Educational Topic 8:
Maternal-Fetal Physiology

Rationale: Knowledge of the physiologic adaptations to pregnancy will promote understanding of the impact of pregnancy on health and disease.

Intended Learning Outcomes:
A student should be able to:

- Describe the maternal physiologic and anatomic changes associated with pregnancy
- Describe fetal and placental physiology
- Interpret common diagnostic studies during pregnancy

TEACHING CASE

CASE: You are seeing a new prenatal patient today. She is a 32 year-old G1 who is a nurse in the dialysis unit. She is in excellent health, a former college athlete. She has sent her own labs. Her vital signs are normal and she has gained 4 lbs. Your physical exam is normal and confirms her menstrual dates of 8 weeks. She has brought you a list of her questions.

COMPETENCY-BASED DISCUSSION & KEY TEACHING POINTS:
Competencies addressed:
- Communication
- Patient Care
- Medical Knowledge

1. I’m urinating all the time so after lunch yesterday I dipped my urine. It showed no bacteria but +2 glucose. Why would this be? Do I have diabetes?

   Why are pregnant women more likely to get diabetes?

   • Increased circulating maternal blood volume and renal blood flow result in increased urine output beginning in early pregnancy.
   • Compression of the bladder by the growing uterus leads to smaller bladder volume.
• Increased filtration leads to a lower threshold for spilling glucose into the urine, though diabetes should still be screened.
• Human placental lactogen dulls the insulin response so that a more constant supply of glucose is available to the fetus.

2. My T4 is high, what meds do you want to start me on?
• Hyperthyroidism is unlikely with normal vital signs, weight gain and physical exam.
• Increased steroid binding globulin leads to increased total T4. If sent, free T4 is likely to be normal.
• TSH, more commonly used as a screening test, should be unchanged in pregnancy.

3. I’m nauseous all day, but only vomit in the evening and when I do, even hours after dinner it looks undigested. Why would that be? Is it true if I’m feeling sick I’m less likely to miscarry?
• High progesterone levels in early pregnancy lead to a lower esophageal sphincter tone and delayed gastric emptying.
• As high HCG levels correlate with nausea symptoms, it’s true that the risk of miscarriage is lower than average.

Your patient is now 32 weeks with a normal pregnancy to date, including her glucose tolerance test. She has stopped sending her own labs but still has a lot of questions.

4. My mom says I sound breathless all the time. I still walk up 5 flights to my unit but I am more tired and my back is starting to bother me at night. I have noticed my O2 sat is normal but my pulse is 90 at rest, and it used to be 50. What do these symptoms mean? Am I anemic?
• Increased plasma volume and fetal utilization of iron both lead to a dilutional anemia in pregnancy, generally requiring (at least) vitamin supplementation even in healthy women.
• An increased heart rate is normal (Average 90-100 bpm). O2 saturation should remain normal in pregnancy. Cardiac output increases by 30-50%.
• A feeling of breathlessness is common though respiratory rate (and vital capacity) should be normal in pregnancy.
• Total lung capacity is decreased by the 3rd trimester uterus, as are functional residual capacity and residual volume.
• Back pain in pregnancy is common due to the progesterone mediated loosening of joints and ligaments and the lordosis of the 3rd trimester.

5. My cousin told me I should be eating iodized salt to protect my baby’s thyroid function. Is this true?
• The fetal thyroid gland begins to fully function by 10 weeks gestation. No additional supplementation is needed.
REFERENCES

