

Clinical Practice Lecture: Nutrition During Pregnancy and Lactation  
Dr. Deckelbaum  
3 May 2002  
Morgan Grams

This presentation is from Dr. Decklebaum's March of Dimes task force, titled "Nutrition today matters tomorrow."

### **Rationale for Optimal Nutrition**

Optimal nutrition during pregnancy and lactation leads to optimal outcomes for the mother and the baby. It reduces risk to the mother (toxemia, morbidity and mortality), fetus (malformations, stunted growth), and infant (mental and physical handicaps, serious childhood illness, adult chronic disease like high blood pressure and diabetes). However, many peri-conceptional factors (those associated with women of childbearing age) are also important. Optimal outcomes for the mother and baby are attained when the mother is biologically mature (it is difficult to support a growing fetus when a woman is still growing herself), maintains an acceptable body weight, receives preventative medicine (like rubella vaccinations), keeps chronic maternal and metabolic diseases under control (like diabetes), eliminates bad habits (like cigarettes, alcohol, and drugs), and receives early peri-conceptional care and (of course) optimal nutrition.

Adequate nutritional status is crucial even before conception, regardless if a woman receives intervention during pregnancy. For example, folic acid sufficiency is important in preventing neural tube defects, and the neural tube develops soon after conception when a woman may not yet be aware of her pregnancy. Thus, doctors recommend that women of childbearing age take folic acid supplements (RDA: 400 micrograms); despite the fact that (in the US) bread and flour are fortified with folic acid, it is difficult to consume the RDA on a normal diet. In addition, nutrition affects maternal weight, which is increasingly accepted as a critical risk factor at the time of conception.

### **Weight Matters -- Both the Mother's and the Baby's**

Dr. Deckelbaum began by describing the difference between prematurity and low birth weight. Premature deliveries are those that occur before 37 weeks gestation, and they account for 7-10% of deliveries worldwide. Low birth weight babies, on the other hand, are those who are small for their gestational age; thus, a baby can be classified as premature but not low birth weight. The incidence of low birth weight babies is much higher in developing countries than developed countries; for example, 50% of the babies born in Bangladesh are low birth weight.

Maternal factors leading to low birth weights babies are low body-mass index, young age (less than five years post-menarchal), micronutrient inadequacy, and lifestyle factors, like excessive exercise, cigarette smoking and STDs. Consequences of low birth weights are stunted growth, a greater risk of neonatal/infant mortality (it's the third leading cause of infant mortality), decreased mental and behavioral performance, and a greater risk of low birth weight offspring.

The differences in incidence of low birth weight babies exist not only between developed and developing countries but also between races within the United States. A 1987 New England Journal of Medicine article found that, in the US, black women are three times more likely to have very low birth weight babies than white women, and 2.3 times more likely to have low birth weight babies. This disparity cannot be explained by socioeconomic status, and is only partially accounted for by the increased number of teenage pregnancies in black women. This disparity is also seen in the incidence of respiratory distress syndrome and sudden infant death syndrome. These are among the leading causes of infant mortality: birth defects (195 deaths per 100,000 live births), sudden infant death syndrome (130 deaths), low birth weight (100 deaths), and respiratory distress syndrome (62 deaths).

Just as underweight mothers face an increased risk of complications during pregnancy, so too do mothers who are overweight or obese. This is significant in the US, where approximately 40% of women aged 15-49 years are classified as overweight (25-29.9 BMI) or obese (>30 BMI). This appears to be a trend; in

teenagers, the rate of obesity has doubled in the last 15 years. In African-American teenagers, the rate has tripled. (This is serious, because teenagers are already at higher risk for complications during pregnancy, and if a teenager is obese the risk is even higher. Also, the age of the onset of menstruation has declined dramatically in the last 150 years, from 17 years in 1850 to 12 in 2000. Women can therefore conceive earlier, and because they are having sexual intercourse at younger ages, they often do.) In developing countries as well, the prevalence of obesity has doubled in the last decade. This is not good. Obesity can cause complications during pregnancy: a massively obese woman (>35 BMI) who becomes pregnant has an 80% chance of developing gestational hypertension, a 45% chance of developing gestational diabetes, a 40% chance of having a C-section, and a 65% chance of inpatient hospitalization (other than C-section). The baby is also at risk. A baby born to an obese mother has an increased risk of congenital malformation (neural tube problems as well as other birth defects), pre-term delivery, respiratory distress syndrome, morbidity and mortality. He/she also faces an increased risk of complications later in life, such as obesity, type II diabetes, cardiovascular disease, and even schizophrenia. Educating women about nutrition, therefore, could have an enormous effect on the population as a whole.

### **Rationale for Vitamin Supplements**

The majority of pregnancies are unintended (~60%). Early and consistent peri-conceptional education, chronic disorder and infection control, and optimal nutrition are thus all important in optimizing outcomes for the mother and baby. Women of childbearing age are encouraged to pay attention to these factors “everyday for some day.” Vitamin supplements (like folic acid, discussed above) increase fertility while decreasing structural birth defects. Iodine is important in promoting cognitive development and learning, with sub-clinical iodine levels resulting in babies with lower IQs. Finally, most women, both in developed and developing countries, have low micro-nutrient intake. In the US, the majority of women do not receive 100% RDA; in fact, in 1985, 50% of women were taking in less than 70% of the recommended daily allowance of calcium, and fewer still were consuming enough iron. Women, take your multivitamins.

### **Nutrient-Metabolic-Physiologic Interactions During Pregnancy (and Lactation)**

The fetus and placenta account for less than half the weight gain a woman experiences during pregnancy. A pregnant woman will experience increased blood volume and red blood cell mass, decreased hematologic status (hemodilution), decreased GI motility, decreased albumin, vitamin C, B12, and folic acid concentrations, increased T3, T4, and insulin hormone concentrations, higher nitrogen retention, lower glucose tolerance, and an increased concentration of blood lipids and fibrinogen. Thus, much of the weight gain can be attributed to the build-up in maternal stores and the increase in blood volume. To accomplish all this, women have special nutritional needs during pregnancy. Moreover, women facing higher risk pregnancies, including teenagers, athletes, older prima gravidas (women who are pregnant with their first child), and those who are obese, should pay close attention to their nutritional intake to avoid increasing already elevated risks. Pregnant women need more calories and protein, and higher levels of calcium, phosphate, iron, vitamins, and micro-nutrients. Lactating women require the same additional calories and nutrients, if not slightly more.

### **Rationale for Breast-Feeding**

Breast-feeding is strongly recommended to ensure optimal health. It is a natural, full nutrition that imparts health benefits to both mother and baby. Breast-fed babies have a lower risk of food allergies and infection, and better immune response and iron storage. Mothers who breast-feed may have a reduced risk of certain types of cancers. Finally, there are important psychological factors for both mother and baby. Unfortunately, many babies aren't breast-fed. In 1994, the percent of babies breast-feeding at one week was only 55% (although this is up from the 1950s, when the number was only 30%). The percentage of babies who are fed exclusively breast milk for four to six months is probably less than 25%. Improvement in these statistics is needed not only at the individual level, but also at the more macro level of US government policy, which is poorly constructed to allow working women to breast-feed.

Breast milk is far superior to formula and cow milk. Although lower in many of the essential nutrients, breast milk allows for better absorption of protein, nitrogen retention, and more efficient iron absorption.

Cow milk, which is often used in developing countries, is much higher in sodium. When a child fed cow milk has diarrhea, he/she is much more likely to become hypernatremic (have high sodium levels), which can result in brain damage. Breast milk is also higher in the fish oil omega-3 fatty acids, which can impact cognitive development and learning, visual development, and immune and inflammatory responses. Formula in the US has recently been supplemented with omega-3 fatty acids, lagging behind Europe, which instituted this change a few years ago.

Not all women should breast-feed. The rare counter-indications include an HIV-positive status of the mother (although currently in Africa, the risks associated with not breast-feeding are higher than the risks of an HIV-positive mother breast-feeding her child, and there is a campaign to urge HIV-positive women to do so), certain infections, and drug use. In addition, breast milk is low in vitamin K, but this risk is mitigated by the injection of vitamin K nearly all babies receive in the hospital at birth.

### **Year 2000 Goals**

Unfortunately, most have not been met. They were:

- Decreased rate of iron deficiency
- Increased rate of breast feeding (lousy progress)
- Lower maternal mortality (no progress)
- Higher percentage of women who achieve minimum weight gain (it's actually decreasing)
- Increased pre-natal care (progress, but nowhere near the goal of 90% of women receiving care)
- Decreased smoking and drug use in pregnant women (good progress)
- Decreased incidence of low-birth weight babies (23% increase in premature deliveries over the last 15 years, though this may be attributable to the increase in obesity)
- Decreased incidence of fetal alcohol syndrome (good progress)
- Decreased infant mortality (7 per 1000 live births, this is flat)

In addition, the pre-natal recommendations of the next decade must be tailored to individual women. Women who are obese at conception should gain less weight during pregnancy than women who are not. Women who are anemic at conception need more iron supplementation than those who are not. The disparity in infant mortality rates between babies born to black women and the rest of the population must be narrowed.

### **Intervention Strategies**

- More vitamin supplements?
- More green leafy vegetables in diet?
- More fortification of foods?

Probably all three are needed.