



# Maternal and Fetal Nutrition

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## LEARNING OBJECTIVES

- Explain recommended maternal weight gain during pregnancy.
- Compare the recommended level of intake of energy sources, protein, and key vitamins and minerals during pregnancy and lactation.
- Give examples of the food sources that provide the nutrients required for optimal maternal nutrition during pregnancy and lactation.
- Examine the role of nutrition supplements during pregnancy.
- List five nutritional risk factors during pregnancy.
- Compare the dietary needs of adolescent and mature pregnant women.
- Give examples of cultural food patterns and possible dietary problems for two ethnic groups or for two alternative eating patterns.
- Assess nutritional status during pregnancy.

## KEY TERMS AND DEFINITIONS

**adequate intakes (AIs)** Recommended nutrient intakes estimated to meet the needs of almost all healthy people in the population; provided for nutrients or age-group categories where the available information is not sufficient to warrant establishing recommended dietary allowances

**anthropometric measurements** Body measurements, such as height and weight

**body mass index (BMI)** Method of calculating appropriateness of weight for height ( $BMI = \text{weight}/\text{height}^2$ )

**Dietary Reference Intakes (DRIs)** Nutritional recommendations for the United States, consisting of the recommended dietary allowances, adequate intakes, and tolerable upper intake levels; the upper limit of intake associated with low risk in almost all members of a population

**intrauterine growth restriction (IUGR)** Fetal undergrowth from any cause

**kcal** Kilocalorie; unit of heat content or energy equal to 1000 small calories

**lactose intolerance** Inherited absence of the enzyme lactase

**physiologic anemia** Relative excess of plasma leading to a decrease in hemoglobin concentration and hematocrit; normal adaptation during pregnancy

**pica** Unusual craving during pregnancy (e.g., for laundry starch, dirt, red clay)

**pyrosis** A burning sensation in the epigastric and sternal region from stomach acid (heartburn)

**Recommended Dietary Allowances (RDAs)** Recommended nutrient intakes estimated to meet the needs of almost all (97% to 98%) of the healthy people in the population

## ELECTRONIC RESOURCES

Additional information related to the content in Chapter 10 can be found on

the companion website at [evolve](http://evolve.elsevier.com/Lowdermilk/Maternity/)  
<http://evolve.elsevier.com/Lowdermilk/Maternity/>

- NCLEX Review Questions
- WebLinks

or on the interactive companion CD



- NCLEX Review Questions
- Critical Thinking Exercise—Nutrition Education
- Plan of Care—Nutrition during Pregnancy

Nutrition is one of the many factors that influence the outcome of pregnancy (Fig. 10-1). However, maternal nutritional status is an especially significant factor, both because it is potentially alterable and because good nutrition before and during pregnancy is an important preventive measure for a variety of problems. These problems include birth of low-birth-weight (LBW) and preterm infants. It is essential that the importance of good nutrition be emphasized to all women of childbearing potential. Nutrition assessment, intervention, and evaluation must be an integral part of the nursing care provided to all pregnant women.

The Pregnancy Nutrition Surveillance System (PNSS) was developed to help health professionals identify and reduce pregnancy-related health risks (Centers for Disease Control and Prevention [CDC], 2004). The data collected from programs such as the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and prenatal clinics funded by Maternal and Child Health Program Block Grants are submitted to the CDC. Annual data summaries allow states to monitor trends in prevalence of prenatal risk factors that predict low birth weight and infant mortality, as well as monitor infant feeding practices.

## NUTRIENT NEEDS BEFORE CONCEPTION

The first trimester of pregnancy is a crucial one for embryonic and fetal organ development. A healthful diet before conception is the best way to ensure that adequate nutrients are available for the developing fetus. Folate or folic acid intake is of particular concern in the periconceptual period. Folate is the form in which this vitamin is found naturally in foods, and folic acid is the form used in fortification of grain products and other foods and in vitamin supplements. Neural tube defects, or failure in closure of the neural tube, are more common in infants of women with poor folic acid intake. It is estimated that the incidence of neural tube defects could be halved if all women had an adequate folic acid intake during the periconceptual period (Kilpatrick & Laros, 2004). All women capable of becoming pregnant are advised to consume 400 mcg of folic acid daily in fortified foods (e.g., ready-to-eat cereals and enriched grain products) or supplements in addition to a diet rich in folate-containing foods such as green leafy vegetables, whole grains, and fruits. ❁

Both maternal and fetal risks in pregnancy are increased when the mother is significantly underweight or overweight when pregnancy begins. Ideally, all women would achieve a desirable body weight before conception.

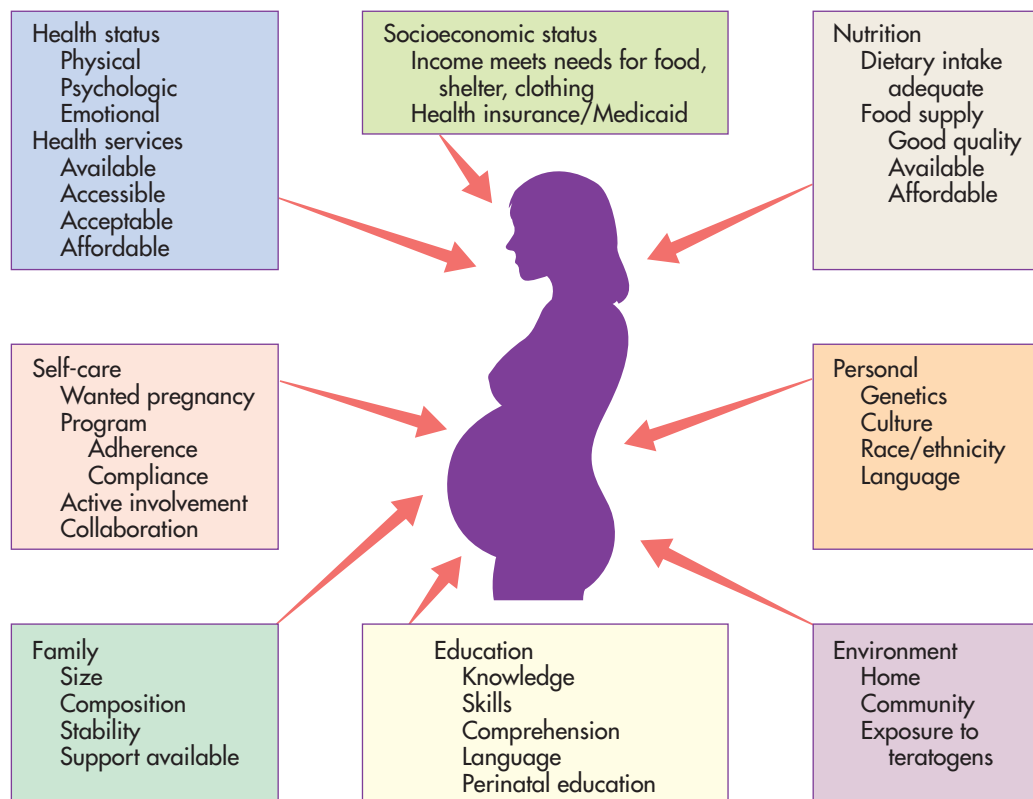


Fig. 10-1 Factors that affect the outcome of pregnancy.

## NUTRIENT NEEDS DURING PREGNANCY

Nutrient needs are determined, at least in part, by the stage of gestation. The amount of fetal growth varies during the different stages of pregnancy. During the first trimester, the synthesis of fetal tissues places relatively few demands on maternal nutrition. Therefore during the first trimester, when the embryo or fetus is very small, the needs are only slightly increased over those before pregnancy. In contrast, the last trimester is a period of noticeable fetal growth when most of the fetal stores of energy sources and minerals are deposited. Basal metabolic rates (BMRs), when expressed as kilocalories (kcal) per minute, are approximately 20% higher in pregnant women than in nonpregnant women. This increase includes the energy cost for tissue synthesis.

The Food and Nutrition Board of the National Academy of Sciences publishes recommendations for the people of the United States, the **Dietary Reference Intakes (DRIs)**. The DRIs consist of **Recommended Dietary Allowances (RDAs)** and **Adequate Intakes (AIs)**, as well as Upper Limits (ULs), guidelines for avoiding excessive intakes of nutrients that may be toxic if consumed in excess. RDAs for some nutrients have been available for many years, and they have been revised periodically. RDAs are recommendations for daily nutritional intakes that meet the needs of almost all (97% to 98%) of the healthy members of the population. AIs are similar to the RDAs and are believed to cover the needs of virtually all healthy individuals in a group, except that they deal with nutrients for which there are not enough data to be certain of their requirements. The RDAs and AIs include a wide variety of nutrients and food components, and they are divided into age, sex, and life-stage categories (e.g., infancy, pregnancy, and lactation). They can be used as goals in planning the diets of individuals (Table 10-1).

### Energy Needs

Energy (kilocalories or **kcal**) needs are met by carbohydrate, fat, and protein in the diet. No specific recommendations exist for the amount of carbohydrate and fat in the diet of the pregnant woman. However, intake of these nutrients should be adequate to support the recommended weight gain. Although protein can be used to supply energy, its primary role is to provide amino acids for the synthesis of new tissues (see the discussion on protein later in this chapter). The RDA during the second and third trimesters of pregnancy is 300 kcal greater than prepregnancy needs. Very underweight or active women or those with multifetal gestations will require more than 300 additional kcal to sustain the desired rate of weight gain.

### Weight gain

The optimal weight gain during pregnancy is not known precisely. It is known, however, that the amount of weight gained by the mother during pregnancy has an important

bearing on the course and outcome of pregnancy. Adequate weight gain does not necessarily indicate that the diet is nutritionally adequate, but it is associated with a reduced risk of giving birth to a small-for-gestational-age (SGA) or preterm infant.

The desirable weight gain during pregnancy varies among women. The primary factor to consider in making a weight gain recommendation is the appropriateness of the prepregnancy weight for the woman's height. Maternal and fetal risks in pregnancy are increased when the mother is either significantly underweight or overweight before pregnancy, and when weight gain during pregnancy is either too low or too high. Severely underweight women are more likely to have preterm labor and to give birth to LBW infants. Women with inadequate weight gain have an increased risk of giving birth to an infant with **intrauterine growth restriction (IUGR)**. Greater-than-expected weight gain during pregnancy may occur for many reasons, including multiple gestation, edema, preeclampsia, and overeating. When obesity is present (either preexisting or developed during pregnancy), there is an increased likelihood of macrosomia and fetopelvic disproportion; operative birth; emergency cesarean birth; postpartum hemorrhage; wound, genital tract, or urinary tract infection; birth trauma; and late fetal death. Obese women are more likely than normal-weight women to have gestational hypertension and gestational diabetes; their risk of giving birth to a child with a major congenital defect is double that of normal-weight women.

A commonly used method of evaluating the appropriateness of weight for height is the **body mass index (BMI)**, which is calculated by the following formula:

$$\text{BMI} = \text{weight}/\text{height}^2$$

where the weight is in kilograms and height is in meters. Therefore for a woman who weighed 51 kg before pregnancy and is 1.57 m tall:

$$\text{BMI} = 51/(1.57)^2, \text{ or } 20.7$$

Prepregnant BMI can be classified into the following categories: less than 19.8, underweight or low; 19.8 to 26, normal; 26 to 29, overweight or high; and greater than 29, obese (Institute of Medicine, 1992).

For women with single fetuses, current recommendations are that women with a normal BMI should gain 11.5 to 16 kg during pregnancy, underweight women should gain 12.5 to 18 kg, overweight women should gain 7 to 11.5 kg, and obese women should gain at least 7 kg (Institute of Medicine, 1992). Adolescents are encouraged to strive for weight gains at the upper end of the recommended range for their BMI because it appears that the fetus and the still-growing mother compete for nutrients. The risk of mechanical complications at birth is reduced if the weight gain of short adult women (shorter than 157 cm) is near the lower end of their recommended range. In twin gestations, gains of approximately 16 to 20 kg appear to be associated with the best outcomes (Malone & D'Alton, 2004).

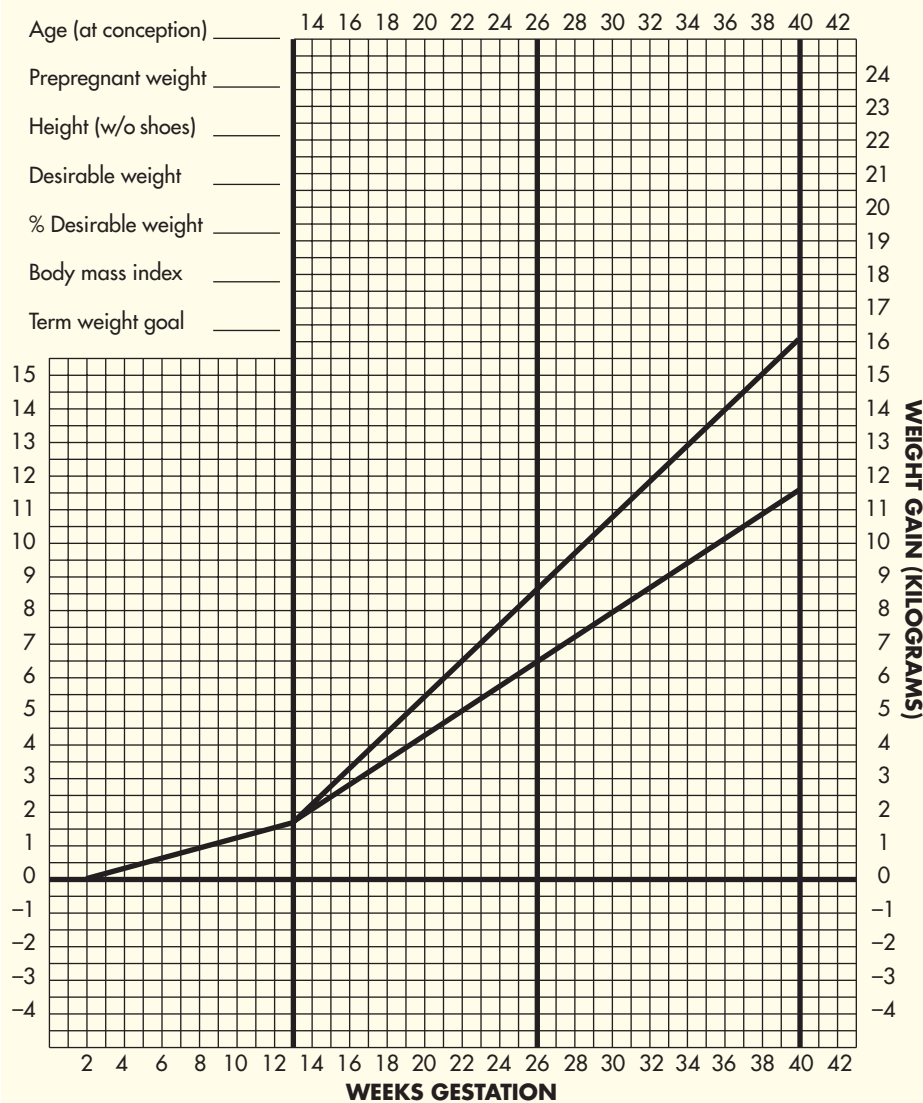
### Pattern of weight gain

Weight gain should take place throughout pregnancy. The risk of giving birth to an SGA infant is greater when the weight gain early in pregnancy has been poor. The likelihood of preterm birth is greater when the gains during the last half of pregnancy have been inadequate. These risks exist even when the total gain for the pregnancy is in the recommended range.

The optimal rate of weight gain depends on the stage of pregnancy. During the first and second trimesters, growth takes place primarily in maternal tissue; during the third trimester, growth occurs primarily in fetal tissues. During the first trimester there is an average total weight gain of only 1 to 2.5 kg. Thereafter the recommended weight gain increases to approximately 0.4 kg/week for a woman of normal weight (Fig. 10-2). The recommended weekly

weight gain for overweight women during the second and third trimesters is 0.3 kg, and for underweight women it is 0.5 kg. The recommended caloric intake corresponds to this pattern of gain. For the first trimester there is no increment; during the second and third trimesters an additional 300 kcal/day over the prepregnant intake is recommended. The amount of food providing 300 kcal is not great. It can be provided by one additional serving from any one of the following groups: milk, yogurt, or cheese (all skim milk products); fruits; vegetables; and bread, cereal, rice, or pasta.

The reasons for an inadequate weight gain (less than 1 kg/month for normal-weight women or less than 0.5 kg/month for obese women during the last two trimesters) or excessive weight gain (more than 3 kg/month) should be evaluated thoroughly. Possible reasons for deviations from the expected



**Fig. 10-2** Prenatal weight gain chart for plotting weight gain of normal-weight women. NOTE: Young adolescents, African-American women, and smokers should aim for the upper end of the recommended range; short women (<157 cm) should strive for gains at the lower end of the range.

TABLE 10-1

*Recommendations for Daily Intakes of Selected Nutrients during Pregnancy and Lactation*

NUTRIENT (UNIT)	RECOMMENDATION FOR NONPREGNANT WOMAN	RECOMMENDATION FOR PREGNANCY*	RECOMMENDATION FOR LACTATION*	ROLE IN RELATION TO PREGNANCY AND LACTATION	FOOD SOURCES
Energy (kilocalories [kcal] or kilojoules [kJ])†	Variable	First trimester, same as nonpregnant; second and third trimesters, nonpregnant + 300 kcal or 72 kJ	Nonpregnant + 500 kcal or 120 kJ	Growth of fetal and maternal tissues; milk production	Carbohydrate, fat, and protein
Protein (g)	50	60	65	Synthesis of the products of conception; growth of maternal tissue and expansion of blood volume; secretion of milk protein during lactation	Meats, eggs, cheese, yogurt, legumes (dry beans and peas, peanuts), nuts, grains
<b>MINERALS</b>					
Calcium (mg)	1300/1000	1300/1000	1300/1000	Fetal and infant skeleton and tooth formation; maintenance of maternal bone and tooth mineralization	Milk, cheese, yogurt, sardines or other fish eaten with bones left in, deep green leafy vegetables except spinach or Swiss chard, calcium-set tofu, baked beans, tortillas
Iron (mg)	15/18	30	10/9	Maternal hemoglobin formation, fetal liver iron storage	Liver, meats, whole grain or enriched breads and cereals, deep green leafy vegetables, legumes, dried fruits
Zinc (mg)	9/8	12/11	13/12	Component of numerous enzyme systems, possibly important in preventing congenital malformations	Liver, shellfish, meats, whole grains, milk
Iodine (mcg)	150	220	290	Increased maternal metabolic rate	Iodized salt, seafood, milk and milk products, commercial yeast breads, rolls, and donuts
Magnesium (mg)	360/320	400/360	350/320	Involved in energy and protein metabolism, tissue growth, muscle action	Nuts, legumes, cocoa, meats, whole grains

**FAT-SOLUBLE VITAMINS**

A (mcg)	700	750/770	1200/1300	Essential for cell development, tooth bud formation, bone growth	Deep green leafy vegetables; dark yellow vegetables; and fruits, chili peppers, liver, fortified margarine and butter
D (mcg)	5	5	5	Involved in absorption of calcium and phosphorus, improves mineralization	Fortified milk and margarine, egg yolk, butter, liver, seafood
E (mg)	15	15	19	Antioxidant (protects cell membranes from damage), especially important for preventing breakdown of RBCs	Vegetable oils, green leafy vegetables, whole grains, liver, nuts and seeds, cheese, fish

**WATER-SOLUBLE VITAMINS**

C (mg)	65/75	80/85	115/120	Tissue formation and integrity, formation of connective tissue, enhancement of iron absorption	Citrus fruits, strawberries, melons, broccoli, tomatoes, peppers, raw deep green leafy vegetables
Folate (mcg)	400	600	500	Prevention of neural tube defects, support for increased maternal RBC formation	Fortified ready-to-eat cereals and other grain products, green leafy vegetables, oranges, broccoli, asparagus, artichokes, liver
B <sub>6</sub> or pyridoxine (mg)	1.2/1.3	1.9	2.0	Involved in protein metabolism	Meat, liver, deep green vegetables, whole grains
B <sub>12</sub> (mcg)	2.4	2.6	2.8	Production of nucleic acids and proteins, especially important in formation of RBCs and neural functioning	Milk and milk products, egg, meat, liver, fortified soy milk

Recommendations are the Dietary Reference Intakes (RDA or AI, see text), where available.

Sources: Food and Nutrition Board, National Academy of Sciences, Institute of Medicine, 1997; *Dietary Reference Intakes for calcium, phosphorus, magnesium, vitamin D, and fluoride*, 1998; *Dietary Reference Intakes for thiamine, riboflavin, niacin, vitamin B<sub>6</sub>, folate, vitamin B<sub>12</sub>, pantothenic acid, biotin, and choline*, 2000; *Dietary Reference Intakes for vitamin C, vitamin E, selenium, and carotenoids*, 2001; *Dietary Reference Intakes for vitamin A, vitamin K, arsenic, boron, chromium, copper, iodine, iron, manganese, molybdenum, nickel, silicon, vanadium, and zinc*, Washington, DC, National Academy Press. Where DRIs are not available, the values are taken from Food and Nutrition Board, National Academy of Sciences, National Research Council: *Recommended dietary allowances*, ed 10, Washington, DC, 1989, National Academy Press.

\*When two values appear, separated by a diagonal slash, the first is for females younger than 19 years, and the second is for those 19 to 50 years of age.

†The international metric unit of energy measurement is the joule (J).

1 kcal = 4,184 kJ.

RBCs, red blood cells.

rate of weight gain, besides inadequate or excessive dietary intake, include measurement or recording errors, differences in weight of clothing, time of day, and accumulation of fluids. An exceptionally high gain is likely to be caused by an accumulation of fluids, and a gain of more than 3 kg in a month, especially after the twentieth week of gestation, often heralds the development of preeclampsia.

### Hazards of restricting adequate weight gain

Figure-conscious women may find it difficult to make the transition from guarding against weight gain before pregnancy to valuing weight gain during pregnancy. In counseling these women the nurse can emphasize the positive effects of good nutrition as well as the adverse effects of maternal malnutrition (manifested by poor weight gain) on infant growth and development. This counseling includes information on the components of weight gain during pregnancy (Table 10-2) and the amount of this weight that will be lost at birth. Early in a woman's pregnancy, explaining ways to lose weight in the postpartum period helps relieve her concerns. Because lactation can help to reduce maternal energy stores gradually, this provides an opportunity to promote breastfeeding.

Pregnancy is not a time for a weight-reduction diet. Even overweight or obese pregnant women need to gain at least enough weight to equal the weight of the products of conception (fetus, placenta, and amniotic fluid). If they limit their caloric intake to prevent weight gain, they may also excessively limit their intake of important nutrients. Moreover, dietary restriction results in catabolism of fat stores, which in turn augments the production of ketones. The long-term effects of mild ketonemia during pregnancy are not known, but ketonuria has been found to be correlated with the occurrence of preterm labor. It should be stressed to obese women (and to all pregnant women) that the quality of the weight gain is important, with emphasis placed on the consumption of nutrient-dense foods and the avoidance of empty-calorie foods.

Weight gain is important, but pregnancy is not an excuse for uncontrolled dietary indulgence. Excessive weight gained

**TABLE 10-2**

### Tissues Contributing to Maternal Weight Gain at 40 Weeks of Gestation

TISSUE	KILOGRAMS	POUNDS
Fetus	3-3.9	7-8.5
Placenta	.9-1.1	2-2.5
Amniotic fluid	.9	2
Increase in uterine tissue	.9	2
Breast tissue	.5-1.8	1-4
Increased blood volume	1.8-2.3	4-5
Increased tissue fluid	1.4-2.3	3-5
Increased stores (fat)	1.8-2.7	4-6



## Critical Thinking Exercise

### Nutrition and the Underweight Pregnant Adolescent

Carmen, of Hispanic heritage, is 15 years old and is 3 months pregnant. She comes to her initial appointment for diagnosis and care. She appears to be underweight for her height. To provide optimum care for her, you plan to calculate her prepregnancy BMI. When her pregnancy is confirmed, you are asked to compose a food plan with Carmen that meets the minimum daily requirements and allows for growth of the pregnancy. You know that it is important to include consideration of personal preferences and cultural factors in your plan. With Carmen, identify barriers to implementing the plan.

- 1 Evidence—Is there sufficient evidence to draw conclusions about an appropriate nutrition plan, taking into consideration personal preferences and cultural factors?
- 2 Assumptions—Describe underlying assumptions about each of the following issues:
  - a. Dietary Reference Intakes for pregnancy and lactation
  - b. Indicators of nutritional risk in pregnancy
  - c. Daily food guide for pregnancy and lactation
  - d. Sources of calcium for women who do not drink milk
- 3 What implications and priorities for nursing care can be drawn at this time?
- 4 Does the evidence objectively support your conclusion?
- 5 Are there alternative perspectives to your conclusion?

during pregnancy may be difficult to lose after pregnancy, thus contributing to chronic overweight or obesity, an etiologic factor in a host of chronic diseases including hypertension, diabetes mellitus, and arteriosclerotic heart disease. The woman who gains 18 kg or more during pregnancy is especially at risk.

## Protein

Protein, with its essential constituent nitrogen, is the nutritional element basic to growth. Adequate protein intake is essential to meet increasing demands in pregnancy. These demands arise from the rapid growth of the fetus; the enlargement of the uterus and its supporting structures, mammary glands, and placenta; an increase in maternal circulating blood volume and subsequent demand for increased amounts of plasma protein to maintain colloidal osmotic pressure; and the formation of amniotic fluid.

Milk, meat, eggs, and cheese are complete-protein foods with a high biologic value. Legumes (dried beans and peas), whole grains, and nuts are also valuable sources of protein. In addition, these protein-rich foods are a source of other nutrients such as calcium, iron, and B vitamins; plant sources of protein often provide needed dietary fiber. The recommended daily food plan (Table 10-3) is a guide to the

TABLE 10-3

## Daily Food Guide for Pregnancy and Lactation

FOOD GROUP	SERVING SIZE	SUGGESTED NUMBER OF SERVINGS		
		NONPREGNANT, NONLACTATING WOMAN	PREGNANT WOMAN	LACTATING WOMAN
<b>GRAIN PRODUCTS</b> Include whole-grain and enriched breads, cereals, pasta, and rice.	1 slice bread; ½ bun, bagel, or English muffin; 1 oz ready-to-eat cereal; ½ c cooked grains	6-11	6-11	6-11
<b>VEGETABLES</b> Eat dark green leafy and deep yellow often. Eat dried beans and peas often; count ½ c cooked dried beans or peas as a serving of vegetables or 1 oz from meat group.	1 c raw leafy greens; ½ c of others	3-5	3-5	3-5
<b>FRUITS</b> Include citrus fruits, strawberries, or melons frequently.	1 medium apple, orange, banana, peach, etc; ½ c small or diced fruit; ¾ c juice	2-4	2-4	2-4
<b>MILK AND MILK PRODUCTS</b>	1 c milk or yogurt; 1½ oz cheese	2-3	3 or more	4 or more
<b>MEAT, POULTRY, FISH, DRY BEANS, NUTS, AND EGGS</b> Eat peanut butter or nuts rarely to avoid excessive fat intake. Limit egg intake to reduce cholesterol intake; trim fat from meat, and remove skin from poultry.	½ c cooked dried beans, 1 egg, or 1½T peanut butter is equivalent to 1 oz of meat	Up to 6 oz total	Up to 6 oz total	Up to 6 oz total

c, cup; T, tablespoon.

amounts of these foods that would supply the quantities of protein needed. The recommendations provide for only a modest increase in protein intake over the prepregnant levels in adult women. Protein intake in many people in the United States is relatively high, so many women may not need to increase their protein intake at all during pregnancy. Three servings of milk, yogurt, or cheese (four for adolescents) and 5 to 6 oz (140 to 168 g) (two servings) of meat, poultry, or fish supply the recommended protein for the pregnant woman. Additional protein is provided by vegetables and breads, cereals, rice, and pasta. Pregnant adolescents, women from impoverished backgrounds, and women adhering to unusual diets, such as a macrobiotic (highly restricted vegetarian) diet, are those most likely to have inadequate protein intake. The use of high-protein supplements is not recommended, because these have been associated with an increased incidence of preterm births.

## Fluids

Essential during the exchange of nutrients and waste products across cell membranes, water is the main substance of cells, blood, lymph, amniotic fluid, and other vital body fluids. It also aids in maintaining body temperature. A good fluid intake promotes good bowel function, which is sometimes a problem during pregnancy. The recommended daily intake is about six to eight glasses (1500 to 2000 ml) of fluid. Water, milk, and juices are good fluid sources. Dehydration may increase the risk of cramping, contractions, and preterm labor.

Women who consume more than 300 mg of caffeine daily (equivalent to about 500 to 750 ml of coffee) may be at increased risk of miscarriage and of giving birth to infants with IUGR. The ill effects of caffeine have been proposed to result from vasoconstriction of the blood vessels supplying the uterus or from interference with cell division in the developing fetus. Consequently, caffeine-containing



products such as caffeinated coffee, tea, soft drinks, and cocoa beverages should be avoided or consumed only in limited quantities.

Aspartame (NutraSweet, Equal), acesulfame potassium (Sunett), and sucralose (Splenda), artificial sweeteners

commonly used in low- or no-calorie beverages and low-calorie food products, have not been found to have adverse effects on the normal mother or fetus. Aspartame, which contains phenylalanine, should be avoided by the woman with phenylketonuria (PKU) (Box 10-1).

### BOX 10-1

#### Use of Artificial Sweeteners during Pregnancy

All of the following sweeteners are approved for use in all age groups, including pregnant women, in the United States:



#### ACESULFAME K

- Brand names: Sunett, Sweet One
- Primary uses: baked goods, frozen desserts, candies, beverages
- Sweetness: 200 times sweeter than sugar
- Shelf life: long
- Suitability for cooking: good, does not break down when heated
- Health concerns: none known

#### ASPARTAME

- Brand names: Equal, NutraSweet, NatraTaste
- Primary uses: beverages, frozen desserts, dairy products, chewing gum, breakfast cereals, table-top sweetener
- Sweetness: 180 times sweeter than sugar
- Shelf life: relatively short (about 5 months in a soft drink)
- Suitability for cooking: breaks down and loses sweetness if cooked at high temperatures or for long periods
- Health concerns: contains phenylalanine, a consideration in the diets of people with phenylketonuria

#### NEOTAME

- Brand names: none (not currently available)
- Primary uses: approved in the United States but not currently marketed; proposed for use in beverages, frozen desserts, yogurt, chewing gum, toppings, fillings, fruit spreads, table-top sweetener
- Sweetness: 8000 times sweeter than sugar
- Shelf life: similar to aspartame (about 5 months in a soft drink)
- Suitability for cooking: good, but loses sweetness if cooked at high temperatures or for prolonged periods
- Health concerns: none known; contains phenylalanine but not in a form that can be metabolized

#### SACCHARIN

- Brand name: Sweet 'n Low
- Primary uses: fountain drinks, chewable vitamins and medications, table-top sweetener
- Sweetness: 300 times sweeter than sugar
- Shelf life: long
- Suitability for cooking: good, does not lose sweetness during cooking
- Health concerns: linked to bladder cancer in rats

#### SUCRALOSE

- Brand name: Splenda
- Primary uses: baked goods, beverages, frozen desserts, gelatins, table-top sweetener
- Sweetness: 600 times sweeter than sugar
- Shelf life: long
- Suitability for cooking: very good, does not break down during cooking (maltodextrin is added to give products better bulk and texture)
- Health concerns: none known

#### SUGAR ALCOHOLS (not technically artificial sweeteners; contain almost as many calories as sugar)

- Types: sorbitol, xylitol, lactitol, mannitol, and maltitol
- Primary uses: sugar-free candy, cookies, and chewing gum
- Sweetness: most are about 70% as sweet as sugar; xylitol equals sugar in sweetness
- Shelf life: long
- Suitability for cooking: good
- Advantages over sugar: do not promote tooth decay, more slowly metabolized so that they do not create a rapid peak in blood glucose
- Health concerns: diarrhea can occur with large intakes

Sugar is important for the volume and moisture of baked goods. Artificial sweeteners may produce a good-tasting product, but some sugar is necessary in many recipes to yield normal volume and texture.

## Minerals and Vitamins

In general the nutrient needs of pregnant women, except perhaps for folate and iron, can be met through dietary sources. Counseling about the need for a varied diet rich in vitamins and minerals should be a part of every pregnant woman's early prenatal care and should be reinforced throughout pregnancy. Supplements of certain nutrients (listed in the following discussion) are recommended whenever the woman's diet is very poor or whenever significant nutritional risk factors are present. Nutritional risk factors in pregnancy are listed in Box 10-2.

### Iron

Iron is needed both to allow transfer of adequate iron to the fetus and to permit expansion of the maternal red blood cell (RBC) mass. Beginning in the latter part of the first trimester, the blood volume of the mother increases steadily, peaking at about 1500 ml more than that in the nonpregnant state. In twin gestations, the increase is at least 500 ml greater than that in pregnancies with single fetuses. Plasma volume increases more than RBC mass, with the difference between plasma and RBCs being greatest during the second trimester. The relative excess of plasma causes a modest decrease in the hemoglobin concentration and hematocrit, termed **physiologic anemia of pregnancy**. This is a normal adaptation during pregnancy.

However, poor iron intake and absorption, which can result in iron deficiency anemia, is relatively common among women in the childbearing years. It affects nearly one fifth of the pregnant women in industrialized countries. The maternal mortality rate is increased among anemic women, who are poorly prepared to tolerate hemorrhage at the time of birth. In addition, anemic women may have a greater likelihood of cardiac failure during labor, postpartum infections, and poor wound healing. The fetus is also affected by maternal anemia. The risk of preterm birth is about threefold

greater in anemic women, and fetal iron stores may also be reduced by maternal anemia. Anemia is more common among adolescents and African-American women than among adult Caucasian women.

The Institute of Medicine (1992) recommended that all pregnant women receive a supplement of 30 mg of ferrous iron daily, starting by 12 weeks of gestation. (Iron supplements may be poorly tolerated during the nausea that is prevalent in the first trimester.) If maternal iron deficiency anemia is present (preferably diagnosed by measurement of serum ferritin, a storage form of iron), increased dosages (60 to 100 mg daily) are recommended. Certain foods taken with an iron supplement can promote or inhibit absorption of iron from the supplement. Even when a woman is taking an iron supplement, she should include good food sources of iron in her daily diet (see Table 10-1).

### Calcium

There is no increase in the DRI of calcium during pregnancy and lactation, in comparison with the recommendation for the nonpregnant woman (see Table 10-1). The DRI (1000 mg daily for women age 19 and older and 1300 mg for those younger than age 19) appears to provide sufficient calcium for fetal bone and tooth development to proceed while maternal bone mass is maintained.

Milk and yogurt are especially rich sources of calcium, providing approximately 300 mg/cup (240 ml). Nevertheless, many women do not consume these foods or do not consume adequate amounts to provide the recommended intakes of calcium. One problem that can interfere with milk consumption is **lactose intolerance**, which is an inability to digest milk sugar (lactose) and is caused by the absence of the lactase enzyme in the small intestine. Lactose intolerance is relatively common in adults, particularly African-Americans, Asians, Native Americans, and Inuits. Milk consumption may cause abdominal cramping, bloating, and diarrhea in such people. Yogurt, sweet acidophilus milk, buttermilk, cheese, chocolate milk, and cocoa may be tolerated even when fresh fluid milk is not. Commercial products that contain lactase (e.g., Lactaid) are widely available. Many supermarkets stock lactase-treated milk. The lactase in these products hydrolyzes, or digests, the lactose in milk, making it possible for lactose-intolerant people to drink milk.

In some cultures, adults rarely drink milk. For example, Puerto Ricans and other Hispanic people may use milk only as an additive in coffee. Pregnant women from these cultures may need to consume nondairy sources of calcium. Vegetarian diets may also be deficient in calcium (Box 10-3). If calcium intake appears low and the woman does not change her dietary habits despite counseling, a daily supplement containing 600 mg of elemental calcium may be needed. Calcium supplements may also be recommended when a pregnant woman experiences leg cramps caused by an imbalance in the calcium/phosphorus ratio.

#### BOX 10-2

#### Indicators of Nutritional Risk in Pregnancy

- Adolescence
- Frequent pregnancies: three within 2 years
- Poor fetal outcome in a previous pregnancy
- Poverty
- Poor diet habits with resistance to change
- Use of tobacco, alcohol, or drugs
- Weight at conception under or over normal weight
- Problems with weight gain
- Any weight loss
- Weight gain of less than 1 kg/mo after the first trimester
- Weight gain of more than 1 kg/wk after the first trimester
- Multifetal pregnancy
- Low hemoglobin or hematocrit values (or both)



## EVIDENCE-BASED PRACTICE

### Calcium Supplementation for Preventing Preeclampsia

#### BACKGROUND

- Hypertensive disorders of pregnancy are associated with maternal and fetal death and morbidity. Hypertension leads to poor uterine perfusion, preterm birth, fetal distress, low birth weight, and perinatal fetal mortality. In the mother, preeclampsia can lead to edema; seizures; renal failure; the syndrome of hemolysis, elevated liver enzymes, and low platelets (HELLP); admission to intensive care; cesarean birth; and maternal death. *Gestational hypertension* is usually defined as new-onset diastolic blood pressure over 90 mm Hg, or a rise over baseline for systolic blood pressure of 30 mm Hg or for diastolic pressure of 15 mm Hg. Preeclampsia is diagnosed when gestational hypertension is accompanied by proteinuria of 2+, or 300 mg in 24 hours. Blood pressure climbs when the endothelial walls become inflamed from unknown causes. Low calcium intake may stimulate either parathyroid hormone or renin release, which increases cellular uptake of calcium, leading to vasospasm. Calcium supplementation reduces parathyroid hormone, thus reducing intravascular inflammation, and may be a treatment for gestational hypertension. Calcium may also relax the smooth muscles in the uterus, reducing the risk of preterm labor. Calcium is cost-effective, familiar, and available. No risk of renal stones has been noted.

#### OBJECTIVES

- The goal of the review was to determine whether calcium supplementation during pregnancy affected preeclampsia, and related adverse maternal and fetal outcomes. Of interest were comparisons of women at low risk for preeclampsia with high risk mothers (teens, women with history of preeclampsia or prepregnancy hypertension, increased sensitivity to angiotensin II) and comparisons of women with low dietary calcium baselines (under 900 mg/day) with women with adequate dietary calcium. The intervention was oral calcium, at least 1 g/day. The controls took a placebo. Maternal outcome measures included hypertension, proteinuria, placental abruption, cesarean birth, mother's length of stay, eclampsia, renal failure, HELLP, intensive care unit admission, and maternal death. Fetal or neonatal outcomes included preterm labor (before 37 weeks), low birth weight, small size for gestational age, admission to neonatal intensive care unit (NICU), length of stay longer than 7 days, perinatal death, long-term disability, and childhood hypertension (greater than 95th percentile).

#### METHODS

##### Search Strategy

- The reviewers searched the Cochrane database, MEDLINE, 30 journals and conferences, and a weekly current awareness service of 37 journals. Search keywords were *calcium*, *hypertension*, *pregnancy*, *blood pressure*, and combinations of these terms.
- Eleven randomized, placebo-controlled trials were selected, representing 6894 women from Argentina, the United States, Australia, Ecuador, and India. The trials were published from 1989 to 2001.

#### Statistical Analyses

- Similar data were pooled, and effect size (the difference between intervention and control groups in each trial) was calculated. The calculations comparing high risk and low risk women, and baseline low and adequate dietary calcium, were analyzed post hoc (after the main calculations).

#### FINDINGS

- Calcium supplementation was associated with significantly less high blood pressure than placebo. The difference was more marked in the group of women at high risk for gestational hypertension and in the group of women with low baseline dietary calcium. Preeclampsia was likewise significantly reduced with calcium in low risk women and markedly reduced in high risk women and women with low baseline dietary calcium, but the effect was not significant with women who had adequate baseline dietary calcium. The risk of preterm birth and low birth weight was significantly decreased among high risk women taking calcium. There was no difference in cesarean births, admission to NICU, or perinatal death. Data were inadequate to make determinations about maternal death or serious morbidity, placental abruptions, mother's length of stay, small-for-gestational-age babies, or childhood disabilities. One follow-up study of children at 7 years of age found fewer elevated blood pressures in the calcium group than placebo, suggesting a lingering benefit for the offspring. No side effects of calcium were recorded in these trials.

#### LIMITATIONS

- The doses and types of calcium differed, as did the definitions of high risk and the baseline dietary calcium intake, causing heterogeneity in the trials and limiting generalizability. Some randomization was not well described. In general, however, these were strong trials in that they were large, double-blinded, and placebo-controlled trials.

#### CONCLUSIONS

- Supplemental calcium is associated with less hypertension and less preeclampsia, as well as less preterm birth and low birth weight, especially in those women at high risk.

#### IMPLICATIONS FOR PRACTICE

- Health care providers should support calcium supplementation for women at high risk for gestational hypertension, as well as in communities with low baseline calcium intake.

#### IMPLICATIONS FOR FURTHER RESEARCH

- Research should focus on women at high risk for gestational hypertension and communities with low baseline dietary calcium, and on ideal dosages of calcium. The one study of long-term benefits for offspring was promising. Researchers should distinguish between small-for-gestational-age babies and preterm babies, because they are different conditions and have different prognoses.

**BOX 10-3****Calcium Sources for Women Who Do Not Drink Milk**

Each of the following provides approximately the same amount of calcium as 1 cup of milk.

**FISH**

3-oz can of sardines  
4½-oz can of salmon (if bones are eaten)

**BEANS AND LEGUMES**

3 cups cooked dried beans  
2½ cups refried beans  
2 cups baked beans with molasses  
1 cup tofu (calcium is added in processing)

**GREENS**

1 cup collards  
1½ cups kale or turnip greens

**BAKED PRODUCTS**

3 pieces cornbread  
3 English muffins  
4 slices French toast  
2 waffles (7 inches in diameter)

**FRUITS**

11 dried figs  
1⅛ cups orange juice with calcium added

**SAUCES**

3 oz pesto sauce  
5 oz cheese sauce

**Sodium**

During pregnancy the need for sodium increases slightly, primarily because the body water is expanding (e.g., the expanding blood volume). Sodium is essential for maintaining body water balance. In the past, dietary sodium was routinely restricted in an effort to control the peripheral edema that commonly occurs during pregnancy. It is now recognized that moderate peripheral edema is normal in pregnancy, occurring as a response to the fluid-retaining effects of elevated levels of estrogen. An excessive emphasis on sodium restriction may make it difficult for pregnant women to achieve an adequate diet. Grain, milk, and meat products, which are good sources of other nutrients needed during pregnancy, are significant sources of sodium. In addition, sodium restriction may stress the adrenal glands and the kidney as they attempt to retain adequate sodium. In general, sodium restriction is necessary only if the woman has a medical condition such as renal or liver failure or hypertension.

Excessive intake of sodium is discouraged during pregnancy just as it is in nonpregnant women, because it may contribute to abnormal fluid retention and edema. Table salt (sodium chloride) is the richest source of sodium. Most

canned foods contain added salt unless the label specifically states otherwise. Large amounts of sodium are also found in many processed foods, including meats (e.g., smoked or cured meats, cold cuts, and corned beef), baked goods, mixes for casseroles or grain products, soups, and condiments. Products low in nutritive value and excessively high in sodium include pretzels, potato and other chips, pickles, catsup, prepared mustard, steak and Worcestershire sauces, some soft drinks, and bouillon. A moderate sodium intake can usually be achieved by salting food lightly in cooking; adding no additional salt at the table; and avoiding low-nutrient, high-sodium foods.

**Zinc**

Zinc is a constituent of numerous enzymes involved in major metabolic pathways. Zinc deficiency is associated with malformations of the central nervous system in infants. When large amounts of iron and folic acid are consumed, the absorption of zinc is inhibited and serum zinc levels are reduced as a result. Because iron and folic acid supplements are commonly prescribed during pregnancy, pregnant women should be encouraged to consume good sources of zinc daily (see Table 10-1). Women with anemia who receive high-dose iron supplements also need supplements of zinc and copper (King, 2000).

**Fluoride**

There is no evidence that prenatal fluoride supplementation reduces the child's likelihood of tooth decay during the preschool years (Fluoride Recommendations Work Group, 2001). No increase in fluoride intake over the non-pregnant DRI is currently recommended during pregnancy.

**Fat-soluble vitamins**

Fat-soluble vitamins—A, D, E, and K—are stored in the body tissues. With chronic overdoses these vitamins can reach toxic levels. Because of the high potential for toxicity, pregnant women are advised to take fat-soluble vitamin supplements only as prescribed. Vitamins A and D deserve special mention.

Adequate intake of vitamin A is needed so that sufficient amounts can be stored in the fetus. Dietary sources can readily supply sufficient amounts. Congenital malformations have occurred in infants of mothers who took excessive amounts of vitamin A during pregnancy, and therefore supplements are not recommended for pregnant women. Vitamin A analogs such as isotretinoin (Accutane), which are prescribed for the treatment of cystic acne, are a special concern. Isotretinoin use during early pregnancy has been associated with an increased incidence of heart malformations, facial abnormalities, cleft palate, hydrocephalus, and deafness and blindness in the infant, as well as an increased risk of miscarriage. Topical agents such as tretinoin (Retin-A) do not appear to enter the circulation in any substantial amounts, but their safety in pregnancy has not been confirmed.

✿ Vitamin D plays an important role in absorption and metabolism of calcium. The main food sources of this vitamin are enriched or fortified foods such as milk and ready-to-eat cereals. Vitamin D is also produced in the skin by the action of ultraviolet light (in sunlight). Severe deficiency may lead to neonatal hypocalcemia and tetany, as well as hypoplasia of the tooth enamel. Women with lactose intolerance and those who do not include milk in their diet for any reason are at risk for vitamin D deficiency. Other risk factors are having dark skin; habitually using clothing that covers most of the skin (e.g., Arab women with extensive body covering); and living in northern latitudes where sunlight exposure is limited, especially during the winter. Use of recommended amounts of sunscreen with a sun protection factor (SPF) rating of 15 reduces skin vitamin D production by as much as 99% (Scanlon, 2001), reinforcing the need for regular intake of fortified foods or a supplement.

### Water-soluble vitamins

Body stores of water-soluble vitamins are much smaller than those of fat-soluble vitamins. Water-soluble vitamins, in contrast to fat-soluble vitamins, are readily excreted in the urine. Therefore good sources of these vitamins must be consumed frequently. Toxicity with overdose is less likely than with fat-soluble vitamins.

Because of the increase in RBC production during pregnancy, as well as the nutritional requirements of the rapidly growing cells in the fetus and placenta, pregnant women should consume about 50% more folic acid than nonpregnant women, or about 0.6 mg (600 mcg) daily. In the United States all enriched grain products (this includes most white breads, flour, and pasta) must contain folic acid at a level of 1.4 mg/kg of flour. This level of fortification is designed to supply approximately 0.1 mg of folic acid daily in the average American diet and has significantly increased folic acid consumption in the population as a whole. All women of child-bearing potential need careful counseling about including good sources of folic acid in their diet (Box 10-4; see Table 10-1). Supplemental folic acid is usually prescribed to ensure that intake is adequate. Women who have borne a child with a neural tube defect are advised to consume 4 mg of folic acid daily, and a supplement is required for them to achieve this level of intake.

Pyridoxine, or vitamin B<sub>6</sub>, is involved in protein metabolism. Although levels of a pyridoxine-containing enzyme have been reported to be low in women with preeclampsia, ✿ there is no evidence that supplementation prevents or corrects the condition. No supplement is recommended routinely, but women with poor diets and those at nutritional risk (see Box 10-2) may need a supplement providing 2 mg/day.

Vitamin C, or ascorbic acid, plays an important role in tissue formation and enhances the absorption of iron. The vitamin C needs of most women are readily met by a diet that includes at least one daily serving of citrus fruit or juice or another good source of the vitamin (see Table 10-1), but women who smoke need more. For women at nutritional

#### BOX 10-4

#### Food Sources of Folate

##### FOODS PROVIDING 500 mcg OR MORE PER SERVING

- Liver: Chicken, turkey, goose (3½ oz)

##### FOODS PROVIDING 200 mcg OR MORE PER SERVING

- Liver: Lamb, beef, veal (3½ oz)

##### FOODS PROVIDING 100 mcg OR MORE PER SERVING

- Legumes, cooked (½ cup)
  - Peas: Black-eyed peas, chickpeas (garbanzos)
  - Beans: Black, kidney, pinto, red, navy
  - Lentils
- Vegetables (½ cup)
  - Asparagus
  - Spinach, cooked
- Papaya (1 medium)
- Breakfast cereal, ready-to-eat (½-1 cup)
- Wheat germ (½ cup)

##### FOODS PROVIDING 50 mcg OR MORE PER SERVING

- Vegetables (cup)
  - Broccoli
  - Beans: lima, baked, or pork and beans
  - Greens: collards or mustard, cooked
  - Spinach, raw
- Fruits (½ cup)
  - Avocado
  - Orange or orange juice
- Pasta, cooked (1 cup)
- Rice, cooked (1 cup)

##### FOODS PROVIDING 20 mcg OR MORE PER SERVING

- Bread (1 slice)
- Egg (1 large)
- Corn (½ cup)

risk, a supplement of 50 mg/day is recommended. However, if the mother takes excessive doses of this vitamin during pregnancy, a vitamin C deficiency may develop in the infant after birth.

### Multivitamin and multimineral supplements during pregnancy

The consensus of the 1992 Institute of Medicine committee is that food can and should be the normal vehicle to meet the additional needs imposed by pregnancy, except for iron. Recall that a supplemental dose of 30 mg/day is recommended. In addition, the recommended folate intake may be difficult for some women to achieve. Some women habitually consume diets that are deficient in necessary nutrients and, for whatever reason, may be unable to change this intake. For these women, a multivitamin-multimineral

supplement should be considered to ensure that they consume the RDA for most known vitamins and minerals. It is important that the pregnant woman understand that the use of a vitamin-mineral supplement does not lessen the need to consume a nutritious, well-balanced diet.

## Other Nutritional Issues during Pregnancy

### Pica and food cravings

**Pica**, the practice of consuming nonfood substances (e.g., clay, dirt, and laundry starch) or excessive amounts of food-stuffs low in nutritional value (e.g., cornstarch, ice, baking powder, and baking soda), is often influenced by the woman's cultural background (Fig. 10-3). In the United States it appears to be most common among African-American women, women from rural areas, and women with a family history of pica. Regular and heavy consumption of low-nutrient products may cause more nutritious foods to be displaced from the diet, and the items consumed may interfere with the absorption of nutrients, especially minerals. Women with pica have lower hemoglobin levels than those without pica. The possibility of pica must be considered when pregnant women are found to be anemic. The nurse should provide counseling about the health risks associated with pica.

The existence of pica, as well as details of the type and amounts of products ingested, is likely to be discovered only by the sensitive interviewer who has developed a relationship of trust with the woman. It has been proposed that pica and food cravings (e.g., the urge to consume ice cream, pickles, or pizza) during pregnancy are caused by an innate drive to consume nutrients missing from the diet. However, research has not supported this hypothesis.

### Adolescent pregnancy needs

Many adolescent females have diets that provide less than the recommended intakes of key nutrients, including energy, calcium, and iron. Pregnant adolescents and their infants are at increased risk of complications during pregnancy and parturition. Growth of the pelvis is delayed in comparison with growth in stature, and this helps to explain why cephalo-pelvic disproportion and other mechanical problems associated with labor are common among young adolescents. Competition for nutrients between the growing adolescent and the fetus may also contribute to some of the poor outcomes apparent in teen pregnancies. Pregnant adolescents are encouraged to choose a weight gain goal at the upper end of the range for their BMI.

Efforts to improve the nutritional health of pregnant adolescents focus on improving the nutrition knowledge, meal planning, and food preparation and selection skills of young women; promoting access to prenatal care; developing nutrition interventions and educational programs that are effective with adolescents; and striving to understand the factors that create barriers to change in the adolescent population.

### Preeclampsia

The cause of preeclampsia is not known. There has been speculation that the poor intake of several nutrients, including calcium, magnesium, vitamin B<sub>6</sub>, and protein, might foster its development. There is no definite evidence that nutritional deficiencies are causes or that nutritional supplements can help prevent it. At present, a diet adequate in the recommended nutrients (see Table 10-1) appears to be the best means of reducing the risk of preeclampsia.



**Fig. 10-3** Nonfood substances consumed in pica: (center) red clay from Georgia (left to right); Nzu from Eastern Nigeria, baking powder, corn starch, baking soda, laundry starch, and ice. Some individuals practice *poly-pica* (consuming more than one of these substances.) (Courtesy Shannon Perry, Phoenix, AZ.)

### Exercise during pregnancy

Moderate exercise during pregnancy yields numerous benefits, including improving muscle tone, potentially shortening the course of labor, and promoting a sense of well-being. If no medical or obstetric problems contraindicate physical activity, pregnant women should perform 30 minutes of moderate physical exercise on most, if not all, days of the week (American College of Obstetricians and Gynecologists [ACOG], 2002). Two nutritional concepts are especially important for women who choose to exercise during pregnancy. First, a liberal amount of fluid should be consumed before, during, and after exercise because dehydration can trigger premature labor. Second, the calorie intake should be sufficient to meet the increased needs of pregnancy and the demands of exercise.

## NUTRIENT NEEDS DURING LACTATION

Nutritional needs during lactation are similar in many ways to those during pregnancy (see Table 10-1). Needs for energy (calories), protein, calcium, iodine, zinc, the B vitamins (thiamine, riboflavin, niacin, pyridoxine, and vitamin B<sub>12</sub>), and vitamin C remain greater than nonpregnant needs. The recommendations for some of these (e.g., vitamin C, zinc, and protein) are slightly to moderately higher than during pregnancy (see Table 10-1). This allowance covers the amount of the nutrients released in the milk, as well as the needs of the mother for tissue maintenance. In the case of iron and folic acid, the recommendation during lactation is lower than during pregnancy. Both of these nutrients are essential for RBC formation and therefore for maintaining the increase in the blood volume that occurs during pregnancy. With the decrease in maternal blood volume to nonpregnant levels after birth, maternal iron and folic acid needs also decrease. Many lactating women have a delay in the return of menses; this conserves blood cells and reduces iron and folic acid needs. It is especially important that the calcium intake be adequate; if it is not and the woman does not respond to diet counseling, a supplement of 600 mg of calcium per day may be needed.

The recommended energy intake is an increase of 500 kcal more than the woman's nonpregnant intake. The Institute of Medicine (1992) recommends that lactating women consume at least 1800 kcal/day; it is difficult to obtain adequate nutrients for maintenance of lactation at levels below that. Because of the deposition of energy stores, the woman who has gained the optimal amount of weight during pregnancy is heavier after birth than at the beginning of pregnancy. As a result of the caloric demands of lactation, however, the lactating mother usually experiences a gradual but steady weight loss. Most women rapidly lose several pounds during the first month after birth whether or not they breastfeed. After the first month the average loss during lactation is 0.5 to 1 kg a month.

Fluid intake must be adequate to maintain milk production, but the mother's level of thirst is the best guide to the right amount. There is no need to consume more fluids than those needed to satisfy thirst.

Smoking, alcohol intake, and excessive caffeine intake should be avoided during lactation. Smoking may not only impair milk production but also may expose the infant to the risk of passive smoking. It is speculated that the infant's psychomotor development may be affected by maternal alcohol use, and alcoholic beverages (two drinks per day) may impair the milk ejection reflex. Caffeine intake may lead to a reduced iron concentration in milk and consequently contribute to the development of anemia in the infant. The caffeine concentration in milk is only approximately 1% of the mother's plasma level, but caffeine seems to accumulate in the infant. Breastfed infants of mothers who drink large amounts of coffee or caffeine-containing soft drinks may be unusually active and wakeful.

## CARE MANAGEMENT

During pregnancy, nutrition plays a key role in achieving an optimum outcome for the mother and her unborn baby. Motivation to learn about nutrition is usually higher during pregnancy as parents strive to "do what's right for the baby." Optimum nutrition cannot eliminate all problems that may arise during pregnancy, but it does establish a good foundation for supporting the needs of the mother and her unborn baby.

### Assessment and Nursing Diagnoses

Assessment is based on a diet history (a description of the woman's usual food and beverage intake and factors affecting her nutritional status, such as medications being taken and adequacy of income to allow her to purchase the necessary foods) obtained from an interview and review of the woman's health records, physical examination, and laboratory results. Ideally, a nutritional assessment is performed before conception so that any recommended changes in diet, lifestyle, and weight can be undertaken before the woman becomes pregnant.

#### Diet history

**Obstetric and gynecologic effects on nutrition.** Nutritional reserves may be depleted in the multiparous woman or one who has had frequent pregnancies (especially three pregnancies within 2 years). A history of preterm birth or the birth of an LBW or SGA infant may indicate inadequate dietary intake. Preeclampsia may also be a factor in poor maternal nutrition. Birth of a large-for-gestational-age (LGA) infant may indicate the existence of maternal diabetes mellitus. Previous contraceptive methods also may affect reproductive health. Increased menstrual blood loss often occurs during the first 3 to 6 months

after placement of an intrauterine contraceptive device. Consequently the user may have low iron stores or even iron deficiency anemia. Oral contraceptive agents, on the other hand, are associated with decreased menstrual losses and increased iron stores. Oral contraceptives, however, may interfere with folic acid metabolism.

**Medical history.** Chronic maternal illnesses such as diabetes mellitus, renal disease, liver disease, cystic fibrosis or other malabsorptive disorders, seizure disorders and the use of anticonvulsant agents, hypertension, and PKU may affect a woman's nutritional status and dietary needs. In women with illnesses that have resulted in nutritional deficits or that require dietary treatment (e.g., diabetes mellitus, PKU), it is extremely important for nutritional care to be started and for the condition to be optimally controlled before conception. A registered dietitian can provide in-depth counseling for the woman who requires a therapeutic diet during pregnancy and lactation.

**Usual maternal diet.** The woman's usual food and beverage intake, adequacy of income and other resources to meet her nutritional needs, any dietary modifications, food allergies and intolerances, and all medications and nutrition supplements being taken, as well as pica and cultural dietary requirements, should be ascertained. In addition, the presence and severity of nutrition-related discomforts of pregnancy, such as morning sickness, constipation, and pyrosis (heartburn), should be determined. The nurse should be alert to any evidence of eating disorders such as anorexia nervosa, bulimia, or frequent and rigorous dieting before or during pregnancy.

The impact of food allergies and intolerances on nutritional status ranges from very important to almost none. Lactose intolerance is of special concern in pregnant and lactating women because no other food group equals milk and milk products in terms of calcium content. If a woman has lactose intolerance, the interviewer should explore her intake of other calcium sources (see Box 10-3).

The assessment must include an evaluation of the woman's financial status and her knowledge of sound dietary practices. The quality of the diet improves with increasing socioeconomic status and educational level. Poor women may not have access to adequate refrigeration and cooking facilities and may find it difficult to obtain adequate nutritious food. The pregnancy rates are high among homeless women, and many such women cannot or do not take advantage of services such as food stamps.

Box 10-5 provides a simple tool for obtaining diet history information. When potential problems are identified, they should be followed up with a careful interview.

**Physical examination.** **Anthropometric** (body measurements) provide short- and long-term information about a woman's nutritional status and are therefore essential to the assessment. At a minimum, the woman's height and weight must be determined at the time of her first prenatal visit, and her weight should be measured at each subsequent visit (see earlier discussion of BMI).

A careful physical examination can reveal objective signs of malnutrition (Table 10-4). It is important to note, however, that some of these signs are nonspecific and that the physiologic changes of pregnancy may complicate the interpretation of physical findings. For example, lower extremity edema often occurs in calorie and protein deficiency, but it may also be a normal finding in the third trimester of pregnancy. Interpretation of physical findings is made easier by a thorough health history and by laboratory testing, if indicated.

**Laboratory testing.** The only nutrition-related laboratory testing needed by most pregnant women is a hematocrit or hemoglobin measurement to screen for the presence of anemia. Because of the physiologic anemia of pregnancy, the reference values for hemoglobin and hematocrit must be adjusted during pregnancy. The lower limit of the normal range for hemoglobin during pregnancy is 11 g/dl in the first and third trimesters and 10.5 g/dl in the second trimester (compared with 12 g/dl in the nonpregnant state). The lower limit of the normal range for hematocrit is 33% during the first and third trimesters and 32% in the second trimester (compared with 36% in the nonpregnant state). Cutoff values for anemia are higher in women who smoke or who live at high altitudes, because the decreased oxygen-carrying capacity of their RBCs causes them to produce more RBCs than other women.

A woman's history or physical findings may indicate the need for additional testing, such as a complete blood cell count with a differential to identify megaloblastic or macrocytic anemia and measurement of levels of specific vitamins or minerals believed to be lacking in the diet.

The assessment gives a basis for making appropriate nursing diagnoses.

- *Imbalanced nutrition: less than body requirements related to*
  - inadequate information about nutritional needs and weight gain during pregnancy
  - misperceptions regarding normal body changes during pregnancy and inappropriate fear of becoming fat
  - inadequate income or skills in meal planning and preparation
- *Imbalanced nutrition: more than body requirements related to*
  - excessive intake of energy (calories) or decrease in activity during pregnancy
  - use of unnecessary dietary supplements
- *Constipation related to*
  - decrease in gastrointestinal motility because of elevated progesterone levels
  - compression of intestines by the enlarging uterus
  - oral iron supplementation

### Expected Outcomes of Care

An individualized plan of care based on the nursing diagnoses should be developed in collaboration with the woman. For many women with uncomplicated pregnancies,



**BOX 10-5**

**Food Intake Questionnaire**

**Which of the following did you eat or drink yesterday?** If the way you ate yesterday wasn't the way you usually eat, choose a recent day that was typical for you.

FOOD OR DRINK	NUMBER OF SERVINGS	FOOD OR DRINK	NUMBER OF SERVINGS
Beer, wine, other alcoholic drinks	_____	Orange or grapefruit juice	_____
Tea	_____	Fruit juice other than orange or grapefruit	_____
Coffee	_____	Soft drinks	_____
Fruit drink	_____	Milk	_____
Water	_____	Cereal with milk	_____
Cheese	_____	Yogurt	_____
Macaroni and cheese	_____	Pizza	_____
Other foods with cheese (such as lasagna, enchiladas, cheeseburgers)	_____	Melon (such as watermelon, cantaloupe, honeydew)	_____
Orange or grapefruit	_____	Berries (kind _____ )	_____
Bananas	_____	Apples	_____
Peaches or apricots	_____	Other fruit	_____
Green salad	_____	Broccoli	_____
Spinach or greens	_____	Green beans	_____
Green peas	_____	Potatoes (other than fried)	_____
Sweet potatoes	_____	Corn	_____
Carrots	_____	Other vegetables	_____
Meat	_____	Chicken or turkey	_____
Fish	_____	Egg	_____
Peanut butter	_____	Nuts	_____
Dried beans or peas	_____	Hot dog	_____
Bacon or sausage	_____	Cold cuts (e.g., bologna)	_____
Bread	_____	Roll/bagel	_____
Rice	_____	Noodles	_____
Spaghetti or other pasta	_____	Chips	_____
Tortillas	_____	Cake	_____
French fries	_____	Donut or pastry	_____
Cookie	_____		
Pie	_____		

Are you often bothered by any of the following? (Circle all that apply)

Nausea      Vomiting      Heartburn      Constipation

Are you on a special diet? No \_\_\_\_\_ Yes \_\_\_\_\_ If yes, what kind? \_\_\_\_\_

Do you try to limit the amount or kind of food you eat to control your weight? No \_\_\_\_\_ Yes \_\_\_\_\_

Do you avoid any foods for health or religious reasons? No \_\_\_\_\_ Yes \_\_\_\_\_ If yes, what foods? \_\_\_\_\_

Do you take any prescribed drugs or medications? No \_\_\_\_\_ Yes \_\_\_\_\_  
If yes, what are they? \_\_\_\_\_

Do you take any over-the-counter medications (such as aspirin, cold medicines, Tylenol)?  
No \_\_\_\_\_ Yes \_\_\_\_\_ If yes, what are they? \_\_\_\_\_

Do you take any herbal supplements?  
No \_\_\_\_\_ Yes \_\_\_\_\_ If yes, what are they? \_\_\_\_\_

Do you ever have trouble affording the food you need? No \_\_\_\_\_ Yes \_\_\_\_\_

Do you have any help getting the food you need? No \_\_\_\_\_ Yes \_\_\_\_\_ (Circle all that apply)

Food stamps      WIC      School lunch or breakfast  
Food from a food pantry, soup kitchen, or food bank

the nurse can serve as the primary source of nutrition education during pregnancy. The registered dietitian, who has specialized training in diet evaluation and planning, nutritional needs during illness, and ethnic and cultural food patterns, as well as translating nutrient needs into food patterns, often serves as a consultant. Pregnant women with

serious nutritional problems, those with intervening illnesses such as diabetes (either preexisting or gestational), and any others requiring in-depth dietary counseling should be referred to the dietitian. The nurse, dietitian, physician, and nurse-midwife collaborate in helping the woman achieve nutrition-related expected outcomes. Some

TABLE 10-4

**Physical Assessment of Nutritional Status**

SIGNS OF GOOD NUTRITION	SIGNS OF POOR NUTRITION
<b>GENERAL APPEARANCE</b> Alert, responsive, energetic, good endurance	Listless, apathetic, cachectic, easily fatigued, looks tired
<b>MUSCLES</b> Well developed, firm, good tone, some fat under skin	Flaccid, poor tone, undeveloped, tender, “wasted” appearance
<b>NERVOUS CONTROL</b> Good attention span, not irritable or restless, normal reflexes, psychologic stability	Inattentive, irritable, confused, burning and tingling of hands and feet, loss of position and vibratory sense, weakness and tenderness of muscles, decrease or loss of ankle and knee reflexes
<b>GASTROINTESTINAL FUNCTION</b> Good appetite and digestion, normal regular elimination, no palpable organs or masses	Anorexia, indigestion, constipation or diarrhea, liver or spleen enlargement
<b>CARDIOVASCULAR FUNCTION</b> Normal heart rate and rhythm, no murmurs, normal blood pressure for age	Rapid heart rate, enlarged heart, abnormal rhythm, elevated blood pressure
<b>HAIR</b> Shiny, lustrous, firm, not easily plucked, healthy scalp	Stringy, dull, brittle, dry, thin and sparse, depigmented, can be easily plucked
<b>SKIN (GENERAL)</b> Smooth, slightly moist, good color	Rough, dry, scaly, pale, pigmented, irritated, easily bruised, petechiae
<b>FACE AND NECK</b> Skin color uniform, smooth, pink, healthy appearance; no enlargement of thyroid gland; lips not chapped or swollen	Scaly, swollen, skin dark over cheeks and under eyes, lumpiness or flakiness of skin around nose and mouth; thyroid enlarged; lips swollen, angular lesions or fissures at corners of mouth
<b>ORAL CAVITY</b> Reddish pink mucous membranes and gums; no swelling or bleeding of gums; tongue healthy pink or deep red-dish in appearance, not swollen or smooth, surface papillae present; teeth bright and clean, no cavities, no pain, no discoloration	Gums spongy, bleed easily, inflamed or receding; tongue swollen, scarlet and raw, magenta color, beefy, hyperemic and hypertrophic papillae, atrophic papillae; teeth with unfilled caries, absent teeth, worn surfaces, mottled
<b>EYES</b> Bright, clear, shiny, no sores at corners of eyelids, membranes moist and healthy pink color, no prominent blood vessels or mound of tissue (Bitot’s spots) on sclera, no fatigue circles beneath	Eye membranes pale, redness of membrane, dryness, signs of infection, Bitot’s spots, redness and fissuring of eyelid corners, dryness of eye membrane, dull appearance of cornea, soft cornea, blue sclerae
<b>EXTREMITIES</b> No tenderness, weakness, or swelling; nails firm and pink	Edema, tender calves, tingling, weakness; nails spoon-shaped, brittle
<b>SKELETON</b> No malformations	Bowlegs, knock-knees, chest deformity at diaphragm, beaded ribs, prominent scapulas

common nutrition-related outcomes are that the woman will take the following actions:

- Achieve an appropriate weight gain during pregnancy. An appropriate goal for weight gain takes into account such factors as prepregnancy weight, whether she is overweight or obese or underweight, and whether the pregnancy is single or multifetal.
- Consume adequate nutrients from the diet and supplements to meet estimated needs.
- Cope successfully with nutrition-related discomforts associated with pregnancy, such as morning sickness, pyrosis (heartburn), and constipation.
- Avoid or reduce potentially harmful practices such as smoking, alcohol consumption, and caffeine intake.
- Return to prepregnancy weight (or an appropriate weight for height) within 6 months of giving birth.

### Plan of Care and Interventions

Nutritional care and teaching generally involve the following: (1) acquainting the woman with nutritional needs during pregnancy and, if necessary, the characteristics of an adequate diet; (2) helping her individualize her diet so that she achieves an adequate intake while conforming to her personal, cultural, financial, and health circumstances; (3) acquainting her with strategies for coping with the nutrition-related discomforts of pregnancy; (4) helping her use nutrition supplements appropriately; and (5) consulting with and making referrals to other professionals or services as indicated. Two programs that provide nutrition services are the food stamp program and WIC. These programs provide vouchers for selected foods to pregnant and lactating women, as well as infants and children at nutritional risk. WIC foods include items such as eggs, cheese, milk, juice, and fortified cereals—foods chosen because they provide iron, protein, vitamin C, and other vitamins.

### Adequate dietary intake

Diet teaching can take place in a one-on-one interview or in a group setting. In either case, teaching should emphasize the importance of choosing a varied diet composed of readily available foods, rather than specialized diet supplements. Good nutrition practices (and avoidance of poor practices such as smoking and alcohol or drug use) are essential content for prenatal classes designed for women in early pregnancy (see Guidelines/Guías box).

MyPyramid (Fig. 10-4), an update of the Food Guide Pyramid, can be used as a guide for making daily food choices during pregnancy and lactation, just as it is during other stages of the life cycle. Five categories are specified: grains, vegetables, fruits, milk, and meats and beans. At least 3 oz of whole grain breads, cereals, rice, and pasta per day is recommended. Other daily recommendations are 2½ cups of vegetables, 2 cups of fruits, 3 cups of low-fat or fat-free milk or milk products, and 5½ oz of protein (meat and beans). Most of the fat in the diet should come from fish, nuts, and vegetable oils. The importance of consuming adequate amounts from the



## GUIDELINES/GUÍAS

### Diet and Nutrition

- You need to gain weight.
- *Usted necesita aumentar de peso.*
- You need to control your weight gain.
- *Usted necesita controlar su aumento de peso.*
- Eat nutritious foods.
- *Coma alimentos nutritivos.*
- Eat foods high in protein, calcium, vitamins, and iron.
- *Coma alimentos altos en proteínas, calcio, vitaminas, y hierro.*
- Eat a lot of fruits and vegetables.
- *Coma muchas frutas y vegetales.*
- Drink four glasses of milk a day.
- *Tome cuatro vasos de leche diariamente.*
- Drink low-fat instead of whole milk.
- *Tome la leche baja en grasa en lugar de la leche entera.*
- Avoid salty foods like sausage, hot dogs, and french fries.
- *Evite alimentos muy salados como calchichas, perros calientes, y papitas fritas.*
- Avoid fried foods.
- *Evite las frituras.*
- Avoid caffeine.
- *Evite la cafeína.*
- There is caffeine in Coca-Cola, tea, and chocolate.
- *Hay cafeína en la Coca-Cola, el té, y el chocolate.*
- Take prenatal vitamins.
- *Tome vitaminas prenatales.*

milk, yogurt, and cheese group needs to be emphasized, especially for adolescents and women under age 25, who are still actively adding calcium to their skeletons. Staying within daily calorie needs and exercising a minimum of 30 minutes per day is important.

**Pregnancy.** The pregnant woman must understand what adequate weight gain during pregnancy means, recognize the reasons for its importance, and be able to evaluate her own gain in terms of the desirable pattern. Many women, particularly those who have worked hard to control their weight before pregnancy, may find it difficult to understand why the weight gain goal is so high when a newborn infant is so small. The nurse can explain that maternal weight gain consists of increments in the weight of many tissues, not just the growing fetus (see Table 10-2).

Dietary overindulgence, which may result in excessive fat stores that persist after giving birth, should be discouraged. Nevertheless, it is best not to focus unduly on weight gain because this could result in feelings of stress and guilt in the woman who does not follow the preferred pattern of gain. Teaching regarding weight gain during pregnancy is summarized in Box 10-6.

**Postpartum.** The need for a varied diet with portions of food from all food groups continues throughout lactation. As mentioned previously, the lactating woman should be



**Fig. 10-4** MyPyramid: a guide to daily food choices. (Modified from U.S. Department of Health and Human Services and U.S. Department of Agriculture. *Dietary Guidelines for Americans*, 2005, 6<sup>th</sup> ed. Washington, DC: U.S. Government Printing Office and U.S. Department of Agriculture Center for Nutrition Policy and Promotion, April 2005, CNPP-16).

**BOX 10-6****Weight Gain during Pregnancy**

- Progressive weight gain during pregnancy is essential to ensure normal fetal growth and development and the deposition of maternal stores that promote successful lactation.
- Recommended weight gain during pregnancy is determined largely by prepregnancy weight for height: normal-weight women, 11.5-16 kg; underweight women, 12.5-18 kg; overweight women, 7-11.5 kg.
- Weight gain should be achieved through a balanced diet of regular foods chosen from all the different food groups (see Table 10-3).
- The pattern of weight gain is important: approximately 0.4 kg/week during the second and third trimesters for normal-weight women; 0.5 kg/week for underweight women; and 0.3 kg/week for overweight women.

advised to consume at least 1800 kcal daily, and she should receive counseling if her diet appears to be inadequate in any nutrients. Special attention should be given to her zinc, vitamin B<sub>6</sub>, and folic acid intake because the recommendations for these remain higher than for nonpregnant women (see Table 10-1). Sufficient calcium is needed to allow for both milk formation and for maintenance of maternal bone mass. It may be difficult for lactating women to consume enough of these nutrients without careful diet planning.

The woman who does not breastfeed loses weight gradually if she consumes a balanced diet that provides slightly less than her daily energy expenditure. Lactating and nonlactating women should know that fat is the most concentrated source of calories in the diet (9 kcal/g versus 4 kcal/g in carbohydrates and proteins). Therefore the first step in weight reduction (or preventing excessive weight gain) is to evaluate sources of fat in the diet and explore with the woman ways of reducing them. Even foods such as vegetables that are naturally low in fat can become high in fat when fried or sautéed, served with excessive amounts of salad dressing, consumed with high-fat dips or sauces, or seasoned with butter or bacon drippings. A reasonable weight loss goal for nonlactating women is 0.5 to 1 kg/week; a loss of 1 kg/month is recommended for most lactating women who need to lose weight. A woman who is lactating may be able to lose up to 2 kg/month without decreasing her milk supply.

**Daily food guide and menu planning.** The daily food plan (see Table 10-2 and Fig. 10-4) can be used as a guide for educating women about nutritional needs during pregnancy and lactation. This food plan is general enough to be used by women from a variety of cultures, including those following a vegetarian diet. One of the more helpful teaching strategies is to assist the woman to plan daily menus that follow the food plan and are affordable, have realistic preparation times, and are compatible with personal preferences and cultural practices. Information regarding cultural food patterns is provided later in this chapter.

**Medical nutrition therapy.** During pregnancy and lactation, the food plan for women with special medical nutrition therapy (therapeutic diets) may have to be modified. The registered dietitian can instruct these women about their diets and assist them in meal planning. However, the nurse should understand the basic principles of the diet and be able to reinforce the diet teaching.

The nurse should be especially aware of the dietary modifications necessary for women with diabetes mellitus (either gestational or preexisting). This is necessary because this disease is relatively common and because fetal deformity and death occur more often in pregnancies complicated by hyperglycemia or hypoglycemia (see discussion of diabetes in Chapter 22).

### Counseling about iron supplementation

As mentioned earlier, the nutritional supplement most commonly needed during pregnancy is iron. However, a variety of dietary factors can affect the completeness of absorption of an iron supplement. The following points should be addressed in patient education:

- Bran, milk, egg yolks, coffee, tea, or oxalate-containing vegetables such as spinach and Swiss chard will inhibit iron absorption if consumed at the same time as iron.
- Iron absorption is promoted by a diet rich in vitamin C (e.g., citrus fruits and melons) or “heme iron” (found in red meats, fish, and poultry).
- Iron supplements are best absorbed on an empty stomach; to this end they can be taken between meals with beverages other than milk, tea, or coffee.
- Some women have gastrointestinal discomfort when they take the supplement on an empty stomach; therefore a good time for them to take the supplement is just before bedtime.
- Constipation is common with iron supplementation.
- Iron supplements should be kept away from any children in the household because their ingestion could result in acute iron poisoning and even death.

### Coping with nutrition-related discomforts of pregnancy

The most common nutrition-related discomforts of pregnancy are nausea and vomiting (or “morning sickness”), constipation, and pyrosis.

**Nausea and vomiting.** Nausea and vomiting are most common during the first trimester. Usually, nausea and vomiting cause only mild to moderate problems nutritionally, although they may cause substantial discomfort. Antiemetic medications, vitamin B<sub>6</sub>, and p6 acupressure may be effective in reducing the severity of nausea (Jewell & Young, 2004). The pregnant woman may find the following suggestions helpful in alleviating the problems: ❁

- Eat dry, starchy foods such as dry toast, Melba toast, or crackers on awakening in the morning and at other times when nausea occurs.

- Avoid consuming excessive amounts of fluids early in the day or when nauseated (but compensate by drinking fluids at other times).
- Eat small amounts frequently (every 2 to 3 hours), and avoid large meals that distend the stomach.
- Avoid skipping meals and thereby becoming extremely hungry, which may worsen nausea. Have a snack such as cereal with milk, a small sandwich, or yogurt before bedtime.
- Avoid sudden movements. Get out of bed slowly.
- Decrease intake of fried and other fatty foods. Starches such as pastas, rice, and breads and low-fat, high-protein foods such as skinless broiled or baked poultry, cooked dry beans or peas, lean meats, and broiled or canned fish are good choices.
- Some women find that tart foods or drinks (e.g., lemonade) or salty foods (e.g., potato chips) are tolerated during periods of nausea.
- Fresh air may help relieve nausea. Keep the environment well ventilated (e.g., open a window), go for a walk outside, or decrease cooking odors by using an exhaust fan.
- During periods of nausea, eat foods served at cool temperatures and foods that give off little aroma.
- Try herbal teas such as those made with raspberry leaf or peppermint to decrease nausea.
- Ginger root may be effective in reducing nausea.
- Avoid brushing teeth immediately after eating.

Hyperemesis gravidarum (severe and persistent vomiting causing weight loss, dehydration, and electrolyte abnormalities) occurs in up to 1% of pregnant women. Intravenous fluid and electrolyte replacement is usually necessary for women who lose 5% of their body weight. Often this is followed by improved tolerance of oral intake; therapy then consists of frequent consumption of small amounts of low-fat foods. Enteral tube feeding using small-bore nasogastric tubes has been successful for some women. Because pulmonary aspiration of the feeding is a potential complication if vomiting occurs, antiemetic medications are sometimes used in conjunction with tube feedings. Tube feedings may be used to supplement oral intake, with the volume of the tube feeding gradually being decreased as oral intake improves. In some instances, total parenteral nutrition (balanced intravenous feedings of amino acids, carbohydrate, lipid, vitamins, and minerals) is used to nourish women with hyperemesis gravidarum when their nutritional status has been severely impaired.

**Constipation.** Improved bowel function generally results from increasing the intake of fiber (e.g., wheat bran and whole-wheat products, popcorn, and raw or lightly steamed vegetables) in the diet. Fiber helps retain water within the stool, creating a bulky stool that stimulates intestinal peristalsis. The recommendation for adults for fiber is 25 to 35 g/day. An increase of approximately 15% would be optimal. An adequate fluid intake (at least 50 ml/kg/day) helps hydrate the fiber and increase the bulk of the stool. Making a habit

of regular exercise that uses large muscle groups (walking, swimming, cycling) also helps stimulate bowel motility.

**Pyrosis.** **Pyrosis**, or heartburn, is usually caused by reflux of gastric contents into the esophagus. This condition can be minimized by eating small, frequent meals rather than two or three larger meals daily. Because fluids increase the distention of the stomach, they should not be consumed with foods. The woman needs to be sure to drink adequate amounts between meals. Avoiding spicy foods may help alleviate the problem. Lying down immediately after eating and wearing clothing that is tight across the abdomen can contribute to the problem of reflux.

### Cultural influences

Consideration of a woman's cultural food preferences enhances communication and provides a greater opportunity for following the agreed-on pattern of intake. Women in most cultures are encouraged to eat a diet typical for them. The nurse needs to be aware of what constitutes a typical diet for each cultural or ethnic group. However, several variations may occur within one cultural group. Therefore a careful exploration of individual preferences is needed. Although some ethnic and cultural food beliefs may seem, at first glance, to conflict with the dietary instruction provided by physicians, nurses, and dietitians, it is often possible for the empathic health care provider to identify cultural beliefs that are congruent with the modern understanding of pregnancy and fetal development. Many cultural food practices have some merit or the culture would not have survived. Food cravings during pregnancy are considered normal by many cultures, but the kinds of cravings often are culturally specific. In most cultures women crave acceptable foods, such as chicken, fish, and greens among African-Americans. Cultural influences on food intake usually lessen if the woman and her family become more integrated into the dominant culture. Nutrition beliefs and the practices of selected cultural groups are summarized in Table 10-5.

**Vegetarian diets.** Vegetarian diets represent another cultural effect on nutritional status. Foods basic to almost all vegetarian diets are vegetables, fruits, legumes, nuts, seeds, and grains. However, there are many variations in vegetarian diets. Semivegetarians, who are not truly vegetarians, include fish, poultry, eggs, and dairy products in their diets but do not eat beef or pork. Such a diet can be completely adequate for pregnant women. Besides plant products, lacto-ovo vegetarians also eat dairy products and eggs. Iron and zinc intake may not be adequate in these women, but such diets can be otherwise nutritionally sound. Strict vegetarians, or vegans, consume only plant products. Because vitamin B<sub>12</sub> is found only in foods of animal origin, this diet is therefore deficient in vitamin B<sub>12</sub>. As a result, strict vegetarians should take a supplement or regularly consume vitamin B<sub>12</sub>-fortified foods (e.g., soy milk). Vitamin B<sub>12</sub> deficiency can result in megaloblastic anemia, glossitis (inflamed red tongue), and neurologic deficits in the mother. Infants born to affected mothers are likely to have megaloblastic anemia and exhibit neurodevelopmental

TABLE 10-5

## Characteristic Food Patterns of Selected Cultures

MILK GROUP	PROTEIN GROUP	FRUITS AND VEGETABLES	BREADS AND CEREALS	POSSIBLE DIETARY PROBLEMS
<b>NATIVE AMERICAN (MANY TRIBAL VARIATIONS; MANY “AMERICANIZED”)</b>				
Fresh milk	Pork, beef, lamb, rabbit	Green peas, beans	Refined bread	Obesity, diabetes, alcoholism, nutritional deficiencies expressed in dental problems and iron deficiency anemia Inadequate amounts of all nutrients Excessive use of sugar
Evaporated milk for cooking	Fowl, fish, eggs	Beets, turnips	Whole wheat	
Ice cream	Legumes	Leafy green and other vegetables	Cornmeal	
Cream pie	Sunflower seeds	Grapes, bananas, peaches, other fresh fruits	Rice	
	Nuts: walnuts, acorn, pine, peanut butter	Roots	Dry cereals	
	Game meat		“Fry” bread Tortillas	
<b>MIDDLE EASTERN* (ARMENIAN, GREEK, SYRIAN, TURKISH)</b>				
Yogurt	Lamb	Peppers, tomatoes, cabbage, grape leaves, cucumbers, squash	Cracked wheat and dark bread	Fry many meats and vegetables Lack of fresh fruits Insufficient foods from milk group High consumption of sweetenings, lamb fat, and olive oil
Little butter	Nuts Dried peas, beans, lentils Sesame seeds	Dried apricots, raisins, dates		
<b>AFRICAN-AMERICAN (PARTICULARLY SOUTHERN AND RURAL)</b>				
Milk†	Pork: all cuts, plus organs, chitterlings	Leafy vegetables	Cornmeal and hominy grits	Extensive use of frying, smothering in gravy, or simmering Fats: salt pork, bacon drippings, lard, and gravies High consumption of sweets Insufficient citrus Vegetables often boiled for long periods with pork fat and much salt Limited amounts from milk group†
Ice cream	Beef, lamb	Green and yellow vegetables	Rice	
Cheese: longhorn, American	Chicken, giblets	Potato: white, sweet	Biscuits, pancakes, white breads	
	Eggs	Stewed fruit	Puddings: bread, rice	
	Nuts	Bananas and other fresh fruit		
	Legumes			
	Fish, game			
<b>CHINESE (CANTONESE MOST PREVALENT)</b>				
Milk: water buffalo	Pork sausage‡ Eggs and pigeon eggs	Many vegetables Radish leaves	Rice/rice flour products	Tendency of some immigrants to use large amounts of grease in cooking Limited use of milk and milk products Often low in protein, calories, or both Soy sauce (high sodium)
	Fish	Bean, bamboo sprouts	Cereals, noodles	
	Lamb, beef, goat		Wheat, corn, millet seed	
	Fowl: chicken, duck			
	Nuts			
	Legumes			
	Soybean curd (tofu)			

MSG, monosodium L-glutamate.

\*Religious holidays may involve fasting, which is believed to increase the likelihood of preterm labor. Fasting requirement may be waived during pregnancy.

†Lactose intolerance relatively common in adults.

‡Lower in fat content than Western sausage.

TABLE 10-5

*Characteristic Food Patterns of Selected Cultures—cont'd*

MILK GROUP	PROTEIN GROUP	FRUITS AND VEGETABLES	BREADS AND CEREALS	POSSIBLE DIETARY PROBLEMS
<b>FILIPINO (SPANISH-CHINESE INFLUENCE)</b>				
Flavored milk Milk in coffee Cheese: gouda, cheddar	Pork, beef, goat, rabbit Chicken Fish Eggs, nuts, legumes	Many vegetables and fruits	Rice, cooked cereals Noodles: rice, wheat	Limited use of milk and milk products Tendency to prewash rice Tendency to have only small portions of protein foods
<b>ITALIAN</b>				
Cheese Some ice cream	Meat Eggs Dried beans	Leafy vegetables Potatoes Eggplant, tomatoes, peppers Fruits	Pasta White breads, some whole wheat Farina Cereals	Prefer expensive imported cheeses; reluctant to substitute less expensive domestic varieties Tendency to overcook vegetables Limited use of whole grains High consumption of sweets Extensive use of olive oil Insufficient servings from milk group
<b>JAPANESE (ISEI, MORE JAPANESE INFLUENCE; NISEI, MORE WESTERNIZED)</b>				
Increasing amounts being used by younger generations	Pork, beef, chicken Fish Eggs Legumes: soys, red, lima beans Tofu Nuts	Many vegetables and fruits Seaweed	Rice, rice cakes Wheat noodles Refined bread, noodles	Excessive sodium: pickles, salty crisp seaweed, MSG, and soy sauce Insufficient servings from milk group May use prewashed rice
<b>HISPANIC, MEXICAN-AMERICAN</b>				
Milk Cheese Flan, ice cream	Beef, pork, lamb, chicken, tripe, hot sausage, beef intestines Fish Eggs Nuts Dry beans: pinto, chickpeas (often eaten more than once daily)	Spinach, wild greens, tomatoes, chilies, corn, cactus leaves, cabbage, avocado, potatoes Pumpkin, zapote, peaches, guava, papaya, citrus	Rice, cornmeal Sweet bread, pastries Tortilla: corn, flour Vermicelli (fideo)	Limited meats primarily due to cost Limited use of milk and milk products Large amounts of lard Abundant use of sugar Tendency to boil vegetables for long periods

*Continued*



TABLE 10-5

## Characteristic Food Patterns of Selected Cultures—cont'd

MILK GROUP	PROTEIN GROUP	FRUITS AND VEGETABLES	BREADS AND CEREALS	POSSIBLE DIETARY PROBLEMS
<b>PUERTO RICAN</b>				
Limited use of milk products	Pork	Avocado, okra	Rice	Small amounts of pork and poultry
Coffee with milk (café con leche)	Poultry	Eggplant	Cornmeal	Extensive use of fat, lard, salt pork, and olive oil
	Eggs (Fridays)	Sweet yams		Lack of milk products
	Dried codfish	Starchy vegetables and fruits ( <i>viandas</i> )		
	Beans ( <i>habichuelas</i> )			
<b>SCANDINAVIAN (DANISH, FINNISH, NORWEGIAN, SWEDISH)</b>				
Cream	Wild game	Berries	Whole wheat, rye, barley, sweets	Insufficient fresh fruits and vegetables
Butter	Reindeer	Dried fruit	(cookies and sweet breads)	High consumption of sweets, pickled or salted meats, and fish
Cheeses	Fish (fresh or dried)	Vegetables: cole slaw, roots		
	Eggs			
<b>SOUTHEAST ASIAN (VIETNAMESE, CAMBODIAN)</b>				
Generally not taken	Fish (daily): fresh, dried, salted	Seasonal variety: fresh or preserved	Rice: grains, flour, noodles	Fresh milk products generally not consumed
Coffee with condensed cow's milk	Poultry/eggs: duck, chicken	Green, leafy vegetables	French bread	Poultry/eggs may be limited
Plain yogurt	Pork	Yams	"Cellophane" (bean starch) noodles	Meat considered "unclean" is avoided
Ice cream (rare)	Beef (seldom)	Corn		Preference for a diet high in salt and pepper, as well as rice and pork
Soybean milk	Dry beans			High intake of MSG and soy sauce
	Tofu			
<b>JEWISH: ORTHODOX*</b>				
Milk†	Meat (bloodless; Kosher prepared): beef, lamb, goat, deer, poultry (all types), no pork	Wide variety	Wide variety	High intake of sodium in meat products
Cheese‡	Fish with fins and scales only			
	No crustaceans			

delays. Iron, calcium, zinc, and vitamin B<sub>6</sub> intake may also be low in women on this diet, and some strict vegetarians have excessively low caloric intakes. The protein intake should be assessed especially carefully because plant proteins tend to be incomplete in that they lack one or more amino acids required for growth and maintenance of body tissues. The daily consumption of a variety of different plant proteins (grains, dried beans and peas, nuts, and seeds) helps provide all of the essential amino acids.

### Evaluation

In evaluating the adequacy of nutritional intake during pregnancy, the woman's weight gain can be compared with standardized grids showing recommended patterns (see Fig.

10-2). These grids are based on mean data and do not always account for factors such as ethnic or racial variations. To evaluate the adequacy of the woman's diet, it can be compared with the plan in Table 10-2. It is essential that individual factors affecting nutritional needs and dietary intake be considered.

Physical examination and laboratory testing can be used to confirm that nutritional status is adequate (see the section on assessment). When weight gain is inadequate or when nutritional deficits are present, the nurse must reassess the woman and her understanding of her nutritional needs, reinforce teaching as needed, and continue to reevaluate her nutritional status regularly (see Plan of Care).



## PLAN OF CARE

## Nutrition during Pregnancy

**NURSING DIAGNOSIS** Deficient knowledge related to nutritional requirements during pregnancy

**Expected Outcome** The patient will delineate nutritional requirements and exhibit evidence of incorporating requirements into diet.

**Nursing Interventions/Rationales**

- Review basic nutritional requirements for a healthy diet using recommended dietary guidelines and MyPyramid to provide knowledge baseline for discussion.
- Discuss increased nutrient needs (calories, protein, minerals, vitamins) that occur as a result of being pregnant to increase knowledge needed for altered dietary requirements.
- Discuss the relationship between weight gain and fetal growth to reinforce interdependence of fetus and mother.
- Calculate the appropriate total weight gain range during pregnancy using the woman's body mass index (BMI) as a guide and discuss recommended rates of weight gain during the various trimesters of pregnancy to provide concrete measures of dietary success.
- Review food preferences, cultural eating patterns or beliefs, and prepregnancy eating patterns to enhance integration of new dietary needs.
- Discuss how to fit nutritional needs into usual dietary patterns and how to alter any identified nutritional deficits or excesses to increase chances of success with dietary alterations.
- Discuss food aversions or cravings that may occur during pregnancy and strategies to deal with these if they are detrimental to fetus (e.g., pica) to ensure well-being of fetus.
- Have woman keep a food diary delineating eating habits, dietary alterations, aversions, and cravings to track eating habits and potential problem areas.

**NURSING DIAGNOSIS** Imbalanced nutrition: more than body requirements related to excessive intake or inadequate activity levels (or both)

**Expected Outcome** The patient's weekly weight gain will be reduced to the appropriate rate using her BMI and recommended weight gain ranges as guidelines.

**Nursing Interventions/Rationales**

- Review recent diet history (including food cravings) using a food diary, 24-hour recall, or food frequency approach to ascertain food excesses contributing to excess weight gain.
- Review normal activity and exercise routines to determine level of energy expenditure; discuss eating patterns and reasons that lead to increased food intake (e.g., cultural beliefs or myths, increased stress, boredom) to identify habits that contribute to excess weight gain.

- Review optimal weight gain guidelines and their rationale to ensure that woman is knowledgeable about healthful weight gain rates.
- Set target weight gains for the remaining weeks of the pregnancy to establish goals.
- Discuss with the woman what changes can be made in diet, activity, and lifestyle to enhance chances of meeting weight gain goals and dietary needs. Weight-reduction diets should be avoided, because they may deprive the mother and fetus of needed nutrients and lead to ketonemia.

**NURSING DIAGNOSIS** Imbalanced nutrition: less than body requirements related to inadequate intake of needed nutrients

**Expected Outcome** The woman's weekly weight gain will be increased to the appropriate rate using her BMI and recommended weight gain ranges as guidelines.

**Nursing Interventions/Rationales**

- Review recent diet history (including food aversions) using a food diary, 24-hour recall, or food frequency approach to ascertain dietary inadequacies contributing to lack of sufficient weight gain.
- Review normal activity and exercise routines to determine level of energy expenditure; discuss eating patterns and reasons that lead to decreased food intake (e.g., morning sickness, pica, fear of becoming fat, stress, boredom) to identify habits that contribute to inadequate weight gain.
- Review optimal weight gain guidelines and their rationale to ensure that woman is knowledgeable about healthful weight gain rates.
- Set target weight gains for the remaining weeks of the pregnancy to establish goals.
- Review increased nutrient needs (calories, protein, minerals, vitamins) that occur as a result of being pregnant to ensure that woman is knowledgeable about altered dietary requirements.
- Review relationship between weight gain and fetal growth to reinforce that adequate weight gain is needed to promote fetal well-being.
- Discuss with woman what changes can be made in diet, activity, and lifestyle to enhance chances of meeting set weight gain goals and nutrient needs of mother and fetus.
- If woman has fear of being fat, if symptoms of an eating disorder are evident, or if problems in adjusting to a changing body image surface, refer woman to the appropriate mental health professional for evaluation, because intensive treatment and follow-up may be required to ensure fetal health.

## COMMUNITY ACTIVITY

Visit a prenatal clinic. Identify sources of nutrition education that are evident in the waiting room. Does the clinic employ a nutritionist or dietitian? Who provides nutrition counseling in the clinic? Are print materials available in multiple languages? Are interpreters available? Are there sources of free materials

on nutrition that could be placed in the clinic? Are the nutrition education materials culturally relevant? Identify strengths and weaknesses of nutrition education in that setting. Develop a feasible plan for improving nutrition education in the clinic.

## Key Points

- A woman's nutritional status before, during, and after pregnancy contributes significantly to her well-being and that of her infant.
- Many physiologic changes occurring during pregnancy influence the need for additional nutrients and the efficiency with which the body uses them.
- Both the total maternal weight gain and the pattern of weight gain are important determinants of the outcome of pregnancy.
- The appropriateness of the mother's prepregnancy weight for height (BMI) is a major determinant of her recommended weight gain during pregnancy.
- Nutritional risk factors include adolescent pregnancy, nicotine use, alcohol or drug use, bizarre or faddish food habits, a low weight for height, and frequent pregnancies.
- Iron supplementation is usually routinely recommended during pregnancy. Other supplements may be warranted when nutritional risk factors are present.
- The nurse and the woman are influenced by cultural and personal values and beliefs during nutrition counseling.
- Pregnancy complications that may be nutrition related include anemia, preeclampsia, gestational diabetes, and IUGR.
- Dietary adaptation can be an effective intervention for some of the common discomforts of pregnancy, including nausea and vomiting, constipation, and heartburn.

## Answer Guidelines to Critical Thinking Exercise

### Nutrition and the Underweight Pregnant Adolescent

- 1 Yes. A dietary assessment using a food intake questionnaire should be conducted and a physical assessment of nutritional status performed. Based on these data, the desired pattern of weight gain during pregnancy, and a knowledge of characteristic food patterns of Hispanic people, planning can begin.
- 2
  - a. A list of Dietary Reference Intakes for pregnancy and lactation can be shared with Carmen. Through discussion, you can determine whether Carmen is ingesting adequate amounts of these important elements and whether supplementation of vitamins and minerals is necessary.
  - b. While reviewing indicators of nutritional risk in pregnancy with Carmen, problem areas can be identified, and recommendations for change provided as needed.
  - c. The daily food guide for pregnancy and lactation can be shared with Carmen. It can provide a basis for planning appropriate menus to provide the necessary nutrients and provide more energy (calories) to increase her weight gain, taking into consideration the growth needs of an adolescent
  - d. As someone of Hispanic heritage, Carmen may be lactose intolerant and may need sources of calcium other than milk. Through careful questioning, her lactose status can be determined and counseling can be provided about nonmilk sources of calcium.
- 3 As part of her prenatal care, Carmen (and all pregnant women) should receive nutrition counseling. Carmen is currently underweight. Carmen can be assisted to plan menus that allow a weight gain to support growth of the pregnancy and the fetus and provide nutrients to support her own growth.
- 4 Yes, there is ample evidence about DRIs in pregnancy and lactation. Nutrition counseling should be part of the plan of care for Carmen.
- 5 Often adolescents have inadequate intakes of appropriate nutritional elements. They may try to maintain a slender appearance. Women who are underweight are at risk for preterm birth as well as for having a fetus with IUGR. Carmen could be trying to hide her pregnancy by limiting her weight gain. Fast food choices as well as ethnic and cultural patterns of eating could be factors. Enlisting the support of her family would likely be helpful in planning appropriate meals.

## Resources

American Botanical Council  
P.O. Box 144345  
Austin, TX 78714-4345  
512-926-4900  
[www.herbalgram.org](http://www.herbalgram.org)

American Diabetes Association  
Diabetes Information Service Center  
1660 Duke St.  
Alexandria, VA 22314  
800-342-2383  
[www.diabetes.org](http://www.diabetes.org)

American Dietetic Association  
216 West Jackson Blvd., Suite 800  
Chicago, IL 60606-6995  
[www.eatright.org](http://www.eatright.org)

American Medical Association  
Department of Foods and Nutrition  
515 N. State St.  
Chicago, IL 60610  
[www.ama-assn.org](http://www.ama-assn.org)

Anorexia Nervosa and Related Eating Disorders, Inc.  
[www.anred.com](http://www.anred.com)

Body Mass Index Calculator  
National Heart, Lung, and Blood Institute Information Center  
P.O. Box 30105  
Bethesda, MD 20824-0105  
301-592-8573  
www.nhlbisupport.com/bmi

Center for Food Safety and Applied Nutrition  
Food and Drug Administration  
200 C St., SW  
Washington, DC 20250  
202-720-2791  
www.usda.gov/usda.htm

Food and Nutrition Board  
Institute of Medicine  
2101 Constitution Ave., NW  
Washington, DC 20418  
202-334-1732  
www.iom.edu  
email: fnb@nas.edu

MyPyramid:  
www.mypyramid.gov

National Dairy Council  
6300 N. River Rd.  
Rosemont, IL 60018  
www.nutritionexplorations.org

Nutritional content of foods:  
www.nal.usda.gov/fnic/foodcomp

Office of Dietary Supplements  
National Institutes of Health  
31 Center Dr., Room 1829  
Bethesda, MD 20892-2086  
301-435-2920  
www.ods.od.nih.gov

RDAs according to age and sex:  
www.nal.usda.gov

Society for Nutrition Education  
1001 Connecticut Ave., NW, Suite 529  
Washington, DC 20036-5528  
202-452-8534  
www.sne.org  
email: info@sne.org

Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)  
Food and Consumer Service  
3101 Park Center Dr., Room 819  
Alexandria, VA 22302  
703-305-2286  
www.usda.gov

U.S. Department of Agriculture  
Food and Nutrition Information Center  
14th and Independence Ave., SW  
Washington, DC 20250  
202-720-2791  
www.usda.gov

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