth, especially in the last trimester. **Metabolic adaptation** increases the efficiency of protein synthesis during pregnancy.

Recommended Intake

No additional protein is required in the first trimester of pregnancy. Therefore the recommended daily intake for protein in women aged 19–50 in the first trimester is 0.75 g/kg per day.

The recommended daily intake for protein in women aged 19–50 in the second and third trimester is 1.0 g/kg per day; for women aged 14–18, it is 1.02 g/kg per day.

Good sources of protein include milk, eggs, meat, chicken, cheese, and dried beans.

Carbohydrates

Carbohydrate metabolism is constantly altered throughout pregnancy to ensure that the fetus receives an adequate supply of macronutrients even if maternal nutrition is intermittent. Adequate glucose is required for **maternal brain metabolism** and as a primary energy resource for the fetus.

Usually, 45%–65% of total energy needs come from carbohydrates for persons > 14 years of age. During pregnancy, the recommended dietary allowance for carbohydrate intake is **175 g per day**, or 45 g more than the carbohydrate requirement for non-pregnant females (see image).

Dietary Fiber

Due to high levels of **progesterone**, there is **decreased gastrointestinal transit** during pregnancy. This is beneficial because food is in contact with absorption sites for a longer period and therefore better absorbed, but it can also lead to **constipation**.

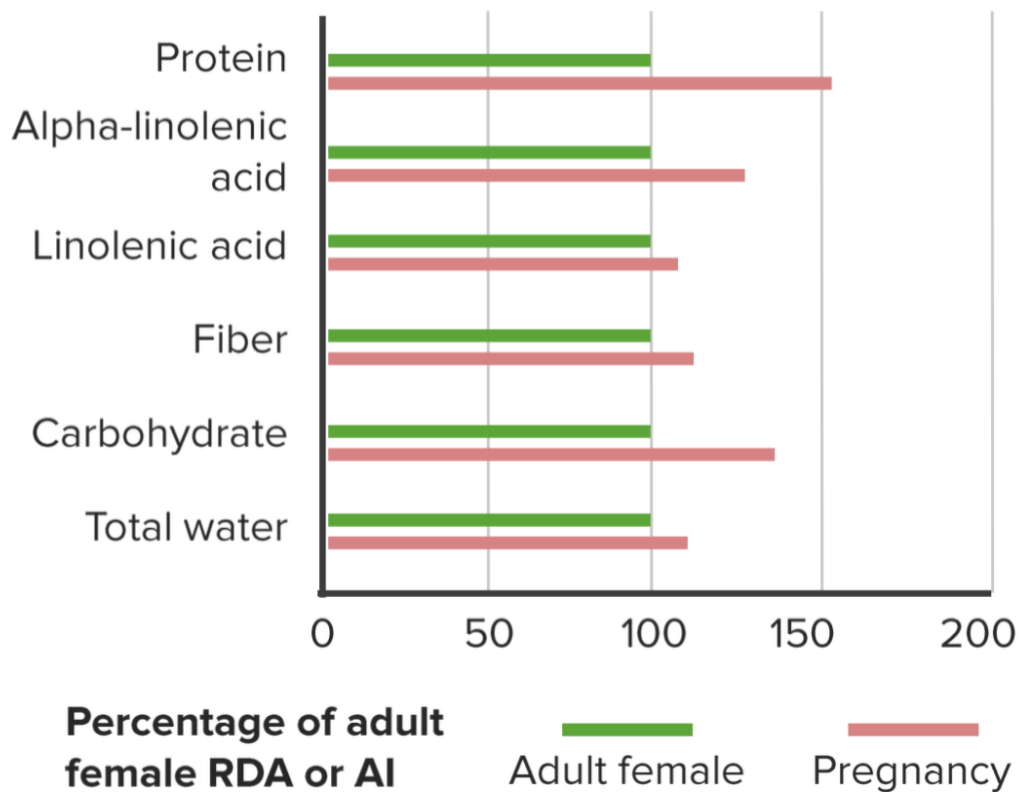
Adequate intake of dietary fiber is therefore necessary to maintain regular bowel habits during pregnancy. The recommended dietary allowance of fiber for pregnant women aged 19–50 years is **22 g per day**. To meet the recommended daily needs for both carbohydrates and fiber, **low-energy-density food** or **low-glycemic index food sources** should be consumed, including fruits, cereals, whole grains, and vegetables.

Fats

Fatty acids fulfill **half of the energy needs** of the fetus during early pregnancy. In the later stages, the fetus forms its own fatty acids. **Long-chain polyunsaturated fatty acids** are essential for **brain growth and development** in the fetus, especially in the third trimester, when the growth of nerve tissue is at its highest.

The fetus has a limited ability to synthesize long-chain polyunsaturated fatty acids and therefore is dependent upon the **placental supply**. Obese women who have insulin resistance as well as those with a low BMI are more in need of dietary fat to maintain an adequate supply to the fetus. Recommended doses for essential fatty acids and omega 3 long-chain polyunsaturated fatty acids for pregnant women aged 19–50 years are as follows:

- **Linoleic acid:** 10 g per day
- **Alpha-linolenic acid:** 1 g per day
- **Total omega-3 long-chain polyunsaturated fatty acids:** 115 mg per day



Graph of the Recommended Dietary Allowance (RDA) or Adequate Intake (AI) of common nutrients in adult non-pregnant females in comparison to pregnant females.

Minerals

Iron

Iron deficiency is the most common deficiency in pregnant women. It leads to **impaired red blood cell function** and **anemia**, which in turn increases the risk of **post-partum infections, hemorrhage, heart failures, and mortality**.

The **recommended dose** for pregnant women aged 14–50 is **27 mg per day**. Iron requirements during the first trimester are lower than in later stages, but these doses are recommended to build iron stores for the last trimester of pregnancy.

Good sources of iron include dried beans, animal protein, iron-fortified food, and any food that is cooked in iron cookware.

Calcium

There is an increased demand for calcium during pregnancy but this need is largely fulfilled by **greater maternal calcium absorption, retention, and turnover** in the first trimester. Demand for calcium is high because of the continuous building of fetal tissue, especially in the third trimester. The recommended allowance for pregnant women aged 19–50 is **1,000 mg per day**, the same as for non-pregnant and non-breastfeeding women.

Dairy products and leafy green vegetables are rich in the calcium needed for Vitamin D absorption and are recommended for pregnant women.

Zinc

Any deficiency in zinc during pregnancy can result in **neural tube defects, premature delivery, low birth weight**, and other complications. The recommended allowance for pregnant women aged 14–18 is 10 mg per day; for women aged 19–50, it is 11 mg per day.

As a well-balanced diet will meet zinc requirements, extra supplementation is not recommended when iron supplements are higher than 60 mg per day.

Selenium

Increased demands for selenium during pregnancy occur because of **fetal growth** and **selenoprotein synthesis**. The recommended allowance for pregnant women aged 14–50 is **65 µg per day**.

Magnesium

Magnesium deficiency can result in **uterine hyper-irritability, fetal growth retardation, cerebral palsy**, and **pregnancy-induced hypertension**. The recommended allowance for pregnant women aged 14–18 is 350 mg per day; for women aged 19–30, it is 360 mg per day; and for women aged 31–50, it is 360 mg per day.

Iodine

High rates of fetal growth increase the maternal need for iodine. Iodine deficiency can result in miscarriages, stillbirths, birth defects, and neurological defects. The recommended allowance for pregnant women aged 14–50 is **220 µg per day**; iodized salt can prevent iodine deficiency.

Copper

Copper accumulates in the fetus, amniotic fluid, and newly formed maternal tissue, thereby increasing copper demand during pregnancy. The recommended allowance for pregnant women aged 14–50 is **1.3 mg per day**.

Sodium

To maintain increased plasma volume during pregnancy, sodium requirements are higher than normal. The recommended intake for pregnant women aged 14–50 is **460–920 mg per day**.

Potassium

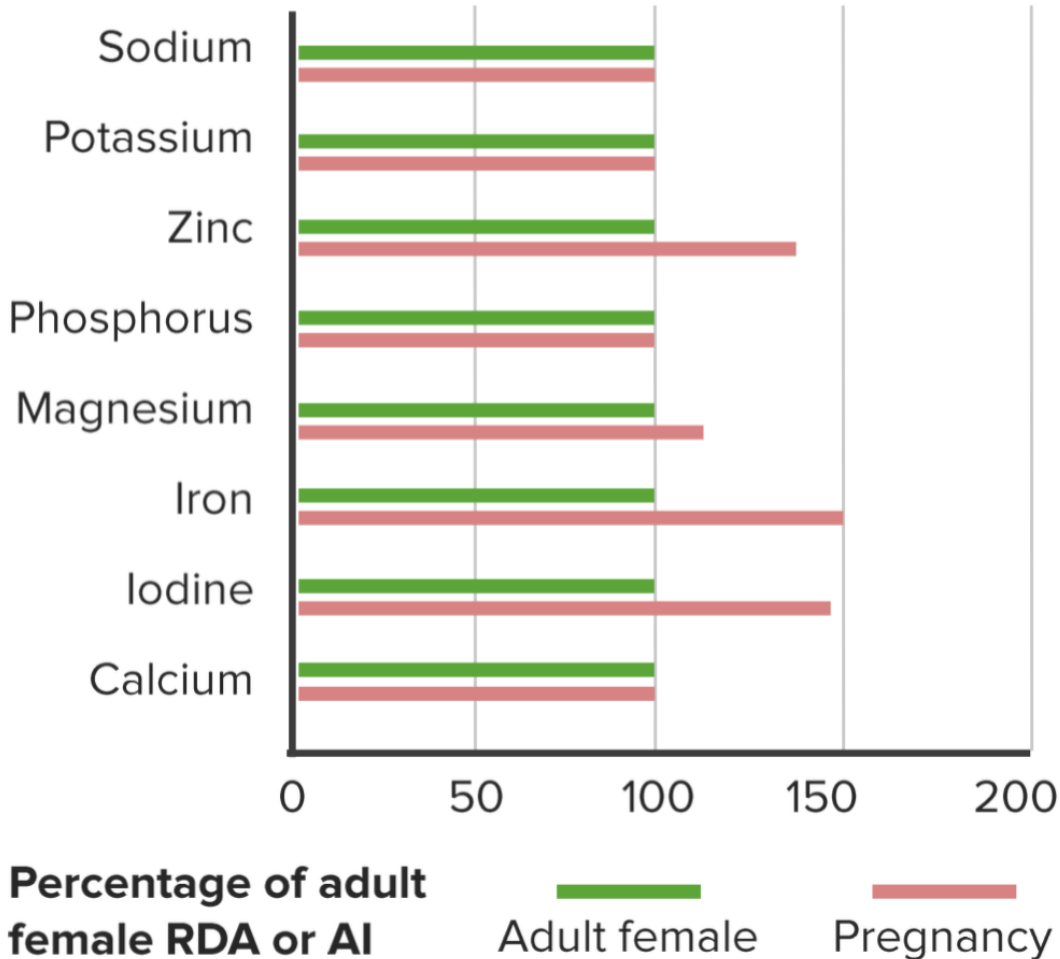
Although there is an overall increase in potassium needs during pregnancy, it is a slight increase and thus does not require supplemental intake. Hence, adequate intake is the same as for non-pregnant women, i.e., **2,800 mg per day**.

Sulfate

Higher sulfate requirements during pregnancy can be met from adequate water intake and a protein-rich diet that includes **sulfur-containing amino acids**.

Fluoride

Fluoride is necessary for the developing **deciduous teeth** of the fetus. There are no increased fluoride requirements during pregnancy. The recommended allowance is **3 mg per day**.



Graph of the Recommended Dietary Allowance (RDA) or Adequate Intake (AI) of common minerals in adult non-pregnant females in comparison to pregnant females.

Vitamins

Vitamin A

Sufficient supplies of vitamin A play a role in **birth weight, circumference and length of the head**, and the **duration of gestation**. It helps in glycoprotein synthesis and cellular growth. Sub-optimal levels are associated with **increased maternal motility**. The recommended allowance for pregnant women aged 19-50 is **800 µg per day**. This represents only a 10% increase in daily requirements; amounts greater than this can be harmful to the fetus.

The best sources of Vitamin A are leafy green and orange vegetables.

Vitamin D

A deficiency of vitamin D during pregnancy results in **decreased fetal growth**. This is due to the effect of vitamin D deficiency on maternal calcium homeostasis. The recommended dose for pregnant women aged 19–50 is **5 µg of vitamin D per day**. Fortified milk is a good source of vitamin D.

Vitamin E

The recommended dose of vitamin E for pregnant women aged 19–50 is **7 mg per day**, the same as for non-pregnant women. This amount can be supplied by sufficient animal fats and proteins.

Vitamin K

The recommended dose of vitamin K for pregnant women aged 14–50 is **60 µg per day**, the same as for non-pregnant women. Rich sources include leafy green vegetables, eggs, tomatoes, and dairy products.

Folate

The decrease in serum and red cell folate levels is teratogenic in early pregnancy. Any deficiency leads to **neural tube defects**, **megaloblastic anemia of pregnancy**, **atherosclerosis** in the mother, and **cervical dysplasia**. The recommended dose for pregnant women aged 14–18 years is 800 µg per day; for those aged 19–50, it is 1,000 µg per day.

Thiamin (Vitamin B₁)

A deficiency of vitamin B₁ during pregnancy affects the growth of the fetus and increases the risk of **congenital malformations** such as cleft lip and palate, **sudden infant death syndrome**, and **pre-eclampsia**. The recommended dose for pregnant women aged 14–50 is **1.4 mg of vitamin B1 per day**.

Riboflavin

Deficiency of riboflavin can cause **pre-eclampsia**. The recommended dose for pregnant women aged 14–50 is **1.6 mg of riboflavin per day**.

Riboflavin is found in green vegetables, eggs, cheese, milk, and fish. Routine intake of riboflavin is not recommended.

Niacin

Increased demands for niacin during pregnancy are related to the increased energy requirements and growth of the fetus. The recommended dose for pregnant women aged 14–50 is **18 mg niacin per day**.

Pantothenic Acid

The recommended dose of pantothenic for pregnant women aged 14–50 is **5 mg per day**, the same as for non-pregnant women.

Vitamin B₆ (pyridoxine)

Vitamin B₆ is essential for **nervous system development** and any deficiency will affect the brain of the fetus. It is also essential for the metabolism of protein, carbohydrate, and lipid. The recommended dose for pregnant women aged 14–50 is **1.9 mg per day**.

Vitamin B₁₂ (Cobalamin)

Vitamin B₁₂ is essential for **normal hematological and neurological functions**. The recommended dose for pregnant women aged 14–50 is **2.6 µg per day**. It is found in animal protein.

Biotin

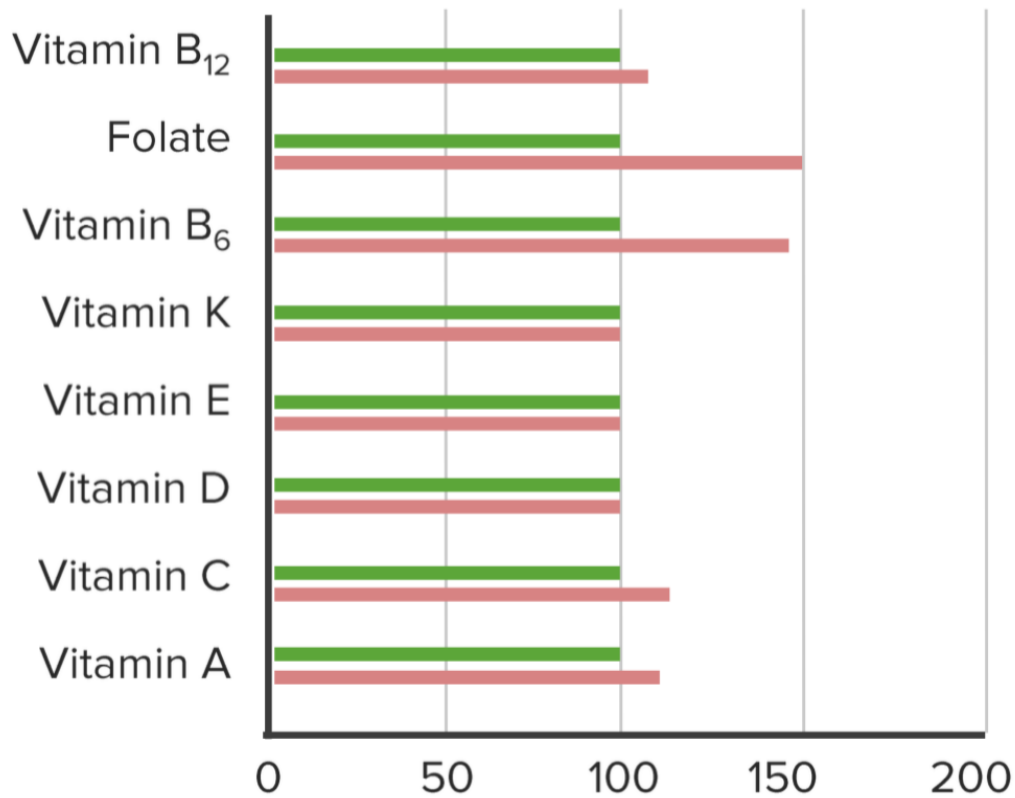
Biotin is essential for fetal development, and the fetus depends on maternal dietary intake. The recommended dose for pregnant women aged 14–50 is **30 µg per day**. This amount is 5 µg higher than that required for non-pregnant women.

Rich sources include fortified grains, leafy green vegetables, and dried beans.

Vitamin C

Any deficiency in vitamin C during pregnancy is associated with **ruptured placental membranes, infections, and premature births**. The recommended dose for pregnant women aged 14–18 is 55 mg per day. The dose for pregnant females aged 19–50 is 60 mg per day.

Good sources of vitamin C include fruits and vegetables. Routine supplementation is usually not needed if a woman has a balanced diet.



Percentage of adult female RDA or AI

■ Adult female
 ■ Pregnancy

Graph that shows the comparison of the Recommended Dietary Allowance (RDA) or Adequate Intake (AI) of various vitamins in adult non-pregnant females and pregnant females.

Water

The need for water intake during pregnancy is **3.1 liters per day**. About 2.3 of these liters is fulfilled by drinking water; the rest comes from food and other fluids.

Perinatal Nutrition: Breastfeeding or Formulas?

Breastfeeding is recommended as the best feeding option for the newborn. It should be exclusively practiced for 6 months and is recommended for up to 12 months. Breast milk prevents allergies and helps improve immunity. Formula is a healthy option in the absence of breastfeeding.

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