Lecture 23: Nutrition for Pregnant Women

Nutrition 150
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Development

• Processes during development are irreversible
• Critical periods: finite periods during development in which certain events occur that will have irreversible effects on later developmental stages (Whitney and Rolfes)

Your ability to reach your peak physical and intellectual performance as an adult is determined by your nutrition during development
First Trimester

- 0-13 weeks of gestation
- Cells differentiate and rapidly divide into the tissues of the body
- Fetus is very susceptible to teratogens
- Teratogen: Compounds that cause birth defects
**First Trimester - Late**

A fetus after 11 weeks of development is just over an inch long. Notice the umbilical cord and blood vessels connecting the fetus with the placenta.

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**Spina Bifida**

Vertebra

Meninges

Spinal cord

Spinal fluid

Spine

**Normal Spine**

Spine

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**Second Trimester**

- 14-27 weeks of gestation
- Continued growth and maturation of organ systems and body structures
- Baby can hear, react to light, open and close eyes, suck thumb
- Beginning: 3”
- End: 1 foot and 2 lbs
Third Trimester

- 28-40 weeks of gestation
- Fetus doubles in length
- Fetus quadruples in weight
- Maturation of fetal lungs and brain

Full-term Baby

- Born at 38-42 weeks gestation
- Healthy weight from 5.5-9 lbs

Low-birth Weight

- Pre-term
- Below 5.5lbs when full term
- Linked to:
  - Increased risk of infection
  - Learning disabilities
  - Impaired physical development
  - Death in the first year of life

Maternal Malnutrition

Poor maternal nutrition may permanently alter body functions:
- Blood pressure
- Glucose tolerance
- Immune function
- Etc....
**Maternal Malnutrition**

For example:

Malnutrition may alter blood vessel growth, lipid metabolism and lean body mass development in ways that promote cardiovascular disease.

Malnutrition during the critical period of pancreas growth may stunt the growth of the organ so that it is unable to handle the burden of proper or over-nutrition later in life (type 2 diabetes).

**Effect of Maternal Weight**

- **Underweight:**
  - Increased risk of preterm births and infant death
- **Overweight:**
  - Large children which are difficult to deliver (trauma to both mother and child)
  - Increased risk of heart defects and other abnormalities
- **Obese:**
  - Increased risk of hypertension, gestational diabetes, postpartum infections, heart and neural tube defects and other abnormalities

**Weight Gain and Pregnancy**

- All women should gain weight during pregnancy
- No woman should diet during pregnancy
- Important to reach healthy weight before conception
- Excessive weight gain during pregnancy is risky
Weight Gain

<table>
<thead>
<tr>
<th>Pre-pregnancy Weight</th>
<th>Total lbs</th>
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<tbody>
<tr>
<td>Underweight</td>
<td>28-40</td>
</tr>
<tr>
<td>Normal</td>
<td>25-35</td>
</tr>
<tr>
<td>Overweight</td>
<td>15-25</td>
</tr>
<tr>
<td>Obese</td>
<td>15 lb minimum</td>
</tr>
</tbody>
</table>

Healthy weight women should gain 3-5lbs in the first trimester and about 1 lb per week thereafter.
Pregnancy Calorie Needs

- 1st trimester: Equivalent to normal
  - Though choosing more nutrient-dense foods
- 2nd and 3rd Trimester: About 400 cal more
  - A yogurt and graham cracker with jam
  - Nutrient dense foods

Nutrient Needs

- At least 130g carbohydrate
  - Prevents ketosis
- 25 g more protein a day
  - Usually no increase above normal diet
- No change in fat intake
  - Fat is important for development of child
  - Essential fatty acids very important for child’s brain and eye growth (omega-3 and omega-6 fatty acids, DHA)

Mineral Needs

<table>
<thead>
<tr>
<th>Mineral</th>
<th>% Increase</th>
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<tbody>
<tr>
<td>Calcium</td>
<td>0</td>
</tr>
<tr>
<td>Iron</td>
<td>50</td>
</tr>
<tr>
<td>Zinc</td>
<td>38</td>
</tr>
<tr>
<td>Sodium</td>
<td>0</td>
</tr>
<tr>
<td>Iodine</td>
<td>47</td>
</tr>
</tbody>
</table>
Mineral Needs

- Ability to absorb iron and calcium increases (also Vit D)
- Pregnancy and lactation does not permanently reduce calcium from bone
- Iron need increases dramatically
  - Increase blood volume
  - Transfer of iron to fetus

Iron-Deficiency Anemia

- Iron stores go to child before the mother
  - Fetus stores the iron it will need for the first few months of life in the liver
- Over 100,000 women worldwide die each year during pregnancy or childbirth due to iron-deficiency anemia (UNICEF)

Vitamin Needs

<table>
<thead>
<tr>
<th>Vitamin</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Folate</td>
<td>50</td>
</tr>
<tr>
<td>Vit B12</td>
<td>8</td>
</tr>
<tr>
<td>Vit C</td>
<td>13</td>
</tr>
<tr>
<td>Vit D</td>
<td>10</td>
</tr>
</tbody>
</table>

Supplements?

- Most physicians recommend that pregnant women take supplements to assure proper vitamin and mineral intake
- However, pregnant women should still focus on eating a nutrient-dense diet
**Fluid Intake**

- 10 cups of fluid as beverages
- Extra water needed for
  - amniotic fluid
  - increased blood volume
  - metabolic reactions
  - maintaining body temperature etc.
- Combats fluid retention, constipation, and urinary tract infections

**Pregnancy in Teens**

- During adolescence, nutrient needs are high due to growth
- Adding the nutritional need of pregnancy on top of the needs of an adolescent mother can be overwhelming
- Teens typically have low-birth-weight babies, preterm babies, and other complications due to poor nutritional status

**Cravings?**

- Thought to be due to hormonal fluctuations
- Not necessarily indicative of nutrient deficiencies or needs
- Pica: Craving for non-food items
  - ie, ice, starch, dirt

**Things to Avoid**

- Taking medications or supplements without consulting your physician
- Infection with listeriosis
  - Unpasteurized cheeses, deli meats, uncooked or rare meats, unwashed fruits and veggies
- Mercury contaminated fish
  - Shark, swordfish, tile fish, king mackerel
  - Canned tuna is safer than fresh tuna
Caffeine

- Diuretic action makes it hard to maintain fluid balance
- High use is dangerous
  - Increases risk of miscarriage and low birth weight
- Moderate use is most likely ok
  - Less than 2 cups coffee per day

Tobacco Use

- Restricts blood supply to developing fetus
  - Limits oxygen supply
  - Decreases removal of wastes
- Can affect intellectual and behavioral development of child
- Increases likelihood of:
  - Complication with birth
  - Low-birth weight baby
  - Sudden infant death syndrome

Alcohol

- No amount of alcohol is known to be safe
- Teratogen
- Crosses placenta and accumulated in fetal blood stream

Two drinks/day and occasional binge drinking

Increases risk of:
- miscarriage
- complications during delivery
- preterm birth
- developmental delays
- developmental and behavioral defects (ADD and hyperactivity)
- physical abnormalities
Fetal Alcohol Syndrome

• Greater than 3-4 drinks/day
• Characteristic malformations
• High mortality rate
• Emotional, behavioral, social, learning, development problems throughout life

Constipation

• Hormones of pregnancy cause smooth muscles to relax
• Slugging movement of large intestine
• Increase pressure on large intestine
• Hemorrhoids likely
• To avoid: Eating fiber, drinking water, exercising, moving bowels soon after urge to do so
Heartburn

- Sphincters of esophagus and stomach relax
- Stomach acid irritates the esophageal lining
- Enlarged uterus pushes on the stomach

Avoiding Heartburn

- Eating small meals
- Avoid excessive weight gain
- Don’t wear tight clothes
- Wait for one hour before lying down post-meal
- Sleep with head elevated

Gestational Diabetes

- During pregnancy, mother temporarily fails to produce insulin or becomes insulin resistant
- Can usually be controlled through diet, exercise, and/or medication
- Increased risk of diabetes type 2 for both mother and child

Preeclampsia

- High-blood pressure, swelling, excessive and rapid weight gain unrelated to food intake, protein in urine
- Linked to deficiencies in Vitamin C, Vitamin E, magnesium
- Correlated to high blood triglycerides – Often due to high-sugar diets
- Only cure is birth of child
Exercise

- A tremendous benefit to mother
- Physically fitness helps the mother throughout pregnancy and birth
- Keeps blood pressure down
- Improves mood
- Easier for mother to lose weight after birth

Exercise

- Mother should be active before conceiving
- If not, introduction of activity should be gradual
- Focus on low or no-impact exercise
  - No contact sports or risk of falling
- Do not unduly raise heart rate
- Be careful of over-heating