

Nutrition in Pregnancy

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Common Clinical Scenario: A 30-year-old woman in her first pregnancy presents for her initial prenatal care visit. She is well educated, apparently maintains a healthy diet, and exercises regularly. She has a number of concerns about dietary restrictions in pregnancy. She is curious about your recommendations regarding consumption of fish and caffeine during pregnancy. Having reviewed the latest literature, you are able to make your recommendations.

A woman's nutritional health begins prior to pregnancy. Most nutritional advice for pregnant women is based on the 1990 Institute of Medicine (IOM) Pregnancy Report, the 2005 *Dietary Guidelines for Americans* from the Department of Health and Human Services and the Department of Agriculture (USDA), and the 2006 IOM publication *Dietary Reference Intakes: The Essential Guide to Nutrient Requirements*.¹⁻³ Recommended daily allowances (RDAs) of nutrients are established by an expert IOM panel.

A careful history can reveal unhealthy habits, evidence of undiagnosed chronic disease, dietary needs for current conditions (eg, celiac disease, anemia, seizure disorder, malabsorption syndromes, prior bariatric surgery), and behavioral habits that may pose a risk to mother or fetus. Baseline dietary habits can be discovered using food diaries or self-administered questionnaires. Obstetrical history should also be reviewed for previous pregnancies with neural tube defects. See

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Table 1 for specific recommendations that may be prompted by the patient history.

Typically, women consuming 3 meals a day including fruits and vegetables, low-fat proteins, and low saturated fats have appropriate servings of essential nutrients. However, women who frequently skip meals or have a high intake of soft drinks, fast foods, and snacks are often deficient in nutrients and benefit from nutritional counseling. Women should aim to:

- Eat healthy meals with a balanced diet low in saturated fats
- Limit high-fat foods and concentrated sweets
- Avoid skipping meals and implementing special diets (which lead to inappropriate weight gain during pregnancy and poor nutrient intake)
- Avoid excessive amounts of vitamin A (teratogenic).⁴

Physical examination includes determining prepregnancy height and weight and calculation of body mass index (BMI). A prepregnancy BMI of 19.8 to 26.0 is considered normal. The clinician should evaluate for signs of nutritional deficiency or chronic disease, including evidence of eating disorders.

NUTRITIONAL GOALS AND WEIGHT MANAGEMENT

Weight gain guidelines were modified in 2009 by the IOM.⁵ The guidelines had not been revised in nearly 2 decades. Now, a different population of women are carrying pregnancies. American mothers now tend to be older, have higher frequency of multiples, higher prepregnancy BMI, and higher burden of chronic diseases. Recommendations are the same for women of smaller stature and differing races and ethnicity (Table 2).

Achieving a normal BMI prior to conception improves general health maintenance, mental health, and energy as a new parent. Nearly all

FOCUSPOINT

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TABLE 1. Special Nutritional Recommendations in Pregnancy

Scenario	Recommendation
Prior pregnancy with neural tube defect	Supplementation with 4 mg of folic acid instead of 400 µg
Malabsorption syndromes (including prior bariatric surgery)	Assess for anemia, vitamin B ₁₂ and vitamin D deficiency, and compliance with prenatal vitamins to supplement fat-soluble vitamins
Substance use or abuse	Promote cessation of usage and avoidance of risky behavior
Excessive use of herbal supplements	Herbal products lack safety and efficacy data
Excessive amounts of vitamin A (>10,000 IU)	Associated with neural crest anomalies ³
Eating disorders	May require medication, hospitalization, and multidisciplinary treatment approach
Iron deficiency anemia	Encourage iron supplementation

complications of pregnancy are increased in obese women. Morbidly obese women (BMI >35) are more likely to develop gestational hypertension, preeclampsia, and gestational diabetes and to have increased risk for preterm delivery, macrosomic infants (>4,500 g), and cesarean delivery.^{6,7} Obese women also have greater long-term health risks, such as cardiovascular disease, as they age. Obesity carries an increased risk not only for the parturient but also for her child. Maternal obesity in the first trimester of pregnancy is associated with elevated risk for having an overweight child.⁸ Finally, weight reduction is not recommended during pregnancy.

CALORIE AND MICRONUTRIENT CHANGES

Calories are the most important factor in nutrition correlated with infant birth weight; yet, the relationship between maternal calories consumed, weight gained, and infant birth weight is complex. Pregnant women are recommended to increase daily calorie intake by

340 kcal/day in the second trimester and 452 kcal/day in the third trimester. However, calorie requirements vary by current weight and energy expenditure.¹

Diets low in cholesterol and saturated fats are preferred and have been associated with decreased risk for preterm delivery. *Trans* fatty acids are transported across the placenta and may affect essential fatty acid metabolism, adversely impacting fetal growth and development.⁹ “My Pyramid for Moms” from the USDA offers assistance with food selection at www.mypyramid.gov/mypyramidmoms/index.html.

The RDAs are different in females of different ages and during pregnancy and lactation. Micronutrients do not have profound effects on fetal birth weight in well-nourished women, with few exceptions. In prospective studies in Tanzania, women receiving prenatal vitamins had lower rates of small-for-gestational-age infants, while rates of preterm delivery were not statistically different.¹⁰ The IOM and CDC recommend that pregnant women who do not consume an adequate, balanced diet supplement it with prenatal vitamins containing iron and folic acid (Table 3).^{1,11} Iron deficiency anemia is common in pregnancy, especially in women with poor nutritional habits. Severe iron deficiency anemia in early pregnancy is associated with low birth weight and prematurity.¹²

Foodborne illnesses can contribute to maternal and fetal disease, miscarriage, and preterm birth. Reducing risk for foodborne illness is important and can be accomplished with attention to these basic principles:

- Personal hygiene, specifically hand washing
- Eating fully cooked meats and eggs

TABLE 2. New 2009 IOM Recommendations for Total Weight Gain and Rate of Weight Gain During Pregnancy⁵

Weight	Prepregnancy BMI (kg/m ²)	Total Weight Gain (lb)	Rates of Weight Gain in 2nd and 3rd Trimesters (mean range, lb/wk)
Underweight	<18.5	28–40	1 (1–1.3)
Normal weight	18.5–24.9	25–35	1 (0.8–1)
Overweight	25.0–29.9	15–25	0.6 (0.5–0.7)
Obese	≥30.0	11–20	0.5 (0.4–0.6)

TABLE 3. Micronutrient Alterations in Pregnancy^{1,11}

Micronutrient	Prepregnancy	Pregnancy	Purpose/Role in Fetal/Maternal Unit
Protein	0.8 g/kg/d	1.1 g/kg/d	<ul style="list-style-type: none"> Fetal/placental unit consumes 1 kg during gestation (most during last 6 mo)
Carbohydrates	130 g/d	175 g/d of complex carbohydrates	<ul style="list-style-type: none"> Metabolism of complex carbohydrates supplies glucose and amino acids to developing fetal brain
Calcium	1,000 mg/d (ages 19–50) 1,300 mg/d (ages 14–18)	same as prepregnancy	<ul style="list-style-type: none"> Required for fetal skeletal development, especially third trimester Maternal physiology allows improved absorption and progressive retention of calcium
Iron	15 mg/d	30 mg/d (unless hemoglobin <10.4 g/dL)	<ul style="list-style-type: none"> Expand maternal red cell mass Needed for fetal-placental development Supplement with 30–120 mg/d or until anemia corrects
Folic acid	0.4 mg/d for several months prior to conception and during pregnancy	0.6 mg/d	<ul style="list-style-type: none"> Early pregnancy: reduce risk of neural tube defect Later pregnancy: need average of 0.6 mg/d to meet growth needs of fetus and development of placenta

- Avoiding unpasteurized cheeses
- Rinsing fruits and vegetables prior to consumption
- Avoiding raw sprouts, since the root of the sprout is difficult to clean
- Cleaning utensils and preparation areas after working with raw meats.

The FDA provides reference guides with specific information on food safety for pregnant women at www.fda.gov/Food/ResourcesForYou/HealthEducators/ucm082539.htm.

DIETARY MODIFICATIONS

Fish consumption

Omega-3 fatty acids, found in fish and shellfish, have a beneficial effect on maternal health and fetal neurodevelopment.¹³ Conversely, diets high in mercury-containing fish can have teratogenic effects. Following initial reports in the 1960s correlating elevated maternal mercury levels with teratogenicity, there have been several longitudinal cohort studies investigating this relationship. These studies yield conflicting results. Overall, significantly elevated mercury levels have adverse effects on the fetal central nervous system; conversely avoidance of fish yields lower maternal and fetal health benefits.¹⁴

Predatory and older fish contain higher levels of mercury. These fish include shark, mackerel,

tile fish, and marlin. Commonly consumed fish with lower levels of mercury are shrimp, canned light tuna, salmon, pollack, and catfish. Albacore tuna has more mercury than canned light tuna, and therefore consumption should be limited to once weekly. Specific information on foodborne pathogens and contaminants in seafood can be found online at www.fda.gov/Food/FoodSafety/Product-SpecificInformation/Seafood.

Most fish consumers are unlikely to be at risk regarding exposure to methylmercury, provided their consumption of fish with higher mercury content is less than once per week. An exposure assessment is recommended for those who have a diet high in seafood (Table 4). The Environmental Protection Agency and local health departments provide information regarding safety of fish consumption in local areas. More information can be found at www.who.int/foodsafety/publications/chem/mercury.

Caffeine

The consumption of caffeine in pregnancy has been historically linked with increased rates of miscarriage and low birth weight.¹⁵ Data are not conclusive and at best are fraught with numerous confounders including drink serving size, brand of coffee, tea, or soda, and brewing method. One recent randomized trial gave pregnant women either caffeinated

TABLE 4. Exposure Recommendations for Fish Consumption

	Less Than 1 Meal With Fish per Week	1 to 3 Meals With Fish per Week	Greater Than 3 Meals With Fish per Week
Pregnancy recommendations	Encourage more fish for benefit of omega-3 fatty acids ¹⁴	Ensure that no more than 1 meal contains orange roughy, sea perch, catfish, albacore tuna	Evaluate with exposure assessment

or decaffeinated coffee starting at 20 weeks of gestation. Average birth weight and length of gestation were similar in both groups, discounting the correlation with low birth weight.¹⁶ Because data are limited, current recommendations are conservative and suggest limiting caffeine intake to less than 300 mg/day. Table 5 lists average caffeine content in common beverages.

Artificial sweeteners

There are many artificial sweeteners available on the market. To date, none are associated with an increased risk of birth defects above the baseline rate in the general population.¹⁷ Sweeteners evaluated include aspartame (NutraSweet®), sucralose (Splenda®), saccharin (Sweet’N Low®), acesulfame potassium (Sunett®), and stevioside (Stevia). Consistent with most dietary recommendations, artificial sweeteners should be used in moderation during pregnancy.

CONCLUSION

In general, women should aim to maintain a healthy lifestyle throughout pregnancy. Healthy practices should include avoidance of high-risk behaviors, gaining the appropriate amount of weight, participation in daily exercise, and consumption of a variety of foods. There are few absolute dietary restrictions; eating in moderation with appropriate portions is encouraged.

Table 5. Average Caffeine Content in Common Beverages

Beverage	Serving Size (oz)	Caffeine Content (mg)
Drip coffee	8	234
Instant coffee	8	85
Brewed tea	8	9–46
Hot chocolate	6	10
Soda	12	40–55

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