Board Review- Vitamins

From A to BBBBB to C....with a touch of folate

December 18, 2014
A 14-year-old girl presents with a 3-day history of severe headache and diplopia. Findings on physical exam include yellowing of the skin, moderate acne, and papilledema on fundoscopic examination.

Of the following, the findings are MOST likely due to an excess of vitamin A, B1, C, D, or E.

- HA+Diplopia+Papilledema → pseudotumor cerebri
- Yellowing of skin → carotenemia
Vitamin A

**Excess**
- Infants: NV, drowsiness, bulging fontanelle
- Children (typically chronic) includes: swelling and tenderness of the bones, decreased ROM, anorexia, decreased weight gain, fatigue, pruritis, irritability
- Other signs: hepatomegaly, cirrhosis, increased ICP, scaly skin, alopecia, fissuring of corners of mouth

**Deficiency**
- Deficiency is MC cause of preventable blindness in children
  - Integrity of epithelial cells is damaged
- Ophthalmologic involvement is first clinical sign
  - Night blindness- due to delayed ability of rhodopsin to regenerate
  - Progression to ulceration and infection
- FTT and decreased immune function may indicate subclinical deficiency
- Seen in those with problems of malabsorption
Question # 1

Which of the following pairings is NOT correct?

a. Vitamin C - Scurvy
b. Vitamin B12 - Macrocytic anemia
c. Vitamin B6 - Pellagra
d. Vitamin B1 - Beriberi
e. Vitamin B2 - Cheilosis
<table>
<thead>
<tr>
<th>Vitamin</th>
<th>Where found/How become deficient</th>
<th>Symptoms of deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1 Thiamine</td>
<td>Yeast, legumes, pork, rice, cereal, milk products vegetables</td>
<td>Weight loss surgery, TPN without supplementation, rice polishing/processing</td>
</tr>
<tr>
<td>B2 Riboflavin</td>
<td>Meats, fish, eggs, milk, green vegetables, yeast, enriched foods</td>
<td>Lack of consumption</td>
</tr>
<tr>
<td>B3 Niacin</td>
<td>Milk and eggs</td>
<td>Malnutrition, corn diets, anorexia, prolonged INH therapy</td>
</tr>
<tr>
<td>B6 Pyridoxine</td>
<td>Yeast, rice, cereals</td>
<td>Malabsorption, diarrhea, prolonged INH therapy, rice polishing/processing</td>
</tr>
<tr>
<td>B12 Cobalamin</td>
<td>Animal meat</td>
<td>Hematologic and neurologic systems; skin hyperpigmentation</td>
</tr>
</tbody>
</table>
Too much of a good thing?

› B1: causes vasodilation, hypotension, bradycardia if given by IV too rapidly
› B3: can cause flushing, blood and skin disorders
› B6: can cause peripheral neuropathy

› C: Hemolytic crisis in presence of G6PD, oxalate or cysteine nephrocalcinosis, diarrhea

Vit D and E- fat soluble...Heidi’s part of the alphabet 😊
Question # 9

Which of the following patients is at risk for thiamine deficiency?

a. Exclusively breast-fed infant, mother is well nourished
b. 2 year old immigrant fed a vegetarian diet
c. 3 year old refugee whose dietary staple is highly processed rice
d. 4 year old American boy who eats only breakfast cereal
e. All of the above
Thiamine (B1)

- Pork, fish, and poultry are good nonvegetarian dietary sources.
- Main sources for vegetarians are rice, oat, wheat, and legumes.
- Most ready-to-eat breakfast cereals are enriched.
- Thiamine is water soluble and heat labile - most is lost when foods are repeatedly washed/processed and the cooking water is discarded.
- The breast milk of a well-nourished mother provides adequate thiamine; only if mom is deficient is infant at risk.
- Most infants and older children consuming a balanced diet obtain adequate intake and do not require supplements.
- Deficiency of thiamine is associated with:
  - severely malnourished states, including malignancy and following surgery
  - over processed or polished rice
  - Presence of highly refined wheat flour as a major part of the diet
  - Alcoholics
  - food faddists
You are evaluating a 2-year old daughter of strict vegan parents. Her birthweight at term was 3.5kg. Since weaning at 12 months of age, the child’s diet has included homemade, macrobiotic-based formula. In your office today, the girl’s weight is 11.2kg.

Of the following, the child’s diet MOST likely is deficient in

a. Essential amino acids
b. Folate
c. Vitamin A
d. Vitamin B12
e. Vitamin C
B12

› “Vegan”- solely from plant sources
  – But maintain adequate amounts of A and C, as well as essential fatty acids

› B12 is found in meat, eggs, dairy products
  – Must supplement if these items are not consumed

› Breastfed infants may develop deficiency but only if mom’s stores are low
  – Soy alternative- commercial products are supplemented

› Vegan diets of young children show small but significant differences in height and weight compared with children who have mixed diets
  – But not growth failure!
  – Ca and Zinc may be low too
You are evaluating n 8-month-old infant for anemia. At 6 months of age, **iron supplementation** was prescribed when a complete blood count revealed anemia. **Follow-up CBC** shows that the anemia has persisted, although the child’s mother insists she has been giving the iron supplements. The infant has been **exclusively bottle fed with fresh goat’s milk** since age 4 months. Cereal and baby foods have not yet been introduced.

Of the following, the MOST likely cause for this infant’s persistent anemia is

a. Folate deficiency
b. Iron deficiency
c. Vitamin B12 deficiency
d. Vitamin E deficiency
e. Zinc deficiency
Folate

- High content in organ meats (liver and kidney), green vegetables, orange juice, yeast
- Human milk has adequate folate for a BFing infant
- Heat-sterilized cow milk inadequate
- Goat milk contains very little folate
- 3.6mcg/kg per day of dietary folate
- Deficiency also seen commonly in pregnant women - fetus imposes increased demand
  - “the fetus is privileged in extracting adequate folate, even in the face of maternal deficiency”
- In infants, typically a component of starvation and protein-calorie malnutrition in infants
- Goats milk is the only risk factor you need to know for deficiency
The other’s

› Zinc
  – Present in both colostrum and milk, meats, veggies
  – Deficiency if TPN given without supplementation
  – especially in premies....stores not built up until 3rd trimester

› Iron
  – Our patient’s anemia did not improve with treatment
  – Although at risk for both iron and folate deficiency in those given only goats milk

› B12
  – Rare in infancy, only seen in cases of maternal B12 deficiency
  – Vegan diet, or infants with severe malabsorption

› Vitamin E
  – Hemolytic anemia
  – Supplementation will eliminate this risk in premies
Specs Covered:

1. Know the absorption and metabolism of water-soluble vitamins (B complex, C)
2. Recognize that a child with a resected terminal ileum and ileal inflammation requires appropriate vitamin B12 supplementation, and plan the regimen
3. Know that folate deficiency may develop in children with malabsorption syndrome
4. Know the nutritional complications associated with a strict vegan diet
5. Recognize the signs, symptoms, and causes of vitamin B12 deficiency
6. Recognize the signs, symptoms, and causes of vitamin C deficiency
7. Recognize the signs, symptoms, and causes of vitamin A deficiency
8. Recognize the signs, symptoms, and causes of folate deficiency
9. Recognize the signs and symptoms of hypervitaminosis A
10. Recognize vitamin B12 or folate deficiency as a cause of macrocytic anemia
11. Document the diagnosis of B12 or folate deficiency with specific measurement of serum B12 concentration or serum or erythrocyte folic acid concentrations before beginning replacement therapy
12. Know that B12 deficiency may occur following small bowel resection or as a result of a maternal vegan diet in a child who is breast-fed exclusively