Physiology of Pregnancy
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Physiology of Pregnancy
Overview

- Definition
  - Pregnancy
  - Gestation

- Changes
  - Endocrine
  - Physiological
  - Behavioural

- Why do they happen?
- How they might go wrong
How is pregnancy ‘diagnosed’?
Physiology of Pregnancy
Diagnosis of Pregnancy

- History and examination
  - Amenorrhoea
  - Nausea & vomiting
  - Malaise
  - Breast tenderness
  - Cervical & uterine changes

- Laboratory investigation
  - β-hCG (‘biochemical pregnancy’)
  - Progesterone

- Ultrasonography
Clinical vs. Biochemical Pregnancy
Physiology of Pregnancy

Overview

- Changes
  - Endocrine
  - Physiological
    - Cardiovascular, renal, respiratory, metabolic, GI
  - Behavioural
- Evolutionarily driven
  - Support pregnancy and lactation
  - Ensure viability of fetus
Physiology of Pregnancy
Endocrine changes

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Physiology of Pregnancy
Endocrine changes
Physiology of Pregnancy
Endocrine changes
Physiology of Pregnancy

Endocrine – Oestrogen + progesterone

- Gradual increase throughout pregnancy
- Stimulate uterine & mammary tissue growth

**Progesterone:**
- Most important hormone in pregnancy
- Initially from Corpus Luteum then → placenta (12-16 weeks)
- Maintains endometrium + suppresses uterine contraction
- Suppresses milk secretion
- Increases uterine size

**Oestrogen:**
- Increase uterine blood flow + vessel growth
Physiology of Pregnancy
Endocrine

- A 24 year-old pregnant woman comes in for a health-check-up. The midwife palpates her abdomen and feels the fundus of the uterus at the level of the patient's umbilicus. ‘Ahh’, she says. ‘You must be ___ weeks pregnant!’.
Physiology of Pregnancy
Endocrine
Physiology of Pregnancy
Endocrine – Problems

- BUT..
- hPL and progesterone antagonise insulin → gestational diabetes → fetal and maternal complications

Fetal:
- Preterm labour
- Impaired maturation – eg. lungs
- Increased birthweight → ↑ dystocia and birth trauma risk
- Fetal distress + sudden fetal death

Maternal:
- ↑ UTI/wound infections
- ↑ Pre-eclampsia risk
Key point 1

Always monitor for pre-eclampsia
- Hypertension
- Proteinuria
- Headaches/visual disturbances
Physiology of Pregnancy
Overview

Changes
  - **Endocrine**
  - Physiological
    - Cardiovascular, renal, respiratory, metabolic, GI
  - Behavioural

Evolutionarily driven
  - Support pregnancy and lactation
  - Ensure viability of fetus
Physiology of Pregnancy
Physiological changes – Cardiovascular

- ↑ Cardiac output
Physiology of Pregnancy
Physiological changes – Cardiovascular

- What is the normal cardiac output?
  - About 5 litres/minute in women

- How much does it change in pregnancy?
  - It rises by about 40%

- Why?
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Physiological changes – Cardiovascular

- ↑ Cardiac output
  - ↑ Heart rate; ↑ Stroke volume
- ↑ Blood volume
  - ↑ Plasma volume; ↑ Red blood cells
- ↓ Systemic vascular resistance
  - Progesterone-induced
  - Low resistance placental circulation
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Cardiovascular changes – Problems

- ↑ Cardiac output + ↑ Blood volume
  - Cardiac failure
  - Hypertension + pre-eclampsia
- Anaemia
  - ↑ Plasma volume > ↑ RBC
  - ↑ Requirements – Iron and folate
    - Fetal growth
    - Uterine growth
    - ↑ RBCs
Key point 2

Always check for anaemia in pregnancy
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Dietary advice

- Iron
  - Meat (esp. liver and kidney)
  - Eggs
  - Green vegetables

- Folate
  - Green vegetables
  - Fish
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Cardiovascular changes – Problems

- ↑ Cardiac output + ↑ Blood volume
  - Cardiac failure
  - Hypertension + pre-eclampsia
- Anaemia
  - ↑ Plasma volume > ↑ RBC
  - ↑ Requirements – Iron and folate
    - Fetal growth
    - Uterine growth
    - ↑ RBCs
- *Aorto-caval compression
Key point 3

Do **not** lie pregnant women flat on their back in late stages of pregnancy
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Aorto-caval compression

Source: Pearlman MD, Tintinalli JE, Dyne PL: Obstetric and Gynecologic Emergencies: Diagnosis and Management: http://www.accessemergencymedicine.com

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Aorto-caval compression
Physiology of Pregnancy
Aorto-caval compression

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Physiological changes – Respiratory + GI

- **Respiratory**
  - Uterus pushes up against diaphragm
    - May feel short of breath
  - ↑ Tidal volume
  - ↑ Oxygen consumption

- **GI**
  - Uterus pushes stomach upwards → nausea, vomiting, indigestion
  - Passage of food through the gut slows → constipation → haemorrhoids
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Physiological changes – Others

- Loosening of ligaments
  - Back pain
  - ↑ Risk of sprains

- Uterus pushes down on bladder
  - ↑ Urination frequency

- ↑ Venous thrombo-embolism (DVT) risk

- Breast changes
  - ↑ Size
  - Change in colour around nipple area

- Skin changes
Key point 4

Pregnancy is a risk factor for DVTs
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Physiological changes – Skin

Linea nigra
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Physiological changes – Skin

Striae
Key point 5

Screening for UTIs is important
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UTIs

- Leads to ↑ morbidity and mortality in neonate and mother
  - ↑ risk of preterm labour
  - More likely to damage kidneys (pyelonephritis)
- Often no symptoms (asymptomatic bacteruria)
- Dipstick urine when possible
  - Leukocytes
  - Nitrites
  - Protein (but remember pre-eclampsia)
Questions?
Physiology of Pregnancy
Summary – Key points

1. Pre-eclampsia
2. Anaemia
3. Aorto-caval compression
4. Deep vein thrombosis
5. Urinary tract infections
Thank you