PUBERTY AND PUBERTAL DISORDERS

- **What is puberty?**
  - It is a stage in which there is physiologic maturation resulting in development of secondary sexual characteristics and the person becomes capable of reproducing.
  - **Normal age:** 10-16 years

- **What factors are influencing puberty?**
  - Genetic factors.
  - Geographical location.
  - Nutritional status (e.g. obese = earlier onset of puberty).
  - Psychological factors.

- **Hormones and age:**
  - **Intrauterine life:** ↑ FSH and LH
  - **After birth:** there will be peak of gonadotropines which will reach a constant level at age of 4. Then, they will decrease until time of puberty when there will be pulsatile release of GnRH from hypothalamus leading to pulsatile release of LH and FSH from anterior pituitary gland.

- **Tanner staging:**
  - **Stage I:** childhood (pre-pubertal).
  - **Stage II:** appearance of pubic hair and breast budding.
  - **Stage III:** pubic hair becomes darker and curlier; increase in size of breast; increase in length of penis.
  - **Stage IV:** increase in width of penis; development of glans; darker scrotal skin; raised areola of breast.
  - **Stage V:** adult; areola is no more raised.

- **Investigations and imaging:**
  - Testosterone, estrogen, FSH and LH
  - Pelvis and abdomen imaging, skull imaging (x-ray or MRI) and left-hand-wrist x-ray (to determine bone age).
**MENOPAUSE**

- **What is menopause?**
  - It describes the cessation of menstrual cycle. Climacteric is a more appropriate term because it includes the few years before and after menopause.
  - It nearly starts at the age of 45 (with few years of menstrual disturbances). Notice that if amenorrhea persists more than 12 months → this indicated that menopause has been reached.
  - The number of ovarian follicles will decrease leading to a fall in estrogen (↓ 17β-estradiol) level. Therefore, this will result in increased FSH and LH (due to lack of negative feedback).
  - Estone becomes the dominant estrogen (produced by adipose tissues which contain the enzyme aromatase that converts adrostendione derived from adrenal cortex to estrone).

- **Menopause causes (HAVOCS):**
  - **H**: Hot flashes.
    - Lasting for 1-3 minutes.
    - Can occur at any time (but more common at night)
  - **AV**: Atrophy of vagina
  - **O**: Osteoporosis
    - Reduced bone mass per unit volume.
    - Hip fractures become more common.
    - **Prevention**: calcium intake + vitamin-D; exercise; smoking cessation.
  - **C**: Coronary artery disease
  - **S**: Sleep disturbance

**CONTRACEPTION**

- **Combined oral contraception pill (commonest):**
  - It is composed of progestogen/ progestin (synthetic progesterone) + estrogen (mainly ethinylestradiol). Notice there are three generations of progestogens with the 3rd generation being most safe because of high affinity to progesterone receptors.
  - **Contraceptive pill packet:**
    - Menstrual cycle: 28 days.
    - There are 21 tablets in the pack.
    - 7 pill-free days to cause withdrawal bleeding.
  - **Types of contraceptive pills:**
    - **Monophasic**: same dose of estrogen and progestogen in all tablets.
    - **Biphasic**: same dose of estrogen but different doses of progestogen.
    - **Triphasic**: different doses of estrogen and progestogen.
  - **Contraindications**: hypertension, diabetes, obesity, smoking, CAD and sickle cell anemia. These pills are also contraindicated during lactation because they inhibit milk production
  - **Progestogen-dependent hormonal contraception:**
    - Progestogen only pill; taken orally everyday at the same time (compliance is very important)
    - **Mechanism of action**: endometrium atrophy, affecting ovulation and changing cervical mucus.
    - It is used when combined pills are contraindicated and it is more effective in older women.
    - If there is no compliance, depot progestogen injections can be taken every 3 months.
- **Non-hormonal contraception:**
  - **Pearl index:** \( \frac{\text{Number of unwanted pregnancies}}{\text{Total months of pregnancy exposure}} \times 1200 \text{ HWY} \)
  - **Family planning methods:**
    - **Reversible:**
      - **Interrupting sexual intercourse (oldest method):** in which the male withdraws his penis from the vagina before ejaculation. High failure rate = 40 HWY
      - **Using natural methods which predict ovulation time (high failure rate = 30 HWY):**
        - Temperature method.
        - Mucus test.
        - Calendar method.
        - LH kit.
    - **Male condom (failure rate = 6 HWY):**
      - It is made of latex.
      - **Advantages:** cheap and available, reducing STDs and protecting against cervical cancer.
      - **Disadvantages:** can slip-off, reducing male sensitivity and requiring 100% compliance.
    - **Female condom (failure rate = 6 HWY):**
      - It is made of polyurethane plastic.
      - **Advantages:** available, reducing STDs, protecting against cervical cancer and stronger than male condom.
    - **Cervical cap (failure rate = 6 HWY):**
      - Circular dome made of rubber and inserted high up in the vagina to cover the cervix.
      - **Advantage:** some protection from cervical cancer.
      - **Disadvantages:** need training; risk of cystitis.
    - **Intrauterine device (failure rate 0.5-3.5):**
      - Preventing fertilization, preventing implantation, releasing progesterone and used for long duration (3-5 years).
      - **Disadvantages:** cramping and bleeding, perforation, expulsion and pelvic inflammatory diseases.
  - **Permanent:**
    - **Tubal ligation:** it requires general anesthesia and done with laparoscopy.
    - **Vasectomy (failure rate = 0.005 HWY):** it requires local anesthesia with cutting and ligating vas deferens. Considered successful after two consecutive negative sperm counts.

**NORMAL PREGNANCY**

- **Important Terminologies:**
  - **Embryo:** fertilization \( \rightarrow \) 8\(^{th}\) week of pregnancy.
  - **Fetus:** 8\(^{th}\) week of pregnancy \( \rightarrow \) delivery.
  - **Neonate:** time of birth \( \rightarrow \) 28 days
  - **Infant:** 28 days \( \rightarrow \) 1 year.
  - **Preterm infant:** before 37\(^{th}\) week.
  - **Gravid:** pregnant.
  - **Gravidity:** total number of pregnancy (including normal and abnormal).
  - **Parity:** giving birth to an infant weighing 500 grams or more (alive or dead).
- **Maturity:**

<table>
<thead>
<tr>
<th>Maturity</th>
<th>Wight</th>
<th>Weeks of gestation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premature infant</td>
<td>&lt; 2500 grams</td>
<td>&lt; 37 weeks</td>
</tr>
<tr>
<td>Normal</td>
<td>&gt; 2500 grams</td>
<td>37 - &lt; 42 weeks</td>
</tr>
<tr>
<td>Postmature infant</td>
<td>&gt; 4000 grams</td>
<td>&gt; 42 weeks</td>
</tr>
</tbody>
</table>

- **Diagnosis of pregnancy is made by:**
  - History of amenorrhea.
  - Positive pregnancy test:
    ✓ hCG appearing in blood 1 week after conception. It appears in urine 2 weeks after conception and can be detected by home pregnancy test.

### Manifestation of pregnancy

<table>
<thead>
<tr>
<th>Signs</th>
<th>Presumptive</th>
<th>Probable</th>
<th>Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin</td>
<td>* Skin: linea nigra (↑ MSH); spider navi (↑ estrogen); stretch marks (separation of underlying collagen tissue)</td>
<td>* Pelvic organs: Chadwick’s sign (bluish discoloration of vagina &amp; cervix); leucorrhea; relaxation of pubic symphysis</td>
<td>* Fetal heart sound: 4th month; 120-160 beats/min; by fetoscope</td>
</tr>
<tr>
<td></td>
<td>* ↑ Basal Body Temperature (BBT)</td>
<td>* Abdominal enlargement</td>
<td>* Palpation of fetus</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Uterine contractions (Braxton hicks contractions)</td>
<td>* Ultrasound examination</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Presumptive</th>
<th>Probable</th>
<th>Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Amenorrhea:</td>
<td>caused by ↑ estrogen and progesterone. other causes include other diseases or emotional states</td>
<td>Same as presumptive</td>
<td></td>
</tr>
<tr>
<td>* Nausea and vomiting:</td>
<td>occurring in 50% of pregnant females; common in morning; due to ↑ hCG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Breasts:</td>
<td>mastodynia (tenderness) and Montgomery’s tubercles.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Quickening:</td>
<td>first perception of fetal movement; 14-16 wks in multigravida; 18-20 wks in primigravida</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Urinary tract:</td>
<td>↑ urination due to pressure from enlarged uterus; ↑ risk of UTI</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Calculation gestational age:**
  - **EDD (Expected Date of Delivery):** LMP (Last Menstrual Period) – 3 months + 7 days

**ABORTION**

- **Spontaneous abortion:** termination of pregnancy before 20th week of gestation (80% of spontaneous abortions occur before 12th week of gestation).

- **Causes of spontaneous abortion:**
  - Genetic abnormalities (mostly leading to abortion in 1st trimester):
    ✓ Monosomy X (Turner’s syndrome).
    ✓ Trisomies (16,15,22).
    ✓ Triploidy (haydatidiform mole).
    ✓ Tetraploidy.
    ✓ Robertsonian translocations.
  - Maternal factors:
    ✓ Systemic diseases (Chlamydia, diabetes, hypertension, hyperthyroidism and SLE).
    ✓ Anatomical defects such as bicornuate uterus.
    ✓ Immunologic disorders (blood group incompatibility).
    ✓ Malnutrition.
    ✓ Emotional disturbance.
- **Toxic factors:**
  - Smoking.
  - Alcohol.
  - Radiation.
  - Antineoplastic drugs (chemotherapy).

### Types of spontaneous abortion:

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threatened</td>
<td>Normal bleeding in the 1st trimester (due to implantation). However, the cervix remains closed.</td>
</tr>
<tr>
<td>Inevitable</td>
<td>This happens when there is cervical dilation (it is opened) or rupture of the membrane.</td>
</tr>
<tr>
<td>Incomplete</td>
<td>Products of conception have partially passed; this is associated with cramps and severe hemorrhage.</td>
</tr>
<tr>
<td>Complete</td>
<td>All products of conception have passed (fetus + placenta); this is associated with less bleeding.</td>
</tr>
<tr>
<td>Missed</td>
<td>Pregnancy is kept although fetus is dead!</td>
</tr>
</tbody>
</table>

### Complications of spontaneous abortion:
- Infection.
- Sepsis.
- Infertility.

**Recurrent abortions defined as:** 2 or 3 consecutive pregnancy losses before 20 weeks of gestation with a fetus less than 500 grams.

### Causes of recurrent abortions:
- Maternal anatomical defects.
- Genetic factors.
- Underlying maternal diseases.

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**IUGR (INTRAUTERINE GROWTH RESTRICTION)**

- **Definition:** giving birth to an infant with a weight below the 10th percentile of a given gestational age.

- **Etiology:**

<table>
<thead>
<tr>
<th>Source</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal</td>
<td>Smoking, alcohol, drug abuse and malnutrition</td>
</tr>
<tr>
<td>Placental</td>
<td>Placental insufficiency due to: essential hypertension, placental-induced hypertension or chronic renal disease.</td>
</tr>
<tr>
<td>Fetal</td>
<td>Fetal infections (TORCH): Toxoplasmosis, Rubella, Cytomegalovirus and Herpes simplex virus.</td>
</tr>
<tr>
<td>Combined</td>
<td>-</td>
</tr>
</tbody>
</table>
Types:

<table>
<thead>
<tr>
<th>Symmetrical</th>
<th>In which both head and body are inadequate (head to abdominal ratio is normal but the absolute growth is decreased). This is caused by (TORCH) or fetal anomalies.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymmetrical</td>
<td>In which the head is normal but the rest of the body is reduced in size. This occurs in late pregnancy and mostly affecting liver and pancreas.</td>
</tr>
</tbody>
</table>

Diagnosis of IUGR:

- **Head and abdomen circumferences: normally:**
  - head is bigger than abdomen before 34 weeks.
  - abdomen is bigger than head after 34 weeks.
- **Femoral length.**
- **Amniotic fluid volume.**
- **Calculated fetal weight.**

INFERTILITY

- **Definition:** inability of a couple to conceive after 1 year of marriage without the use of contraception.
- **Classification:**
  | Primary | Identified in couples in whom a pregnancy has never been established. |
  | Secondary | Identified in couples who have previously conceived but are currently unable to do so. |

- **There are two kinds of infertility:**
  | Hypofertile | Able to conceive but require more time and assistance (transient) |
  | Sterile | Unable to conceive forever (permanent) |

- **Requirements of a normal fertility:**
  - Ovulation.
  - Spermatogenesis (with adequate sperm count).
  - Intercourse at the middle of menstrual cycle (time of ovulation).
  - Cervical mucus allowing penetration of sperms.
  - Functional patent fallopian tubes.
  - Endometrium prepared for implantation.

- **Causes of infertility:**
  | Male | Female |
  | Azoospermia: this can be due to undescended testis, mumps or damage to testicular blood supply (traunma) | No ovulation |
  | Oligospermia: due to deficient spermatogenesis caused by ↑ heat, varicocele, smoking or alcohol | Abnormal fallopian tubes |
  | Abnormal sperms | Unreceptive endometrium |
  | Impotence | Abnormal cervical mucus |

- **Investigations:**
  - **Semen analysis: it can be:**
    - Normal: no need for further investigation if the partner confirms ejaculation in the vagina.
    - Abnormal: azoospermia or oligospermia
  - **Collection of semen:** a male must stop having sex for 3 days prior to the test; specimen collected by masturbation in a clear dry glass jar and should be brought to the lab within 1 hour.