Ch. 4, pp. 132-133, 137-142. & AND Position Paper Nutrition During Pregnancy

Key Concept

Pregnancy outcome influenced by:

dietary consumption

supplement use

weight change

The fetus depends on the mother’s nutrient consumption to meet its nutritional needs.

Key Concepts

Periods of rapid growth & development of fetal organs & tissues occur during specific times during pregnancy.

Essential nutrients in required amounts must be available during these times for optimal growth & development

Key Concept

Environmental factors influence fetal growth and development

The risk of heart disease, diabetes, hypertension, and other health problems during adulthood may be influenced by maternal nutrition during pregnancy.

Topic covered:

Status of pregnancy outcome

Reducing infant mortality and morbidity

Physiology of pregnancy

Maternal nutritional needs

Embryonic & fetal growth and development

Pregnancy weight gain

Exercise and pregnancy

Obesity

Terms Before, During, and after Pregnancy

Chronology of Events Related to Declines in Infant Mortality in the United States

The U.S. spends more money on health care than any other nation, yet ranks 56th in an international comparison of infant mortality.

Reducing Infant Mortality and Morbidity

Improve birthweight of newborns

Desirable birthweight = 3500-4500 g (7 lb. 12 oz. to 10 lb.)

Infants born with desirable wt are less likely to develop:

Heart and lung diseases

Diabetes

Hypertension

Range of Birth Weights by Gestational Age, U.S.

Table 4.4: 2020 health objectives

Reduce the rates of fetal and infant deaths.

Reduce the rate of maternal mortality.

Reduce low birthweight and very low birthweight.

Reduce preterm births.

Reduce the rate of fetal and infant deaths.

+

Increase the proportion of pregnant women who receive early and adequate prenatal care.

Increase abstinence from alcohol during pregnancy.

Increase the proportion of women who gain weight appropriately during pregnancy.

Maternal Physiology

Changes in maternal body composition & functions occur in **specific sequence**

Maternal anabolic and catabolic phases

From **Table 4.6** - Summary of maternal anabolic and catabolic phases of pregnancy 16

Altered metabolism during pregnancy

Altered nutrient metabolism

Ensures that nutrients will be available to the fetus when needed

Must be onboard before needed

Altered body water

Increases from seven to ten liters

Expansion of intracellular and extracellular

Edema

Macronutrient metabolism

Carbohydrate metabolism

Glucose shunted to placenta and fetus: preferred fuel

Diabetogenic effect of pregnancy: results from maternal insulin resistance

Fat metabolism

Fat stores accumulate in first half

Enhanced fat mobilization in last half

Protein metabolism

Increased needs must be met by mother’s diet

The Placenta

Functions:

Hormone & enzyme production

Nutrient & gas exchange

Governs rate of passage to and from fetus

Small molecules pass through most easily

Large molecules are not transferred at all

Waste removal

Structure:

Double lining of cells separating maternal & fetal blood

Structure of the Placenta

-Maternal arteries & veins are part of the maternal circulation

-Umbilical arteries & veins are part of the fetal circulation.

-Blood enters the fetus through umbilical veins (02 rich) & exits through umbilical arteries (02 poor).

Mechanisms of Nutrient Transport Across the Placenta

Embryonic & Fetal Growth one-way street

Critical periods of growth

If nutrients are lacking, growth can’t happen

Variations in programmed growth linked to:

Energy, nutrient, & oxygen availability (environmental)

Genetically programmed growth & development

Insulin-like growth factor (IGF-1) is main fetal growth stimulator

Inadequacies result in:

Decreases muscle and cell mass

Produces asymmetrical growth

Newborn Weight Classifications

AGA

SGA

dSGA (disproportionately)

pSGA (proportionately)

LGA

Miscarriage and pre-term delivery

1/3 of implanted embryos do not progress

Low risk:

N/V early in pregnancy

Increased risk:

Underweight at conception & high oxidative stress

Preterm delivery:

Death, neurological problems, low IQ, ADHD, congenital malformations, chronic health problems.

Developmental origins of health and disease

Exposures to adverse nutritional & other conditions during critical periods of growth & development can permanently affect body structures & functions

In utero exposures may predispose individuals to CVD, T2DM, hypertension & other disorders in later life

Famine = increased infant death, LBW & pSGA

Examples

Limited glucose to fetus ->

Fetal CNS gets priority to promote proper development ->

 insulin resistance in muscle cells ->

 risk of adult obesity, insulin resistance, T2DM

G.L. and D.L. w/ GDM

Fetal weight and adult health

Weight Gain Recommendations

Rate of Pregnancy Weight Gain

~ 3-5 lbs in 1st trimester

~ 0.5 lb/wk after 20 wks

~0.75 lb/wk in 3rd trimester

Composition of Weight Gain

Postpartum Weight Retention

Concern over pregnancy weight gain and long-term maternal obesity

Currently gaining more weight during and losing less weight after

~14 pounds lost w/i 6 wks postpartum

Wt loss difficult in women who:

 gained > 44 pounds

 have low activity levels

Previously, women with recommended wt gain in pregnancy were ~2 pounds heavier at 1 yr postpartum

Nutrient Needs During

Needs vary with…?

Maternal diet quality is strongly associated w/ newborn health status

Energy requirements in pregnancy

~300 additional kcals/d on average (range 210-570 kcals/d)

Or (+340/d in 2nd trimester +452/d in 3rd trimester)

Assume: monitoring weight gain w/o edema = adequate calories

Carbohydrates, Protein, Alcohol and Water

Carbohydrate intake (45-65%)

Less processed V/F, whole grains...

Alcohol ingestion

Protein requirements:

RDA +25 g/d (not in 6th ed) or ~71 g/d

Caffeine/coffee – needs investigation

Water/fluids: adequate to keep urine light in color with normal volume and frequency

Need for Fat

Pregnant women consume ~33% of total calories from fat

Fat consumed in food is used as an energy source for fetal growth and development

Provides fat-soluble vitamins & essential fatty acids

Intake of Omega-3 Fatty Acid

13 g/d omega-6 & 1.4 g/d omega-3

Adequate EPA & DHA during pregnancy & lactation linked to:

higher intelligence

better vision

more mature CNS

Dietary intake recommendations for DHA

300 mg/d, not to exceed 3 grams per day

Folate

Folate and pregnancy outcome

21-27 d after conception

Recommendation: 600 dietary folate equiv.

Supplement w/ 400 mcg/d

& eat fruits and vegetables rich in folate (to = 200 mcg more)

Folate

Other Nutrient Concerns

Choline

Vitamin A

Vitamin D

Calcium

As maternal bone demineralizes lead is released

Prevented with > 1000 mg Ca+/d

Iron

 Needs increase dramatically to 27 mg/d

Diets

Taste and smell may change during pregnancy

Pica

Cultural considerations

Pregnancy-related custom in your culture?

Basics of a sound pregnancy diet

Provide sufficient calories to support appropriate rates of weight gain.

Follow the ChooseMyPlate food group recommendations.

Provide all essential nutrients at recommended levels of in­take from the diet.

Include 600 mcg folate, of which 400 mcg is folic acid, daily.

Provide sufficient dietary fiber (28 g/day).

Include 9 cups fluid daily.

Include salt "to taste."

Exclude alcohol.

Are satisfying and enjoyable.

Vegetarian diets

May be low in:

B12, vit D, Ca+, Fe-, Zn, EPA, DHA, energy

Pay attention to protein quality and amount

Complimentary sources

Assessing adequacy

Ask about:

Usual intake

Supps

Weight gain (usual wt)

Bev consumption habits

Food availability

Consider a computer analysis

Exercise and Pregnancy Outcome

Moderate exercise undertaken by healthy women is helpful

Provided adequate wt gain & cooling

Exercise recommendation for pregnant women

3-5 times each week for 20 - 30 minutes at 60-70% VO2 max

Common Health Problems

Nausea and vomiting

Separate liquids from solids

Avoid trigger foods and odors

Heartburn

Small frequent meals

Sit up after meals

Constipation

30 gm fiber/d w/ water

High Risk Conditions

**Obesity**

Age

Diabetes: T1DM, T2DM, GDM

Obesity

Obesity associated with higher rates of GDM, hypertensive disorders and excessive wt gain & retention

Associated with unfavorable metabolic changes:

 blood glucose levels

 C-reactive protein levels/inflammation

 blood levels of insulin & insulin resistance

 blood pressure

High total & LDL cholesterol & triglycerides

Low HDL cholesterol

Infant Outcomes

Obesity associated with higher rates of

Stillbirth

Large for gestational age newborns

Cesarean-section delivery

Poorer adult health of offspring: obesity, T2DM, CAD, CVA, asthma…

Nutritional Recommendations

Preconception counseling

Meet nutrient needs

Consume a variety of foods

Participate in physical activity

Maintain appropriate rates of weight gain

11-20 lbs

Lose appropriate wt postpartum

AND Position Paper

Similarities to Brown (2020)?

Differences?