Growth & Development

Lecture "5"

Newborn
Contents

1. Definition of the newborn.
2. Vital signs.
4. Physiological function.
5. Reflexes.
6. Physiological adjustment.
7. Appearance of the newborn.
8. The senses.
Newborn or the neonatal period:

Is the period that lasts from birth through the first 28 days of life.

- Length: 46 to 54 cm
- Head CX: 34 to 35 cm
- Chest CX: 32 to 33 cm
- Weight: 2.5 to 4 Kg
Newborn lose 5%-10% of weight during the first 10 days of life, because:

1- baby is no longer under the influence of the maternal hormones.
2- diuresis occur (increase in second to third day of life).
3- newborn pass stool.
4- Limited intake (especially B.F baby). In which milk is low caloric.
After loss:

- In first day WT is stable.
- The next 7 days is needed to regain WT for formula feed babies.
- and 10 days is needed to regain WT for breastfeed babies.
Length

The average birth length of a mature female neonate is 53 cm (20.9 in).

For mature males, the average birth length is 54 cm (21.3 in).

The limits of normal length is randomly set at 46 cm (18 in) to 57.5 cm (24 in).
In a mature newborn, the head circumference is usually 34 to 35 cm.

A mature newborn with a head circumference greater than 37 cm or less than 33 cm → investigated for neurologic involvement.

Head circumference is measured with a tape measure drawn across the center of the forehead and around the most prominent portion of the posterior head.
The chest circumference in a term newborn is about 2 cm less than head circumference.

It continues until 1.5 to 2 years of life then begin to increase as the chest compartments are growing (heart, lungs, vessels, etc.).

This is measured at the level of the nipples. If a large amount of breast tissue or edema of breasts is present, this measurement will not be accurate until the edema has subsided.
Newborn lose heat by four mechanisms:

1- **convection**: heat flow from newborn to cooler air.

2- **radiation**: transfer heat from body to cold solid object not in contact with the body.

3- **evaporation**: conversion of liquid to vapor.

4- **conduction**: transfer heat from body to cold solid object in contact with the body.
- Convection
- Radiation
- Conduction
- Evaporation
convection
radiation
conduction
evaporation
Insulation is not efficient because little fat available.

**How newborn conserve heat?**

From the brown fat that available in the intrascapular, thorax and perineal area.

It found in the mature newborn and produce heat by increasing metabolism.
## Vital Signs

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<th>Category</th>
<th>Description</th>
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| **Pulse**         | • At birth: 120-160 b/m.  
                    | • After 1 hour: 120-140 b/m.  
                    | • Palpated from apical or femoral region or listened by stethoscope.                                                                        |
| **Respiration**   | • At birth: 80 br/m.  
                    | • After rest: 30-60br/m.  
                    | • It is irregular with period of apnea.                                                                                                   |
| **Blood pressure**| • At birth: 80/50 mmHg.  
                    | • By 10th day: 100/50.                                                             |
It involves

• The cardiovascular system.
• The gastrointestinal system.
• The urinary system.
• The neuromuscular system.
• The immune system.
The peripheral circulation of a newborn remains sluggish for at least the first 24 hours.

It is common to observe cyanosis in the infant's feet and hands (acrocyanosis).

**Blood values:**

- **WBCs:** higher than normal: 15,000-30,000.
- **Blood volume:** 80-110 ml/KG.
- **Hemoglobin level:** 17 to 18 g/100 mL
newborns born with a low levels of vitamin K → they have a prolonged coagulation or prothrombin time.

Vitamin K, synthesized through the action of intestinal flora, is necessary for the formation of clotting factors II, VII, IX, and factor X.

Because a newborn's intestine is sterile at birth. It takes about 24 hours for flora to accumulate and for vitamin K to be synthesized.

So, all newborn must take injection (IM) of vitamin K to prevent bleeding.
Gastrointestinal

Intestines is sterile in newborn, it cultured by normal flora in 5-24 hours.

**Stool:**

- **First stool:** is called meconium, it is black to green in color, odorless, sticky. formed from mucus, Vernix, lanugo, hormones, and carbohydrates that accumulated during intrauterine life.

- **2nd - 3rd day:** called transitional stool, green in color, loose (like diarrhea).
In the forth day:

**In formula feed babies:**
- Bright yellow, with odor.
- 2-3 times/day.

**In breastfeed babies:**
- Light yellow with sweat smelling (high in lactic acid).
- 3-4 times/day.

A newborn's stomach holds about 60 to 90 mL but has limited ability to digest fat because the pancreatic enzymes, lipase and amylase, remain deficient for the first few months of life.
A newborn placed under phototherapy lights as a treatment for jaundice has bright green stools because of increased Billirubin excretion.

Newborns with bile duct obstruction have clay-colored (gray) stools, because bile pigments are not entering the intestinal tract.

Blood-marked stools usually indicate an anal fissure.

If mucus is mixed with stool or the stool is watery and loose, a milk allergy, lactose intolerance, should be suspected.
The average first void is within the first 24 hours of life. Newborns who do not void within this time should be examined for the possibility of urethral stenosis or absent kidneys or ureters.

The kidneys of newborns do not concentrate urine well, making newborn urine usually light-colored and odorless.

The first void is about 15 ml & the daily urine output is in first 1-2 days: 30-60ml & by the end of the first week is about 300 ml.
• Because newborns have difficulty forming antibodies against invading antigens until about 2 months of age.

• Newborns are prone to infection at this age, so most immunizations are not given to infants younger than 2 months of age.

• On the other hand newborns are born with passive antibodies (IgG) from the mother.

• In most instances, these include antibodies against poliomyelitis, measles, diphtheria, pertussis, chickenpox, rubella, and tetanus.
When child perform the following activities, his nervous system consider normal:

- Moving extremities.
- Attempting to control movement.
- Cry strongly.
- Demonstrate reflexes.
Reflexes

Blinking reflex:

Used to protect the eye, newborn close his lids when any near object come close to his eye. Elicited by flashing strong light in the newborn’s eye.

Rooting reflex:

Used to help newborn find the food. When brushing the cheek near to the corner of the mouth, the newborn will turn to that direction, it disappear at 6 weeks of life.
Sucking reflex:

Newborn suck when his lips is touch, disappear in 6 months.

If never stimulated, it disappears (such as newborn with trachoesophageal shunt, in which food is not allowed to be given by mouth), so newborn is given pacifier to keep this reflex.
Swallowing, gag, and sneeze reflex:

Swallowing occur automatically when food reaches the posterior portion of the tongue.

Extrusion reflex:

Used to protect the newborn from swallowing objects. He extrude any object that is placed in the anterior portion of the tongue. It disappears in the forth month.
Newborn grasp objects placed in their palm by closing their fingers on it. Disappears by the third month.

Mature newborns grasp so strongly that they can be raised from a supine position and suspended momentarily from an examiner's fingers.

A baby begins to grasp meaningfully at about 3 months of age.
Newborn who are held in vertical position with their feet touching a hard surface, will take a few quick alternating steps as they walk.

Disappear by the third month.
Planter grasp:

When touching the sole of the newborn’s feet at the base of the toe, the toes grasp. Disappears in about 8-9 months in preparation for walking.
Tonic neck reflex:

When you turn the newborn's head to one side, the leg and the arm of the same side will extend and the opposite side will flex.

The movement is most evident in the arms.

If you turn a newborn's head to the opposite side, he will often change the extension and contraction of legs and arms accordingly. Disappears at 2-3 months.
Moro reflex (startle)

By startling the newborn with loud voice, the newborn will abduct and extend their arms and legs. And their fingers assume a typical “C” position. Then they adduct their legs and arms.

The reflex simulates the action of someone trying to ward off an attacker, then covering up to protect himself.

It is strong for the first 8 weeks of life and then fades by the end of the fourth or fifth month,
• When stroking the foot with inverted “J”, from heel to upward, newborn will fan his fingers and extend them outward.

• It remains positive (toes fan) until at least 12 months of age, when it is supplanted by the down-turning or adult flexion response.

• Disappears at 12-18 month.
Crossed extension:

If one leg is irritated at sole while supine and legs are extended, the newborn will raise the other leg and cross it to the first leg.

Trunk incurvation:

When newborn is on prone position, and touched on one side, he will flex and swing their pelvis toward the touch.

Deep tendon reflexes:
Biceps and patellar reflexes
1- Hearing:
Fetus hear in uterus before birth, and as they born they hear from near distance. As evidence: they calm in respond to soothing voice and startle at loud voice.

2- Vision:
Newborn see when they born, but they focus on white & black objects at distance of 9-12 inches.
The senses:

3- Taste:
Newborn prefer sweet taste of milk or glucose water.

4- Smell:
They can smell after clearness of nose from mucus & amniotic fluid.
## Physiological adjustment to extra uterine life:

<table>
<thead>
<tr>
<th>Period</th>
<th>Time</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First period</strong></td>
<td>15–30 min</td>
<td>Reactive period</td>
</tr>
<tr>
<td></td>
<td></td>
<td>alert.</td>
</tr>
<tr>
<td><strong>Second period</strong></td>
<td>30–120 min</td>
<td>Resting period</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Newborn is sleeping. V/S stabilized. Color stabilized.</td>
</tr>
<tr>
<td><strong>Third period</strong></td>
<td>2–6 hrs</td>
<td>Second reactive period</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alert. Color &amp; V/S signs change with activity.</td>
</tr>
</tbody>
</table>
Apgar score

- The test was designed to quickly evaluate a newborn’s physical condition after delivery and to determine any immediate need for extra medical or emergency care.

- referred to as an acronym for: Activity, Pulse, Grimace, Appearance, and Respiration.

- The Apgar test is performed twice: once at 1 minute after birth, and at 5 minutes after birth.

- Five factors are used to evaluate the baby’s condition and each factor is scored on a scale of 0 to 2, with 2 being the best score.
<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heart rate</strong></td>
<td>Absent</td>
<td>Slow</td>
<td>&gt; 100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; 100</td>
<td></td>
</tr>
<tr>
<td><strong>Respiratory rate</strong></td>
<td>Absent</td>
<td>Slow</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Irregular</td>
<td>Strong cry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Weak cry</td>
<td></td>
</tr>
<tr>
<td><strong>Muscle tone</strong></td>
<td>Flaccid</td>
<td>Flexion in Extremities</td>
<td>Well flexed</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>Blue, pale</td>
<td>Extremely blue</td>
<td>Normal skin color</td>
</tr>
<tr>
<td><strong>Reflexes</strong></td>
<td>No reflexes</td>
<td>Grimace</td>
<td>Cough Sneeze</td>
</tr>
</tbody>
</table>
A baby who scores a 7 or above on the test at 1 minute after birth is generally considered in good health.

However, a lower score doesn't necessarily mean that baby is unhealthy or abnormal.

But it may mean that baby simply needs some special immediate care, such as suctioning of the airways or oxygen to help him or her breathe, after which baby may improve.
At 5 minutes after birth, the Apgar score is recalculated, and if baby's score hasn't improved to 7 or greater, or there are other concerns, the doctors and nurses may continue any necessary medical care and will closely monitor baby.

Most newborns with initial Apgar scores of less than 7 will eventually do just fine.
Appearance of the newborn

1- skin color:

- **Appear red**: due to increase concentration of RBCs in blood vessels.
- **Appear gray**: indicate infection, sepsis.
- **Appear Blue**: 
  - Acrocyanosis: in lips & hand, normal during crying
  - Central cyanosis: in trunk, due to cardiac problem
- **Appear pale**: indicate anemia, tiredness, poor feeding.
- **Appear yellow**: indicate hyperbilirubinemia, which lead to jaundice.

Misskamlah
Misskamlah

Jaundice

Red

Cyanosis

Jaundice
2- Mongolian spots:
Collection of pigment cells (melanocytes), to form gray patches across the sacrum or buttocks, disappear at school age.

3- Vernix caseosa:
white, cream, cheese-like substance that lubricate the skin.

4- Lanugo:
is fine hair that covers the newborn’s shoulder, back, upper arm. Disappear after two weeks.

5- Desquamation:
dryness of the skin with 24 hours of life, mostly evident on palms and soles.
6- **Milia:**
Small white pinpoint papule appear on the nose, cheek due to immature sebaceous glands. Disappear after 2-4 weeks.

7- **Molding:**
Movement of the sutures to shape the cervix countur, retain to normal after one week.
Caput succedaneum:

- Is edema of the scalp at the presenting part of the head. It may involve wide areas of the head, or it may be the size of a large egg. The edema, which crosses the suture lines, is gradually absorbed and disappears at about the third day of life. It needs no treatment.

Cephalhematoma

- A cephalhematoma is a collection of blood between the periosteum of a skull bone and the bone itself; it is caused by rupture of a periosteal capillary due to the pressure of birth. It usually appears 24 hours after birth.
Anterior Fontanel:
- At the junction of two parietal & frontal bones.
- Diamond in shape, 2-3 cm in width & 3-4 cm in length.
- Close at 12-18 months.

Posterior fontanel:
- At the junction of two parietal & the occipital bones.
- Triangular shape, 1 cm in length.
- Close at 2-3 months.
Gestational Age or Birthweight

- Infants are evaluated as soon as possible after birth to determine their weight and gestational age.

- Infants born after the beginning of week 38 and before week 42 of pregnancy (calculated from the first day of the last menstrual period) are classified as term infants.

- Infants born before term (less than the full 37th week of pregnancy) are classified as preterm infants, regardless of their birth weight.
Infants born after the onset of week 42 of pregnancy are classified as **postterm** infants. Normally, birth weight varies for each gestational week of age.

Infants who fall between the 10th and 90th percentiles of weight for their age regardless of gestational age are considered appropriate for gestational age (AGA).
• Infants who fall below the 10th percentile of weight for their age are considered small for gestational age (SGA).

• Those who fall above the 90th percentile in weight are considered large for gestational age (LGA).
Gestational Age or Birthweight

- Infants weighting under 2,500 g are **low-birth weight infants**.

- Those weighting 1,000 to 1,500 g are **very-low-birth weight infants**.

- Those born weighting 500 to 1,000 g are considered **extremely-very- low birth weight infants**.

- **Preterm infants** may be AGA, SGA, LGA, low birth weight, or very low or extremely very low birth weight.
Assessment of Gestational Age

- Dubowitz Maturity Scale
- Ballard Scale:
  - Ballard modified the Dubowitz scale to an assessment scale that can be completed in 3 to 4 minutes.

- The assessment consists of two portions:
  - physical maturity
  - neuromuscular maturity
## Clinical Criteria for Gestational Assessment

<table>
<thead>
<tr>
<th>Finding</th>
<th>0-36</th>
<th>37-38</th>
<th>39 and Over</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sole creases</td>
<td>Anterior transverse crease only</td>
<td>Occasional creases in anterior two thirds</td>
<td>Sole covered with creases</td>
</tr>
<tr>
<td>Breast nodule diameter (mm)</td>
<td>2</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Scalp hair</td>
<td>Fine and fuzzy</td>
<td>Fine and fuzzy</td>
<td>Coarse and silky</td>
</tr>
<tr>
<td>Ear lobe</td>
<td>Pliable; no cartilage</td>
<td>Some cartilage</td>
<td>Stiffened by thick cartilage</td>
</tr>
<tr>
<td>Testes and scrotum</td>
<td>Testes in lower canal; scrotum small; few rugae</td>
<td>Intermediate</td>
<td>Testes pendulous, scrotum full; extensive rugae</td>
</tr>
<tr>
<td>SIGN</td>
<td>SCORE</td>
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<td>---------------------------</td>
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<tr>
<td></td>
<td>-1</td>
<td>0</td>
<td>1</td>
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<tr>
<td>Heel To Ear</td>
<td>![Heel To Ear_0]</td>
<td>![Heel To Ear_1]</td>
<td>![Heel To Ear_2]</td>
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<tr>
<td>SIGN</td>
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<tr>
<td>Skin</td>
<td>Sticky, friable, transparent</td>
<td>gelatinous, red, translucent</td>
<td>smooth pink, visible veins</td>
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<tr>
<td>Lanugo</td>
<td>none</td>
<td>sparse</td>
<td>abundant</td>
</tr>
<tr>
<td>Plantar Surface</td>
<td>heel-toe 40-50mm: -1 &lt;40mm: -1 &lt;40mm: -2</td>
<td>&gt;50 mm no crease</td>
<td>faint red marks</td>
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<tr>
<td>Breast</td>
<td>imperceptible</td>
<td>barely perceptable</td>
<td>flat areola no bud</td>
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<tr>
<td>Eye / Ear</td>
<td>lids fused loosely: -1 tightly: -2</td>
<td>lids open pinna flat stays folded</td>
<td>sl. curved pinna; soft; slow recoil</td>
</tr>
<tr>
<td>Genitals (Male)</td>
<td>scrotum flat, smooth</td>
<td>scrotum empty, faint rugae</td>
<td>testes in upper canal, rare rugae</td>
</tr>
<tr>
<td>Genitals (Female)</td>
<td>clitoris prominent &amp; labia flat</td>
<td>prominent clitoris &amp; small labia minora</td>
<td>prominent clitoris &amp; enlarging minora</td>
</tr>
<tr>
<td>TOTAL SCORE (NEUROMUSCULAR + PHYSICAL)</td>
<td>WEEKS</td>
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<td>----------------------------------------</td>
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