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ask the experts
A Series on Women and Nutrition

Ob/Gyn alliance

Module 9: Pregnancy

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BACKGROUND

Pregnancy is a strategic time for healthcare providers to educate women about nutrition. Often during these times, women are willing to improve health habits given they are 'eating for two.' In this Ask the Experts module, we review current recommendations for weight gain, the impact of maternal obesity on pregnancy, as well as the impact of maternal obesity on the fetus. In addition, we outline specific nutrients that are important to consume during pregnancy (such as folic acid and omega-3 among others). We will highlight how optimizing nutritional status before and during pregnancy may influence chronic health problems late in life.

WHAT PHYSICIANS NEED TO KNOW

Preconception

The topic of preconception health is not addressed in Ask the Expert module, however, the authors want to highlight and recognize the importance of preconception health. We recommend reviewing a recent supplement from the *American Journal of Obstetrics and Gynecology* that addresses the many important aspects of preconception health, including nutrition. This is accessible to the public for free and was recently published in December, 2008 (Vol 199, No. 6, Supplement B). Click here to access the supplement now.

Weight Gain During Pregnancy – What is Healthy?

In 1990 the Institute of Medicine (IOM) set forth recommendations for weight gain. Although the updated guidelines will not be updated until June 2009 (see http://www.iom.edu/CMS/3788/48191.aspx), they are important for the Ob/Gyn to know. Weight gains during pregnancy should be based on the mother's pre-pregnant body mass index (BMI), as noted below:

Pre-Pregnancy		Ideal Weight Gain
Underweight	(< 19.8 BMI)	28 - 40 pounds
Normal	(19.8 – 26 BMI)	25 – 35 pounds
Overweight	(> 26 to 29 BMI)	15 – 25 pounds
Obese	(> 29 BMI)	at least 15 pounds

Weight gain within these ranges is associated with better outcomes, however, only 30–40% of women fall within these recommended levels.[1]

According to the CDC, a healthy body weight has a normal BMI of 18.5-24.9. There is evidence that a normal weight improves a woman's chances of conception, while extremes of overweight or

underweight interfere with fertility.[2,3] Beginning pregnancy at a healthy weight lowers the risk of complications for the mother and fetus during pregnancy and delivery. This is especially true for hypertension.[4]

As reviewed by Catalano, *maternal obesity* impacts pregnancy in several ways: early in gestation, maternal obesity can cause increased miscarriage, increased recurrent miscarriage, and increased neural tube and congenital defects.[5] Later in gestation, maternal obesity impacts 'metabolic syndrome-like complications' such as gestational hypertension and pre-eclampsia. An important increased risk of unexplained intrauterine fetal death is found with maternal obesity.

At the time of delivery, there are additional considerations regarding risks associated with maternal obesity,[5] including increased risk of cesarean delivery and associated morbidities and difficulty with regional and general anesthesia. On the other hand, those women who are *underweight* have higher rates of preterm delivery.

Pre-pregnancy weights in the U.S. are too high--two thirds of the population is overweight (BMI >25) or obese (BMI>30).[6] The increased risk of fetal macrosomia with maternal obesity is well recognized,5 and includes problems with vaginal delivery and fetal injury. Women who are overweight *prior* to pregnancy tend to remain overweight for the duration of the pregnancy, increasing the risk of several known complications and adverse fetal outcomes. These outcomes include polycethemia, seizure, low Apgar scores, hypoglycemia, and other birth defects, as well as NTD regardless of adequate folic acid intake.[7]

The perinatal period is a critical time during which good maternal nutrition plays a key role in influencing birth weight and the long-term health of the fetus. Poor nutrition during fetal development increases risk for low birth weight and influences the health of the baby well into adulthood. Some authorities hypothesize that chronic adult diseases begin in early fetal development and are subject to modulation depending upon the metabolic environment of the mother.

In 2007, Dr. David Barker, a physician and professor of clinical epidemiology at the University of Southampton in the UK, noted that the risk for chronic disease is a result of under nutrition during the prenatal period. Barker's research found that mortality rates from stroke and cardiovascular disease (in Wales, 1968-1978) correlated to earlier rates of infant mortality due to low birth rates (1921 – 1925). He concluded that environmental influences that impair fetal growth and development also likely increase the risk for ischemic heart disease later in life.[8]

In long-term follow-up studies on the health effects of under nutrition during the Dutch famine (during WW II), the timing of exposure to famine during gestation increased rates of chronic disease in these offspring later in life. Long-term effects of prenatal nutrition are, to some extent, able to be modulated by postnatal factors. Risks for metabolic syndrome in adulthood have been shown to be related to low birth rate followed by a period of rapid, catch-up growth.

Energy Requirements: How Many More Calories are required in Pregnancy?

Many women have the misconception that energy needs dramatically change during pregnancy. In fact, energy needs during pregnancy remain the same for pregnant and non pregnant women until the second trimester, at which time calorie requirements increase by an extra 340 calories per day, followed by an extra 452 calories in the third trimester. This is not as high an increase as many may think. For example, this corresponds to a large bagel (average calories 354) or one cup of tuna salad (average calories of 383).

Pregnant women should be encouraged to meet these needs for increased calories towards the end of pregnancy through eating a variety of foods, including whole grains, fruits, vegetables and high-quality protein.

Folate

The influence of folic acid supplementation prior to pregnancy (400 mcg/day) and the decrease in NTDs is well-recognized. In addition, compromised intake of folate during pregnancy is also associated with several negative outcomes, including low birth weight and miscarriage.[9]

According to the IOM, the recommended dietary intake for pregnant women is 600 mcg of synthetic folic acid daily, from fortified foods and dietary sources. ACOG currently recommends a lower dose of 400 mcg of synthetic folic acid daily, but does highlight that over supplementation has minimal adverse effects. There is a recognized dose-response relationship between folic acid and NTDs,[10] so that increasing folic acid supplementation means reducing NTDs.

The folate from fortified foods and supplements seems to be better-absorbed than that found in high folate food sources (beans, citrus, green leaf vegetables). Despite the mandatory folic acid fortification of grains in 1998, many women are still not meeting their needs throughout pregnancy, possibly due in part to the popularity of low carbohydrate diets.

Iron

The requirements for absorbed iron increase slowly during pregnancy, from 1.2 mg/day in the first trimester to 5.6 mg/day in the third trimester. Although enhanced intestinal absorption occurs, dietary iron intake in most pregnant women is below recommended levels.[11]

Iron deficiency during pregnancy may increase the risk for preterm delivery. Available data suggest that the overall incidence of iron deficiency in North America in the last trimester is substantially increased among low-income minority women. Early supplementation has been shown to increase birth weights and lower the incidence of preterm delivery. This was recently demonstrated by a clinical trial of iron-replete women randomly assigned to supplemental iron (30 mg/day) compared with women assigned to placebo.

Omega-3 Fatty Acids

Omega-3 fatty acids are the subject of considerable interest in many areas of medical research, particularly in the area of fetal development. Much of the research in pregnancy and lactation has focused on the role of DHA (docosahexanenoic acid C22:6n-3) because of its essential role in retinal and neural/cognitive development.[12] The long chain omega-3 fatty acids, EPA (eicosapentaenoic acid) and DHA, are essential fatty acids that are not manufactured by the body and as such must be supplied by the diet.

Omega fatty acids (omega-6 and omega-3) are derived from linoleic acid (LA) and alpha-linolenic acid (ALA). LA can be desaturated and elongated to become AA. Further desaturation and elongation of ALA produces EPA and DHA.

The precursor omega-3 fatty acid (alpha-linolenic acid) is found in foods such as flax seed, walnuts and canola oil, and this precursor is often used to fortify foods. This shorter chain omega-3 fatty acid, however, is *poorly converted to DHA*, and should not be relied upon to contribute to DHA intake. Given this poor conversion, many prenatal vitamins are now supplemented with DHA (and EPA).

Higher levels of DHA in infants are associated with improved performance on visual and neural testing.[13] The best dietary sources of DHA and EPA omega-3 fats that are low in mercury include cold water fish such as salmon, mackerel, herring and sardines. One to two servings per week is the recommended intake; however, supplementation in a prenatal vitamin may be preferred to minimize mercury exposure during pregnancy.

The IOM recommends taking 1.4 g/d (ALA) during pregnancy, the World Health Organization 0.3-0.5 g/d (DHA + EPA), and 0.8-1.1 g/d (ALA), whereas, the International Society for the Study of Fatty Acids and Lipids (ISSFAL) recommends greater than 0.3 g/d (DHA). The authors recommend a prenatal vitamin which also supplements DHA and EPA.

Calcium

The pregnant and non-pregnant recommended calcium intake is 1300 mg/day for women under the age of 18, and 1000 mg/day for women between the age of 19-50. Intakes above these amounts do not appear to confer advantages in terms of pregnancy outcomes, improved lactation or mitigation of bone loss.[14] Optimal levels are best-achieved through consumption of milk and yogurt, which may also provide an important source of probiotics. Non-dairy sources include spinach, almonds, fortified soy milk, some cereals and juices.

Vitamin D

It is well-established that proper fetal bone mineralization depends upon adequate calcium and Vitamin D metabolism. Current research supports its role in the development and possible prevention of autoimmune disorders such as Type 1 DM. Studies in both northern and southern locations indicate that despite supplementation in excess of 200 IU/day (current DRI), most women have what are considered to be low levels of vitamin D. During pregnancy, this may impair fetal bone mineralization resulting in lower bone mass at birth. Most experts would agree that the current DRI is too low and warrants a revised recommendation.[15]

Supplementation

Multivitamins containing 100% of the daily value for recommended nutrients including iron and folic acid, and are generally considered as adjuncts to a balanced diet. Research continues to support their use prior to and throughout pregnancy. Supplements should not contain more than 3000 IU of vitamin A, and the majority of vitamin A should be in the form of beta carotene. Excess preformed vitamin A in the form of retinol increases the risk of birth defects.

A daily vitamin is a low cost, low risk approach to improving pregnancy outcomes. In general, women have different nutrient needs based on genetic differences as well as social and demographic discrepancies, however, multivitamin and mineral supplementation is recommended.

Lastly, we recommend that Ob/Gyn physicians become familiar with the Dietary Reference Intakes (DRIs) that are established by the IOM. These recommendations may be found on the following USDA web page:
http://fnic.nal.usda.gov/nal_display/index.php?info_center=4&tax_level=1&tax_subject=242

WHAT PATIENTS NEED TO KNOW

The nutrients you eat/receive during pregnancy become the building blocks for your baby's health and are the foundation for growth and development of skeletal and muscle tissue, brain and organ systems. Choose lean protein, low fat dairy, fruits, vegetables and whole grains. Remember: What you DO eat is as important as what you DON'T eat. This handout provides a general outline on nutrition during pregnancy.

What You Need and How Much

Food Group	Examples	Serving Size	Per day
Grains	Whole grain bread, cereal Brown rice and pasta Oats, barley, millet, quinoa	 1 oz ½ cup	9+ mostly whole grains
Vegetables	Green, Red, Purple, Yellow Orange	½ cooked 1 cup raw	4+
Fruits	Fresh Fruits Berries/cherries/plums Melon	1 medium 1 cup ¾ cup	3+
Milk/Calcium	Dark green leafy greens/broccoli Low fat milk, yogurt, soy Milk. Low fat cheese	 1 cup 1 cup 1 slice/1 oz	4
Protein/Meat Meat Alternatives	Beans & legumes Eggs Nuts and seeds Nut butter Lean poultry, beef, seafood*	½ cup cooked 1 1/3 cup 2 Tablespoons 2-3 oz	2 +
Other Foods	Butter, margarine, cookies, chips, Candy, fruit drinks, soda, desserts, Dressings, Snack foods	Limit these	This group adds few nutrients and supplies primarily fat, sugar, and sodium
Water	Water, flavored water, green and white teas	8 oz.	8

**Avoid shark, swordfish, king mackerel, tilefish, Limit white or albacore tuna to 6 oz per week. Limit light tuna to 12 oz per week*

What You Should Look for in a Multivitamin

Ideally, you should take a prenatal vitamin *before* pregnancy. During pregnancy you should take a prenatal vitamin that contains folic acid, iron, and omega-3. These nutrients are difficult to obtain through diet alone.

Nutrient	Functions	Sources
Folic Acid*	Folic acid is essential for the proper growth and development of the baby and requirements increase during pregnancy	lean beef, potatoes, whole wheat bread, orange juice lentils, black eyed peas white beans, mushrooms, green leafy vegetables like spinach, asparagus, broccoli
Iron	During pregnancy your blood supply will increase by 20 – 30 %. Iron is an essential component of red blood cells and as a result your need for iron increases during pregnancy. Most women are iron deficient going into a pregnancy and therefore benefit greatly from a supplement	Liver, seafood, lean meat, poultry, dried beans and vegetables
Omega – 3 Fats: EPA and DHA **	These fats are considered "essential" because our bodies cannot manufacture them and as a result they must be supplied by the diet. EPA and DHA are incorporated into cell membranes and essential for proper brain growth and development.	cold water fish like wild salmon, tilapia, black cod, sardines and herring

**Only 25- 50% is absorbed by your body – so a prenatal vitamin is recommended.*
***Good dietary sources are the best source of these fats, however, most people do not eat as much they should. During pregnancy, fish may contain mercury which should not be eaten. Thus, it is strongly recommended that you take a prenatal vitamin that provides adequate amounts of omega-3.*

Calorie Needs during Pregnancy

Energy needs during pregnancy can range from 2,500 to 2,700 calories per day, but will vary depending upon your pre-pregnancy weight, height, age and activity level. If you break it down into increased needs per trimester, energy needs appear as follows:

When?	What?	How?
First Trimester	No extra calories are needed. Focus on the quality of your diet.	
Second Trimester	An extra 350 calories/day are needed	Add mid morning or mid afternoon snacks
Third Trimester	An extra 500 calories/day are needed	Add mid morning and mid afternoon snacks
Post Partum or Breast Feeding	An extra 550 calories/day are needed	Add mid morning and mid afternoon snacks

Examples of Healthy Snacks

- Bowl of cereal
- Whole wheat fig bars
- Dried fruit
- Graham crackers & peanut butter
- Whole grain snack foods
- Chocolate soy milk or almond milk
- Blueberry applesauce
- Whole wheat pita/1/4 cup hummus/12 baby carrots
- 1 cup whole grain cereal; fruit and milk
- 1/3 cup trail mix
- Edamame
- Roasted soy nuts
- Smoothies
- Graham crackers & natural peanut butter
- Low fat tortilla chips and fat free bean dip/salsa
- ½ turkey or peanut butter sandwich

To ask a question related to program module, please email our experts at info@obgynalliance.com.

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