


Physiologic Changes during Pregnancy and Labor

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OBJECTIVES

- 1 Discuss the impact of physiologic changes during pregnancy.
- 2 Learn common discomforts during pregnancy.
- 3 Identify potential etiologies or "differential diagnoses" related to the common discomforts of pregnancy.
- 4 Discuss the physiologic changes during the labor process.

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Objective 1

PHYSIOLOGIC CHANGES DURING PREGNANCY

- Reproductive
- Gastrointestinal
- Respiratory
- Renal
- Hematologic
- Musculoskeletal
- Cardiovascular
- Integumentary
- Metabolic changes
- Endocrine

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Objective 2

COMMON DISCOMFORTS DURING PREGNANCY

- Nausea / vomiting
- Round ligament
- Joint pain
- Shortness of breath
- Urinary frequency
- Pruritis
- Back pain
- Heart burn
- Edema
- Headache
- Leukorrhoea

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Objective 3

POTENTIAL ETIOLOGIES & DIFFERENTIAL DIAGNOSES

- Etiologies and Differential Diagnoses
 - Related to the normal discomforts of pregnancy
 - Review & discuss differences in class

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Objective 4

PHYSIOLOGIC CHANGES DURING LABOR

- Blood pressure
- Renal functioning
- Metabolism
- Gastrointestinal functioning
- Temperature
- Blood count
- Respiration


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PHYSIOLOGIC CHANGES DURING PREGNANCY
OBJECTIVE 1

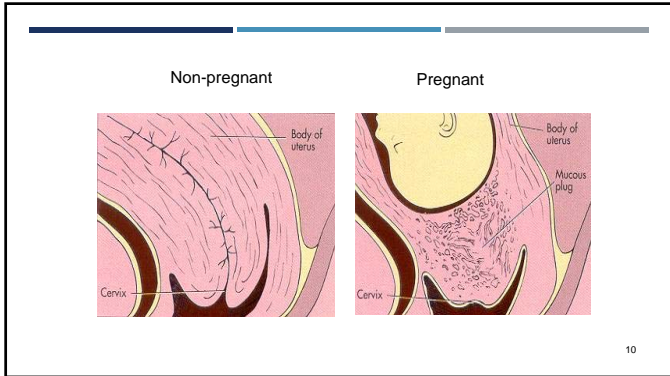
REPRODUCTIVE SYSTEM

- Uterus
 - Size & shape increase
 - Position
 - Dextra-rotary
 - Contractility
 - Braxton-Hick's
 - Blood flow
 - Increases 20 fold
 - Cervix
 - Shape & friability
- Vagina
 - Increase discharge & sensitivity
- Breasts
 - Development of colostrum
 - May increase in size
- Pelvic floor
 - Increase in size

CERVICAL CHANGES

Nullipara  Multipara

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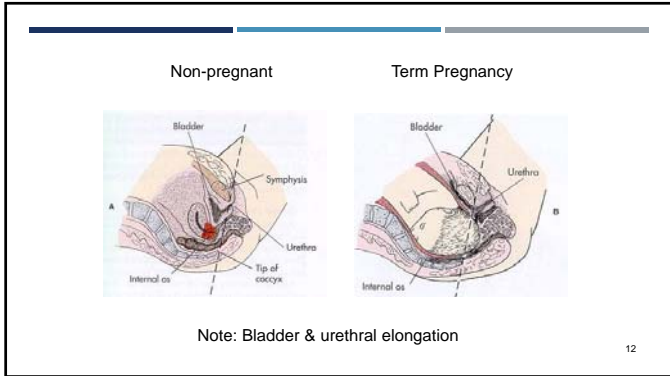
CERVICAL CHANGES: WITHIN INITIAL 6 WEEKS

“Presumptive” Sign of Pregnancy:

- Chadwick’s sign
- Bluish/purplish discoloration of vulva, vaginal mucosa, cervix
 - Due to increased vascularity

“Probable” Signs of Pregnancy:

- Goodell’s sign
- Softening of cervix
- Hegar’s sign
- Softening of lower uterus



Note: Bladder & urethral elongation

CARDIOVASCULAR SYSTEM

- Heart
 - Increased Size
 - Position changes
 - Heart sounds
 - Murmur, Audible S3, Split S1
 - Cardiac output
 - Increased stroke volume and heart rate
- Circulation
 - Blood volume
 - Increase by 40 – 50%
 - Physiological anemia
 - BP changes
 - 26 to 29 weeks = lowest BP

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CARDIOVASCULAR & HEMATOLOGICAL CHANGES

- **Increases:**
 - Heart rate by 10-15 bpm
 - Volume by 40-50%
 - Mostly plasma
 - Cardiac Output by 30-50%
 - RBC mass by 17%
 - WBC's especially 2nd and 3rd trimesters
 - Clotting factors
- **Decreases:**
 - BP especially 2nd trimester
 - Hgb & Hct
 - Especially 2nd trimester
 - Results in physiological anemia of pregnancy

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RESPIRATORY SYSTEM

- Anatomical changes
 - Diameter, circumference & costal vertebral angle all increase
 - Diaphragm displacement
 - Thoracic replaces abdominal breathing
- Upper respiratory changes
 - Vascularity increases
 - Nasal/sinus stuffiness

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PULMONARY FUNCTION CHANGES

- Respiratory rate
 - Unchanged or slightly increased
- Total lung capacity
 - Unchanged or slightly decreased
- Oxygen consumption
 - Increased by 15-20%
- Tidal volume
 - Increased by 30-40%
- Inspiratory capacity
 - Increased
- Vital capacity
 - unchanged

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PULMONARY FUNCTION CHANGES

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BASAL METABOLISM CHANGES

Increases

- 15-20%
- At onset of pregnancy
- Resolves 5-6 days postpartum

Effects

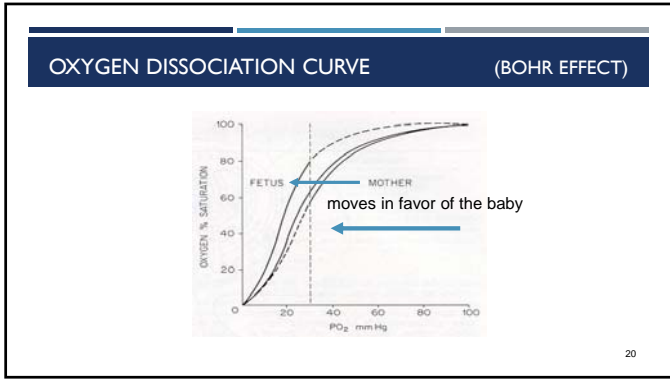
- Heat intolerance
- Perspiration
- Increase in sleep
- Metabolic acid-base changes

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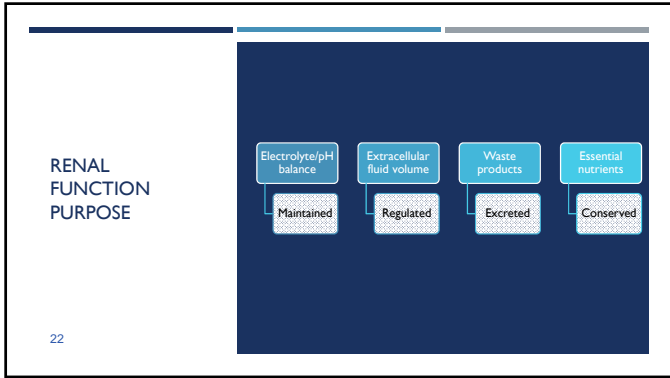
ACID-BASE BALANCE CHANGES

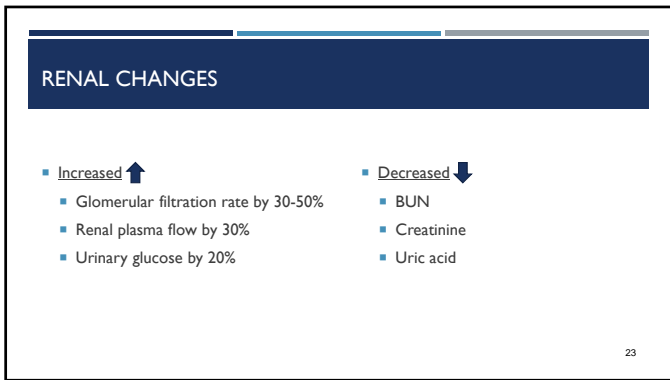
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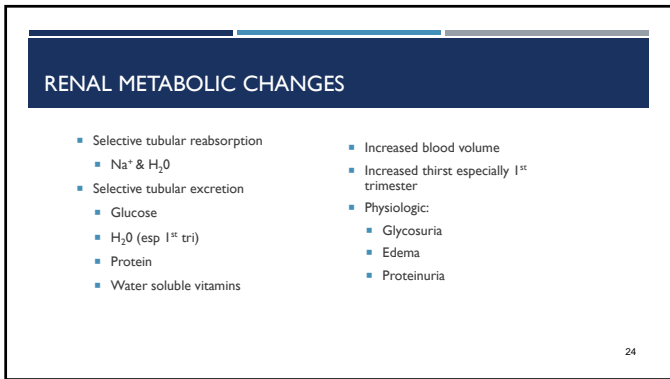
- Progesterone
 - pCO₂ falls
 - HCO₃ falls
 - pH increases (alkaline)
- Facilitates transport
 - CO₂ from baby
 - O₂ from mother
 - To baby



- ### RENAL SYSTEM
- Anatomic changes
 - Kidney
 - Renal pelvis dilates
 - Ureters
 - Dilate
 - Elongate
 - Compression
 - Bladder
 - < tone...capacity
 - May lead to...
 - Urinary frequency
 - Urinary tract infection (UTI) susceptibility







GASTROINTESTINAL SYSTEM

- Mouth
 - Gums bleed easily
 - Ptyalism
- Stomach/intestine
 - Increases in Herniation
 - Decreased
 - HCl
 - GI Motility
- Rectum
 - Hemorrhoids
- Liver/gallbladder
 - Gallstones (cholelithiasis)
 - Cholestasis of pregnancy
- Appendix
 - Location
 - McBurney's point moves up & to the right

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POSITION OF APPENDIX

8 mo
7 mo
6 mo
5 mo
4 mo
3 mo
Usual position of appendix
McBurney's point
Umbilicus

○ = McBurney's point (note how it moves up)

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MUSCULOSKELETAL SYSTEM

- Joints
 - Estrogen, Progesterone, & Relaxin
 - Hypermobility
 - Lordosis
- Ligament Stretching
 - Round
 - Uterosacral
 - Backache
- Center of gravity
 - Moves forward
- Abdominal wall
 - Diastasis
 - Assess post-partum
 - Exercises
 - Chin lifts, single leg lifts, abdominal tightening

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ENDOCRINE SYSTEM

- Pituitary & placenta
 - 20% painless spotting 1st trimester
- Thyroid
 - T₃ increases 1st trimester
 - TSH unchanged
- Adrenals
 - Excess Na⁺
- Pancreas
 - Increased maternal insulin production
 - Results in lower maternal blood sugar levels

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DISCOMFORTS OF PREGNANCY AND DIFFERENTIAL DIAGNOSES

Objectives 2 & 3

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Discomforts of pregnancy are typically related to physiologic changes....

.....**BUT** be aware of the differential diagnoses that may actually be abnormal or pathologic processes!

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FIRST TRIMESTER COMPLAINTS
& **POTENTIAL DIFFERENTIAL DIAGNOSES**

- Breast tenderness
 - Prenatal mastitis
- Urgency/frequency
 - UTI
- Nausea/vomiting
 - Appendicitis
 - Flu
 - Hyperemesis
- Gingivitis/epulis
 - Abscess
- Nasal stuffiness/nose bleeds
 - URI
- Leukorrhoea
 - Infection

Key: Black ink = complaint
Blue ink = differential diagnosis

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SECOND TRIMESTER COMPLAINTS
AND **POTENTIAL DIFFERENTIAL DIAGNOSES**

- Pruritis
 - Cholestasis
- Palpitations and Faintness/syncope
 - Cardiac condition
- Food cravings
 - PICA
- Heartburn
 - Epigastric pain

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SECOND TRIMESTER CONT'D

- Constipation
 - Bowel obstruction
- Varicosities
 - Deep vein thrombosis
- Leukorrhoea
 - Bacterial Vaginosis or yeast infection
- Headaches
 - Pre-eclampsia
- Round ligament pain
 - Kidney stones
 - Abruptio
 - Appendicitis
 - Pre-term labor

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THIRD TRIMESTER COMPLAINTS AND POTENTIAL DIFFERENTIAL DIAGNOSES

- Dyspnea/SOB
 - Respiratory or cardiac condition
- Insomnia
 - Mental illness
- Back pain
 - Preterm labor
 - Kidney stones
- Frequency/urgency
 - UTI
- Perineal discomfort
 - Vulvar varicosities
- Braxton Hicks
 - Preterm labor
- Edema (along with other symptoms)
 - Preeclampsia
- Heartburn/nausea
 - Gallstones
 - Preeclampsia

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NORMAL PHYSIOLOGIC CHANGES DURING LABOR
OBJECTIVE 4

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NORMAL PHYSIOLOGIC CHANGES IN LABOR

Areas of Physiologic Assessment

- Blood Pressure
 - May increase
- Temperature
 - Increases
- Cardiac changes
- Respiratory Rate
 - Increases
- Renal System
 - Increases
- Gastrointestinal
 - Decreases
- Hematological
 - Increases

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HEMODYNAMIC CHANGES OVERVIEW: INTRA & POSTPARTUM

- Intrapartum**
 - Pain
 - ↑ HR + BP
 - Pushing
 - Cardiac output changes
 - Valsalva
 - ↑&↓ preload/ cardiac output (CO)
- Postpartum**
 - ↑ CO by 30%
 - Autodiuresis
 - ~ 24-48 hrs PP
 - Return to pre-pregnancy physiology
 - 6-8 weeks

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HEMATOLOGICAL CHANGES DURING LABOR

Increases:	Decreases:
<ul style="list-style-type: none">HgbStress response/dehydrationClotting factorsPlasma fibrinogenWBCs increase to 15,000 by birth	<ul style="list-style-type: none">Clotting timeGlucose level

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BLOOD PRESSURE CHANGES DURING LABOR

May increase due to:	May decrease due to:
<ul style="list-style-type: none">Uterine contractions<ul style="list-style-type: none">Systolic: 10 – 20 mm HgDiastolic 5 – 10 mm HgFear, tension, pain	<ul style="list-style-type: none">Supine hypotensionPost epidural anesthesiaHemorrhage

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TEMPERATURE CHANGES DURING LABOR

- Elevated
 - Not greater than 1 – 2 degrees F (or 0.5 – 1 degrees C)
 - If higher, evaluate for:
 - Dehydration
 - Chorio-amnionitis
 - Epidural-related increase

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RESPIRATORY CHANGES DURING LABOR

Elevated

- Especially if pain & fear present

Avoid hyperventilation!

- Additional respiratory alkalosis
- Decreased oxygenation to baby
- Place O2 mask on mom if she is hyperventilating

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RENAL SYSTEM CHANGES DURING LABOR

Polyuria	Proteinuria	Ketones	Diuresis
Ensure q 2 hour voiding 30mL/hr or 120mL/4 hrs	Trace to +1 is normal in 1/2 to 1/3 of women Dependent on membrane status	Never normal	1-3 days postpartum

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GASTROINTESTINAL CHANGES DURING LABOR

- Decreased:
 - Motility and absorption
 - Secretion of gastric juices
- Absorption of liquid NOT affected
- Increased:
 - N/V especially during transition

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