Vitamins In Pregnancy

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ASSESSMENT OF NUTRITIONAL STATUS

- Assess before pregnancy, across pregnancy and during lactation

- Potential nutritional problems: skipping meals; limiting food; being on a special diet; consuming sweetened beverages; low frequency of consuming calcium foods, vegetables, or fruits; and high intake of foods with added sugars/fats.

ASSESSMENT

- Women who routinely eat three meals daily that include several servings of vegetables, fruits, whole grains, low-fat dairy, and protein (meat, poultry, seafood, beans, peas, eggs, processed soy products, nuts, seeds) likely meet the DRIs for most nutrients

- Even nutrient-dense diets, may not meet nutrient goals for iron, Vit D, and choline during pregnancy

Referrals

- Consult with a nutritionist if:
- Diabetes, HTN, metabolic disorders, malabsorptive GI disorders
- Hx of bariatric or other GI surgery affecting absorption
- Overweight and obese
- High intake of sweetened beverages or foods with a high level of calories from added sugars or fats. Low intake of Ca-containing foods, vegetables, and/or fruits
- Food avoidances, restrictive diets, skipping meals
- Dieting history, weight fluctuations, eating disorders requiring medication or hospitalization
- Multiple gestation (ex. triplets)
- Substances that may affect nutrition (cigarettes, alcohol, stimulants, recreational drugs)

Gestational weight gain

- **BMI <18.5 → weight gain 12.5 to 18 kg:**
  - 0.5~2 kg over the 1st trimester and ≈0.5 kg/wk thereafter
- **BMI 18.5 ~24.9 → weight gain 11.5 to 16.0 kg:**
  - 0.5~2 kg over the 1st trimester and ≈0.5 kg/wk thereafter
- **BMI 25 ~ 29.9 → weight gain 7 to 11.5 kg:**
  - 0.5~2 kg over the 1st trimester and ≈0.25 kg/wk thereafter
- **BMI ≥30 → weight gain 5 to 9 kg:**
  - 0.5~2 kg over the 1st trimester and ≈0.25 kg/wk thereafter

Calories

- Pregnant women of normal weight with a singleton pregnancy need to increase daily caloric intake by:
- 0 kcal/d in the 1st trimester
- 340 additional kcal/d in the 2nd trimester
- 450 in third trimester

Protein

- 1.1 g/kg/day
- Use of special protein powders/drinks should be discouraged
- In undernourished women→ supplementation does not improve clinically important pregnancy outcomes
- In women who likely have adequate protein intake, there is evidence of possible harm from high-protein supplements

Carbohydrate

- Non-pregnant → 130 g/day
- Pregnant → 175 g/day
- Fiber 28 g/d + fluid → ↓constipation

Fat

- The optimal types and quantity of fat intake in pregnancy is unclear

- Trans fatty acids may have adverse effects on fetal growth and development by interfering with essential fatty acid metabolism, by direct effects on membrane structures or metabolism, or by replacing maternal intake of the cis essential fatty acids

Micronutrients

- Well-nourished women may not need supplements to satisfy daily requirements, but in the absence of a careful evaluation by a nutritionist, it is prudent to recommend them

Micronutrients

- Iron: 27 mg
- Calcium: at least 250 mg (elemental calcium 1000 mg/day)
- Folate: at least 0.4 mg (0.6 mg in the 2nd and 3rd trimesters)
- Iodine: 150 mcg
- Vit D: 200~600 IU (exact amount is controversial)
- Adequate amounts of Vit A, E, C, B, and zinc

Micronutrients

- Risk for micronutrient deficiencies:
- A multiple gestation
- Heavy smokers
- Adolescents
- Vegans
- Substance abusers
- Hx of bariatric surgery
- GI conditions that cause malabsorption (eg, Crohn disease, bowel resection)
- Lactase deficiency

Micronutrients

- UK guideline:
- take folic acid each day, from before pregnancy until the end of the first trimester
- Vit D daily throughout pregnancy and breastfeeding
- Other supplements are not recommended for routine use

Micronutrients

- Cochrane review:
- In low- and middle-income countries, MMN supplements in pregnancy modestly reduce rates of LBW and small for gestational age, and possibly preterm birth compared with iron supplementation ± folic acid
- Maternal anemia was reduced when compared with placebo but not when compared with iron ± folic acid
- There was no demonstrable benefit for miscarriage, congenital anomalies, maternal mortality, perinatal mortality

Iron

- Iron deficiency prevalence (US): 7% in the first trimester to 30% in the third trimester
- Iron: heme and non-heme
- The most bioavailable form is heme: meat, poultry, and fish
- Non-heme: comprises 60% of iron in animal foods and all of the iron in plant foods, fortified grains, and supplements
- Absorption of non-heme iron is inhibited by consumption of dairy products and coffee/tea/cocoa

Iron

- CDC: all pregnant women take a 30 mg/d iron supplement by the first prenatal visit

- Intermittent iron supplementation (1~3 x/wk) appears to be as effective as daily supplementation for preventing anemia at term and is better tolerated

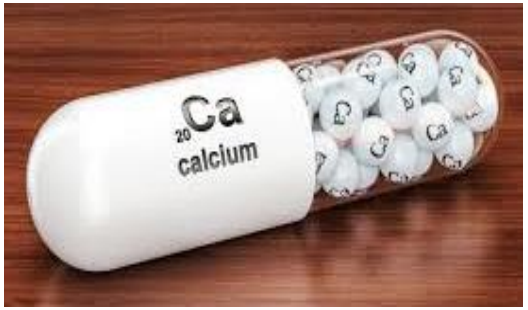
Iron

- There is no strong evidence that iron supplementation in non-anemic pregnant women improves maternal or child clinical outcomes
- Iron is important in fetal brain development
- Screen and treat iron deficiency before anemia development may benefit neuro-developmental outcome

Iron

- If iron deficiency anemia (1st or 3rd trimester Hb <11 g/dL or 2nd trimester Hb ≤10.4 g/dL and low serum ferritin [<40 ng/mL]) → 30 to 120 mg/d until the anemia is corrected
- Iron absorption decreases with increasing dose→ split into several doses during the day
- If oral not tolerated → iv

Calcium



- Fetal skeletal development requires ≈30g Ca during pregnancy, primarily in the last trimester→ a relatively small percentage of total maternal body calcium
- It is easily mobilized from maternal stores, if necessary
- Intestinal absorption and renal retention of Ca increase progressively throughout gestation

Calcium

- RDA:
- 1000 mg/d in pregnant and lactating women 19~50yr
- 1300 mg/d for <18yr

- The recommendation is the same for non-pregnant women of the same age

Calcium

- If low baseline dietary Ca intake → high-dose Ca may reduce the risk of hypertensive disorder of pregnancy (not effective in normal intake)

- Systematic review: Ca supplementation did not reduce the risk of spontaneous preterm birth or low birth weight

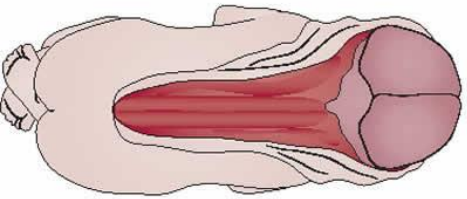
Vitamin D

- 600 IU/d for all reproductive-age women, pregnancy, and lactation
- The safe upper limit of Vit D has not been well studied but was conservatively set at 4000 IU/d
- Meta-analyses: reduced risks of a small for gestational age and wheeze/asthma → small and clinically insignificant

Folic acid

- 0.4~0.8 mg one month before and for the first two to three months after conception to reduce their risk of having a child with a neural tube defect

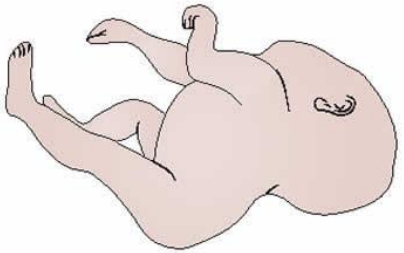
- 0.6 mg thereafter to meet the growth needs of the fetus and placenta



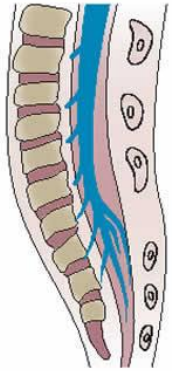
Craniorachischisis
Completely open brain and spinal cord

Anencephaly
Open brain and lack of skull vault

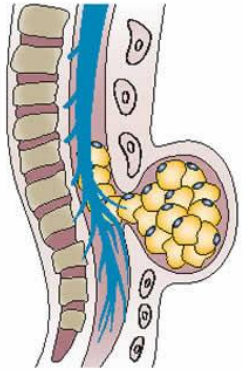
Encephalocele
Herniation of the meninges (and brain)



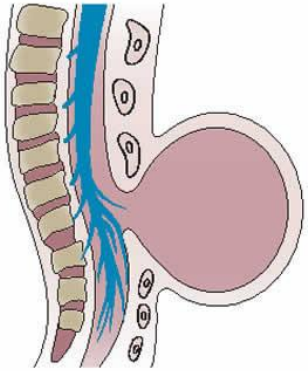
Iniencephaly
Occipital skull and spine defects with extreme retroflexion of the head



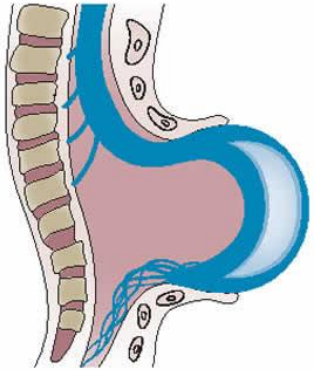
Spina bifida occulta
Closed asymptomatic NTD in which some of the vertebrae are not completely closed



Closed spinal dysraphism
Deficiency of at least two vertebral arches, here covered with a lipoma



Meningocele
Protrusion of the meninges (filled with CSF) through a defect in the skull or spine



Myelomeningocele
Open spinal cord (with a meningeal cyst)

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1

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4

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2

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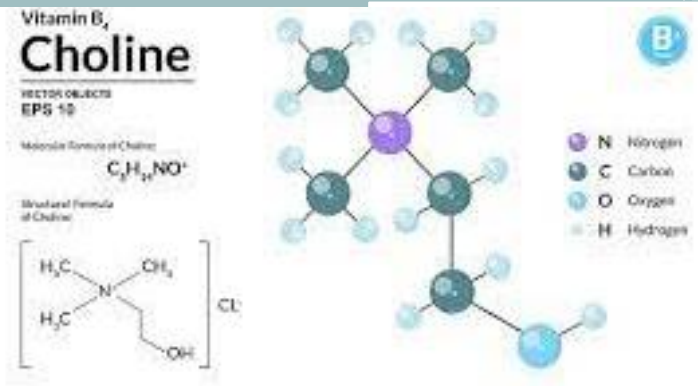
Choline



- It is crucial for the development of the CNS
- 450 mg/day
- Choline in often absent or low in prenatal vitamins
- Eggs, meats, fish, dairy, navy beans, Brussels sprouts, broccoli, and spinach

Zinc

- Zinc is essential for normal growth
- Severe deficiency → growth restriction
- Systematic review: zinc supplementation did not improve any pregnancy outcome, except for a 14% reduction in preterm birth in low-income women

Iodine

- Deficiency → maternal and fetal/neonatal hypothyroidism
- WHO: 250 mcg/d for pregnancy and lactation
- Pregnant women should be encouraged to use iodized salt and/or seafood
- Cochrane: insufficient data on the benefits/ harms of routine I supplementation pre-conception, during pregnancy, or postpartum
- Many prenatal vitamins contain no iodine
- Excessive intake can cause fetal goiter

Vitamin A

- Requirements increase from 2640 IU/d in non-pregnant to 3300 IU/d in pregnancy
- Vit A: cell division, fetal organ and skeletal growth, maintenance of the immune system, and development of vision
- The fetus will obtain sufficient Vit A at the expense of maternal stores → maternal night blindness

Vitamin A

- In some developing countries, Vit A deficiency is a concern→ maternal night blindness, maternal xerophthalmia, anemia, and susceptibility to infection
- By contrast, in developed countries, excessive intake of Vit A is the primary concern
- Vit A deficiency endemic areas (Southeast Asia and sub-Saharan Africa)→ less than 10,000 IU/d or less than 25,000 IU/wk → maternal and fetal/neonatal health benefits

Vitamin A

- Supplementation is unnecessary where habitual intake exceeds three times the RDA
- Excessive supplementation →teratogenic
- Limiting the intake of liver during the first trimester is likely prudent

Vitamin E

- Cochrane: supplementation during pregnancy does not improve outcomes of stillbirth, preterm birth, preeclampsia or low birth weight

- Vit E increased self-reported abdominal pain and prelabor rupture of membranes at term

Vitamin C

- Cochrane: supplementation during pregnancy either alone or in combination with other supplements had no beneficial or harmful effects

Long-chain polyunsaturated fatty acids

- DHA is necessary for normal development of the brain and retina
- The body's ability to produce sufficient DHA is probably inadequate→ consumption of preformed n-3 LCPUFA, such as in fish, is recommended
- DHA intake: 200~300 mg/d

Probiotics

- Some evidence suggests that probiotic use (combinations of certain Lactobacillus and *Bifidobacterium strains)* may have beneficial maternal effects, such as reduced risk of inflammatory events and preeclampsia and improved maternal glucose metabolism