Nutrition during Pregnancy

General principles

1. Give daily ***one mg folic acid***, before conception and up to ***12 weeks*** of gestation.
2. **Avoid** spices, salts, excess fat, excess fluids and sweets.
3. ***The daily-recommended diet*** contains:
   a) 120 gm protein: chicken, meat or fish
   b) No increase or decrease of salt
   c) CHD: potato or rice.
   d) One tab Fe 200 mg
   e) ½ kg milk
   f) Folic acid 1 mg
   g) One egg
   h) One tab Vit B complex
   i) Fresh fruits and vegetables
4. The average woman must consume an additional 300 kcal/day (2500 kcal/day) beyond baseline needs.
5. 30 mg elemental iron per day is recommended in 2nd and 3rd trimesters (T2 & T3).
6. The recommended dietary allowance (RDA) for calcium is increased in pregnancy to 1,200 mg/day and may be met adequately with diet alone.
7. The RDA for zinc is increased from 15 to 20 mg/day.
8. **Vegetarians**
   a. The vegetarians in general have no nutritional deficiencies, except possibly Fe and Zn.
   b. Vegans must consume sufficient quantities of vegetable proteins to provide all essential amino acids normally found in animal protein.
   c. Due to decreased protein density of most vegetables, patients may gain a greater than average amount of weight.
   d. Supplementation of Zn, vitamin B12, and Fe is necessary.

What about caffeine in pregnancy?

   a. Contained in coffee, tea, chocolate, cola beverages
   b. Currently no studies have shown deleterious fetal effects with customary amounts
   c. Adverse maternal effects include: insomnia, acid indigestion, reflux, urinary frequency

Nutritional Supplements

Iron

1. Iron is another important nutrient for pregnant women. It can be found in prenatal vitamins.
2. Benefits: Iron helps the muscles in both mother and baby to develop. It prevents anemia. and can also lower the risk of preterm birth (PTB) and low birth weight (LBW).
3. **Iron needs during pregnancy:** total body iron measures about 3500 mg. Demands of pregnancy are about 900-1300 mg (1000 mg, average): fetus and uterus: 500mg, increased maternal blood volume: 500 mg, so need about 4 mg/day, 2.5 mg in early pregnancy and 8 mg in late pregnancy (elementary Fe)
4. ***Can diet supply such needs?*** **No**, you must give supplement as ferrous Fe (not ferric) as 200-300 mg/day (up to 3 times in presence of anemia)
5. **Absorption of Fe**: only 10% only is absorbed of oral Fe. Vitamin C enhances Fe absorption, take on empty stomach (Fe in 325 mg tablet = 65 element Fe + 10–20%

absorbed, therefore 7–12 mg absorbed daily).

6. Sources

a. Good dietary sources: lean red meat poultry, fish, spinach, tofu, dried fruits, such as raisins and prunes, nuts, such as almonds, cashews and peanuts, salmon, whole-grain and fortified breads and cereals.

Table 1a: Suitable dietary needs during pregnancy and lactation

Nutrient	Non-pregnant	Pregnant	Lactating	Benefits	Sources
Calories	2100	2400	2600		
Proteins (gm)	45	120	More	Helps in the production of amino acids; repairs cells	Most animal foods, meat, poultry, eggs, dairy products, veggie burgers, beans, legumes, nuts
Iron (mg)	20	30-60	50-60	Helps in the production of hemoglobin; prevents anemia, low birth weight, and premature delivery	Beef, pork, dried beans, spinach, dried fruits, wheat germ, oatmeal or grains fortified with iron
Calcium (gm)	0.8	1.2-1.5	1.5-2	Creates strong bones and teeth, helps prevent blood clots, helps muscles and nerves function	Yogurt, milk, cheddar cheese, calcium-fortified foods like soy milk, juices, breads, cereals, dark green leafy vegetables, canned fish with bones
Folic acid (ug)	400	800	900	Helps support the placenta, and prevents spina bifida and other neural tube defects	Oranges, orange juice, strawberries, green leafy vegetables, spinach, beets, broccoli, cauliflower, fortified cereals, peas, pasta, beans, nuts

b. Fe bio-availability

1. **Haem containing diet (high bio availability):** meat, fish, poultry (industrialized countries diet)
2. **Non-haem containing diet (low bio availability):** cereals, roots, maize, rice, beans (non-developed countries)

Folic acid

1. Folic acid supplementation is recommended, with a minimum 400 mc**g/day for all**

women, 1mg tab/day: [50% decrease in neural tube defects (NTD)] and 4 mg/day (5 mg tab) for women with prior children with NTD (70% decrease in NTD).

a. Start at least 1 month before conception and continue until at least 28 days after conception (time of neural tube closure).
b. All reproductive-age women should be on folic acid supplementation.

2. Good dietary sources of folic acid (folate) include: fortified breakfast cereals, fortified whole-grain breads, leafy green vegetables, dried peas and beans, citrus fruits and juices such as oranges and grapefruits, bananas, cantaloupe and tomatoes.

3. RCOG: daily **folic acid 400** mcg**, before conception and up to 12 weeks of gestation, reduces the risk of having a baby with neural tube defects (anencephaly, spina b**ifida)**. [A]**

Vitamin A

1. ***> 25 000 IU/ day*** of vitamin A can ***cause birth defects*** and miscarriages.
2. ***Avoid*** vitamin A supplements, with maximum intake prior to and during pregnancy probably 5000 IU.
3. ***Beneficial to women with vitamin A deficiency***, especially in prevention of night blindness, in developing countries.
4. No sufficient evidence to support vitamin A supplementation as intervention for anemia.

5. RCOG: vitamin A supplementation (> 700 mcg**) might be teratogenic and therefore i**t should be avoided. Liver and liver products **contain high levels of vitamin A; consumption of these products should also be avoided. [C]**

Vitamin B6 (pyridoxine)

Daily 2.0 mg will decrease incidence of dental decay or missing/filled teeth, pyridoxine supplementation

Vitamin D

Neonatal hypocalcemia is less common with vitamin D supplementation compared to placebo.

RCOG recommendation: take 10 mcg of vitamin D per day.

Vitamin E

There are **no trials** available to assess whether vitamin E supplementation may be useful for **all pregnant women**, or if vitamin E may be beneficial when used alone.

Multivitamin supplementation (MTV)

1. **There is insufficient evidence to recommend routine MTV supplementation for all women**, or even only for women, who are underweight, have poor diets, smokers, substance abusers, vegetarians, multiple gestations.
2. ***Avoid excess*** (>1 tab) prenatal vitamin intake/day. No prenatal MTV supplement has been shown to be superior to another.

Magnesium

Oral ***magnesium*** treatment from before the 25th wk is associated with a ***lower*** frequency of PTB, a less low birth weight rate, less ante-partum hemorrhage (APH), and fewer small for gestational age infants compared with placebo; but similar incidences of pre-eclampsia (PIH).

Calcium

1. Calcium supplementation is associated with a ***reduction*** in the incidence of ***pre-eclampsia***.
2. Calcium helps the nervous, muscular and circulatory systems stay healthy.
3. When a pregnant woman doesn't get enough calcium from the foods she eats, the body takes the calcium from her bones to give it to her growing baby.
4. Having less calcium in the bones can cause serious health conditions later in life, such as osteoporosis.

Table 1b: Suitable dietary needs during pregnancy and lactation

Nutrient	Non-pregnant	Pregnant	Lactating	Benefits	Sources
Vit A (u)	5000	6000	8000	Helps bones and teeth grow	Liver, milk, eggs, carrots, spinach, green and yellow vegetables, broccoli, potatoes, pumpkin, yellow fruits, cantaloupe
Vit D (ug)	200	400	400	Helps body use calcium and phosphorus; promotes strong teeth and bones	Milk, fatty fish, sunshine
Vit C (mg)	60	80	120	An antioxidant that protects tissues from damage and helps body absorb iron; builds healthy immune system	Citrus fruits, bell peppers, green beans, strawberries, papaya, potatoes, broccoli, tomatoes
Vit B1 (mg) Thiamin	1.5	1.8	2.3	Raises energy level and regulates nervous system	Whole grain, fortified cereals, wheat germ, organ meats, eggs, rice, pasta, berries, nuts, legumes, pork
Riboflavin/ B2		1.4 mg		Maintains energy, good eyesight, healthy skin	Meats, poultry, fish, dairy products, fortified cereals, eggs

Phosphorus (mg)	0.8	1-5	2		
Magnesium (mg)	300	450	450		
Zinc (mg)	15	20	25	Helps produce insulin and enzymes	Red meats, poultry, beans, nuts, whole grains, fortified cereals, oysters, dairy products

Zinc

Zinc supplementation is associated with **significant reduction in preterm birth (PTB)**.

Iodine

1. ***Reduce endemic cretinism*** with low iodine intake (desert and oasis people).
2. ***Reduce*** infancy and early childhood deaths, with decreased endemic cretinism at the age of 4 years, and better psychomotor development scores.

Food safety

1. *Keep* hot foods hot, cold foods cold and keep everything clean.
2. ***Antigen-avoidance diet*** (e.g. avoiding chocolate, nuts, etc.) to reduce substantially the incidence of the child's atopic diseases in high-risk women, and such a diet decreases birth weight, and might increase LBW and PTB.

What about drinking caffeinated beverages?

1. ***Better to avoid caffeine***, but moderate intake ≤ 200 mg/day (1-2 cups of coffee) has no negative effects on pregnant women and their babies.
2. ***High amounts of caffeine***, ≤ 500 mg daily; (≥ 5 cups of coffee) may cause a decrease in your baby's birth weight and head circumference.
3. ***Avoid herbal teas***, as little is known about herbs and their effects on pregnancy. In some cases, they can do damage. The herb comfrey, for example, can cause serious liver disease.

RCOG Recommendation for Food-acquired Infections

Reduce the risk of listeriosis **by:**

1. **drinking only pasteurized milk**
2. **not eating ripened soft cheese such as Camembert, Brie and blue-veined cheese (there is no risk with hard cheeses, such as Cheddar, or cottage cheese and processed cheese)**
3. **not eating pâté (of any sort, including vegetable)**
4. **not eating uncooked or undercooked ready-prepared meals. [D]**

Reduce the risk of salmonella infection by:

1. **avoiding raw or partially cooked eggs or food that may contain them (such as mayonnaise)**
2. **avoiding raw or partially cooked meat, especially poultry. [D]**

Fat-soluble vitamins

1. They are vitamins A, D, E and K.
2. Foods with fat-soluble vitamins are regarded as being '***stable***' because ordinary cooking does not usually damage their vitamin content.
3. These vitamins dissolve in body fat and its extra be stored in the liver and fat tissue to draw on these body stores weeks or months later, at times when their diet does not include them. However, being able to store fat-soluble vitamins also means they can more readily accumulate to toxic levels in the body, particularly if supplements are taken. It is important to be careful about overdosing on fat-soluble vitamins, especially when pregnant.

Water-soluble vitamins

1. They are vitamins C and the B group vitamins.
2. They 'dissolve in water'. Therefore, foods containing them can be leached of their vitamin content by normal cooking and soaking in water.
3. Most water-soluble vitamins do not tend to accumulate in the body like fat-soluble vitamins.
4. Any excess amounts of vitamins are usually excreted by the kidneys through the urine, and we generally need to eat foods daily that contain water-soluble vitamins.

Vitamins are organic. Therefore many are unstable when heated; meaning their content in foods can be depleted when cooked in certain ways.

Major and trace Minerals

1. Minerals can be classified as either 'major' or 'trace'.
2. Major minerals are not necessarily more important to the body than trace minerals; however they are needed by the body in much larger quantities.
3. The major minerals include calcium, phosphorus, potassium, sodium and magnesium.
4. Some trace minerals include iodine, iron, selenium and zinc.
5. Minerals are not organic. Therefore they are chemically stable and are not destroyed by heating (like vitamins are). However, minerals can be lost if foods are cooked in water and the minerals leach into the water that is then poured down the drain.

Remember for diet

Good dietary sources of folic acid (folate) include:

• Fortified breakfast cereals • Fortified whole-grain breads
• Leafy green vegetables • Dried peas and beans
• Citrus fruits and juices, such as oranges and grapefruits
• Bananas • Cantaloupe
• Tomatoes

Good dietary sources of iron include:

• Lean red meat
• Fish
• Tofu
• Poultry
• Spinach
• Dried fruits, such as raisins and prunes
• Nuts, such as almonds, cashews and peanuts
• Whole-grain and fortified breads and cereals

Good dietary sources of calcium include:

- Milk
- Yogurt
- Canned sardines with bones
- Broccoli
- Papaya
- Cheese
- Salmon
- Spinach
- Dried beans
- Oranges
- Calcium-fortified foods such as some fruit juices and breakfast cereals

1. Recommended weight gain in pregnancy is 25-35 pounds for normal weight-women, less if overweight and more if underweight.
2. Pregnant women are not "eating for two" and only need about an extra 300 kcal per day.
3. Pica is craving/eating non-foods, often associated with iron deficiency anemia and poor nutritional status.

Nutritional supplements

1. Inform women that dietary supplementation with folic acid, from 12 wk before conception and throughout the first 12 wk of pregnancy, reduces the risk of having a baby with a neural tube defect and recommend a dose of 500 mcg per day.
2. Advise women that taking vitamins A, C or E supplements is not of benefit in pregnancy and may cause harm.
3. Advise women who are pregnant to take an iodine supplement of 150 mcg each day.
4. Women with pre-existing thyroid conditions should seek advice from their medical practitioner before taking a supplement.
5. **Do not routinely offer iron supplementation to women during pregnancy.**

Review Questions

1. Describe the optimal diet in pregnancy.
2. Should the diet increase for multiple gestations?
3. How important is peri-conception nutrition?
4. Are vitamin and mineral supplements necessary during pregnancy?
5. What problems are associated with mega-dose vitamin and mineral therapy?
6. True or false: All herbal remedies are safe in pregnancy.
7. What are the guidelines for fluid requirements during pregnancy?
8. Can maternal fluid status affect the fetus?
9. Do all pregnant women need additional iron?
10. What about absorption of iron?
11. List the sorts of foods that should be encouraged to increase iron in the diet.
12. What are the nutritional concerns for the pregnant vegetarian?
13. What are the nutritional concerns with adolescent pregnancy?
14. What is pica?

Answers

(1)

a. The energy requirement increases by 17% over the non-pregnant state to be average of 2500 kcal/day, with additional 300 kcal/day
b. Generally, thin and undernourished women require higher energy intakes than other women.

c. Protein: 20%, fat: 30%, and carbohydrates: 50%.
d. A sample diet in pregnancy based on the food pyramid should include 6-11 servings of grains, 3-5 servings of vegetables, 2-4 servings of fruit, 3-5 servings of dairy, 2-3 servings of meats, beans, or nuts, and one serving of sweets.

(2)

Yes, it is thought to be significantly increased from singleton pregnancies and recommendations of an additional 300 kcal and 10 gm of protein per fetus beyond singleton are standard.

(3)

Folic acid

a. It reduces the incidence of neural tube defects (NTDs) by 50% on consuming 0.4 mg of folate/day.
b. Women with a history of NTDs pregnancy should consume 4 mg of folate/day from 1 month preconception until the end of the T1.

Pregestational diabetes

a. Women with **diabetes** should be counseled preconceptionally with proper control in the peri-conception.
b. **Poor control of diabetes during embryogenesis** → fourfold increase in the incidence of major fetal congenital malformations

Women with phenylketonuria

a. It increased risk of fetal malformations, including cardiac defects and microcephaly, **how to reduce these risks?** By phenylalanine-restricted diet 3 months before conception.
b. The associated low birth weight (LBW) is reduced if phenylalanine levels are normalized by 8 wk.

(4)

If all the necessary nutrients can be consumed in the daily diet, then the answer is no. However, women with special needs should be addressed separately.
Various categories of special need for vitamin and mineral supplementation include:

1. **Dilantin therapy:** Folate, vitamins, and amino acids are supplementation gives favorable outcomes as greater fetal weight and length, decreased subcutaneous bleeding, more ossification centers, and fewer malformations.
2. **Environmental lead exposure:** vitamins C and E (antioxidant vitamins) may play a role in the reduction of potentially adverse effects of lead during pregnancy, including protection of the fetus against lead toxicity and/or free radical change.
3. **Multiple gestations:** supplemental folate is recommended.
4. **HIV infection:** supplemental selenium with antioxidant vitamins has been speculated as a measure to reduce the probability of placental transmission of HIV.
5. **Alcohol consumption: give** B complex as alcohol intake may deplete many nutrients, notably B complex.
6. **Hemoglobinopathies** may benefit from supplemental folate, given the increased red blood cell turnover.
7. **Hypertension** may benefit from calcium supplementation.

(5)

1. Large intakes of fat-soluble vitamins such as vitamin A and D, and mega-doses of selenium have been shown to cause birth defects in both humans and animals.

2. Large doses of zinc suppress the immune system, also zinc competes with iron for absorption, and iron deficiency anemia may result.
3. Large amounts of fluoride have been associated with mottled teeth.
4. Excessive vitamin C interferes with copper metabolism.

(6)

False

a. Remedies marketed as calmatives or nerviness may contain large amounts of alkaloids, shown to cause hepatic damage.
b. Mate, a tea-like infusion increases the risk of digestive tract cancers.
c. An **herbal tea**, pleurisy root, has been shown to have digoxin-like factors.

What is safe? "**Pregnancy tea**," containing chamomile, mint, and raspberry leaves, appears to be safe when consumed in moderation.

(7)

a. An average of 9 L of fluid gained during gestation translates into 30 ml/day requirement above the nonpregnant state.
b. The calculation of maintenance fluids based on body weight-100 ml/kg for first 10 kg, 50 ml/kg for next 10 kg, and 25 ml/kg above 20 kg-provides a baseline assessment of fluid needs, although it overestimates the requirement in obese patients and underestimates it in underweight patients.

(8)

It may affect the regulation of amniotic fluid volume, and there are data to demonstrate that acute changes in maternal osmolarity alter fetal hydration.

(9)

No. Women who eat carefully planned daily diets with maximal dietary iron probably do not need supplemental iron. ***However, numerous dietary surveys indicate that iron intake is suboptimal in a high percentage of the population***.

(10)

1. **Absorption** from heme sources is 10%; from non-heme sources it is approximately 2%. Thus large portions of non-heme foods are required to compensate.
2. **Vit C helps its absorption, also take before or after meal by 2 hr**
3. Iron-deficient persons, however, generally absorb twice as much iron from a meal as those without iron deficiency.
4. In a small study, iron absorption was observed to increase with gestational age: 7% at week 12, 36% at week 24, and 66% by week 36.
5. Iron should not be consumed within 1 hour of **calcium** intake, ***why?*** An insoluble complex can result in reduced iron absorption.
6. **Antacids** taken for heartburn can also interfere with iron absorption.
7. **Tea and coffee** can cut absorption of non-heme iron by more than half compared with water.

(11)

1. **High sources**: oysters; lean red meats, especially liver; in vegetarian diets, tofu, legumes, and beans when consumed with an acidic beverage such as orange, grapefruit, or tomato juice.
2. **Moderate sources**: enriched grain products and cereals
3. **Low sources**: light and white meats, including chicken, salmon, and pork; dairy products

(12)

1. Ovolactovegetarians consuming milk products, eggs, fish, and poultry generally meet the suggested guidelines without further supplementation.
2. More restrictive diets (lactovegetarian-no fish, eggs, or poultry; vegan-plants only) should prompt consideration of vitamin B complex, which includes B_{12}, calcium, and additional iron supplementation.
3. Highly restrictive diets (only fruits, Zen macrobiotic diets) are best avoided during pregnancy.

(13)

These patients may require additional energy, protein, and calcium to meet their nutritional needs for maternal *and* fetal growth, ***why?*** Girls under the age of 17 are at increased risk for preterm delivery, perinatal mortality, and LBW-outcomes correlated with sociocultural stress, also their own body growth demands compete with those of the fetus.

(14)

Pica is the craving and eating of nonfoods, such as cornstarch (amylophagia), clay (geophagia), and ice cubes. The etiology is unknown, although iron deficiency anemia, cultural beliefs, and limited access to nutrition are thought to be possible etiologies. ***What are its dangers?*** Ingestion of toxic substances and an increased risk of iron deficiency anemia due to the binding of dietary iron by non-foods, ***how to manage?*** It is based on the detection of pica, and counseling as to its detrimental effects in pregnancy.

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