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7.0 OBJECTIVES

After studying this practical, you should be able to:

- Explain who is sick neonate and the significance of monitoring sick neonate;
- Define the vital parameters like temperature, pulse and respiration etc.;
- Identify normal range of vital signs in neonate;
- Assess temperature, pulse and respiration, blood pressure, blood sugar, oxygen saturation and capillary blood sampling;
- Identify normal and abnormal variations; and
- Assess the condition and progress made by the infant.

7.1 SICK NEONATE AND THE NEED FOR MONITORING THE SICK NEONATE

Sick neonate is the one who has the following characteristics:

- Weight less than 1500 gm
- Temperature less than 36ºC despite warming for 1 hour
- Cried after 5 minutes of birth
- Difficulty or absence of sucking
- Respiratory rate is more than 60/minute with chest retraction.
- Apnea or Gasping respiration
- Central cyanosis
- Jaundice
- Convulsion
- Bleeding
- Major malformation
- Presence of diarrhoea/vomiting or abdominal distension
- Pus in the umbilicus
- Fever and skin pustules

Sick neonates are looked after at the district hospitals where the special newborn care unit is available or in the small health facilities. At the smaller health facilities, only immediate care such as warmth, stabilization etc. is given. Once the neonate is stabilized, the baby is referred to higher health facility for the necessary monitoring and management. It is essential that the sick neonate is monitored every hour. Measurement of vital signs determines the neonate’s level of health and response to stress (physical, physiological) as well as medical, surgical and nursing therapy. Any alteration is indicative of deviation of health from normal. Measurement of vital signs is also routine part of complete physical examination.

As a nurse you should be able to measure vital signs correctly, understand and interpret the values and record them appropriately. In this unit we shall discuss about the assessment of temperature, pulse and respiration in relation to purposes, indications and contraindications, equipments and steps of procedure.
7.2 TEMPERATURE

Temperature is defined as the degree of heat maintained in the body. It is the balance between heat produced and heat lost from the body. Normal temperature in newborn is 36.5-37.5°C.

7.2.1 Purposes

- To assess the condition of the infant on admission
- To determine the baseline values for comparison
- To detect any deviations
- To evaluate therapeutic measures

7.2.2 Indications

- On admission
- Routine assessment
- Any change in health status
- Pyrexia
- Pre and postoperatively
- Post procedures
- Emergencies

7.2.3 Contraindications

These are listed as per routes of taking temperature:

Axillary Temperature should not be taken immediately after bath/sponge

Rectal Temperature - rectal surgery, diarrhoea, rectal anomaly, after enema

7.2.4 Equipments

- Thermometer (oral/rectal) – Low reading thermometer
- Bowl of cotton swabs
- Spirit
- Kidney tray
- Paper bag
- Electronic Temperature Monitor
- Tympanic membrane thermometer (Fig. 7.1)
- Wrist Watch

Fig 7.1: Tympanic Membrane Thermometer
7.2.5 Procedure

Tactile Assessment:
- Wash Hands
- Rub them to dry
- Rub together and warm them
- Touch babies’ soles and palms with the dorsum of your hands
- Now touch the babies’ chest with the dorsum of your hands
- If both are warm – baby is normothermic. If periphery is cold but chest is warm – cold stress. If both are cold – baby is hypothermic.

Axillary Temperature
- Explain the procedure to mother or caretaker
- Shake thermometer to lowest level
- Ensure dry arm pit
- Abduct arm at shoulder, place the bulb of the thermometer in the apex of the axilla
- Hold arm in abduction in shoulder and flexion at the elbow for 3 minutes
- Remove the thermometer
- Read the mercury reading at eye level and record the reading
- Clean and replace the thermometer.

Refer to Table 7.1 for different routes of taking temperature.

<table>
<thead>
<tr>
<th>Site</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Contraindication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axilla</td>
<td>• Safest method</td>
<td>• Less accurate</td>
<td>• Cannot be used in children who have skin infection or surgery done in axillary region</td>
</tr>
<tr>
<td></td>
<td>• Non-invasive</td>
<td>• Needs more time for recording</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No bad taste of disinfection</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No fear of biting thermometer</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Most reliable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rectal</td>
<td>• False reading if rectum is loaded with fecal matter</td>
<td></td>
<td>• Infant with rectal surgery and rectal conditions</td>
</tr>
<tr>
<td></td>
<td>• In newborns and infants, insertion results in ulceration and perforation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Not recommended by WHO as it causes damage and infection to rectal mucus membrane</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Remember: Rectal temperature is not recommended
7.2.6 Conversion of Temperature Readings

If you have to express the Fahrenheit temperature in Celsius or Celsius into Fahrenheit you can use the following formula for conversion.

**Formula to Convert Fahrenheit Scale into Celsius Scale**

\[
C = \frac{(F-32) \times 5}{9}
\]

*C = Temperature in centigrade

*F = Temperature in Fahrenheit

e.g. to convert 102°F to Celsius

\[
C = (102 - 32) \times \frac{5}{9}
= 70 \times \frac{5}{9}
= 38.8°C
\]

So 102°F equals to 38.8°C

**Formula to Convert Celsius Scale into Fahrenheit Scale**

\[
F = \frac{(C \times 9)}{5} + 32
\]

e.g. to convert 38.5°C to Fahrenheit

\[
F = \left(\frac{38.5 \times 9}{5}\right) + 32
= \left(\frac{346.5}{5}\right) + 32
= 69.3 + 32
= 101.3°F
\]

So 38.5°C equals to 101.3°F

Temperature monitoring can be intermittent or continuous. Based on the instrument used it also varies.

**Intermittent monitoring**

- Clinical thermometer
- Digital electronic thermometer
- Infrared thermometer

**Continuous monitoring**

- Monitor with thermocouple or thermistor probe.

7.3 PULSE

Pulse is the palpable bounding of the blood flow noted at various points on the body where the artery is near the surface and passes over a bone, when blood is pumped into the arteries by the contraction of left ventricle (normal range is 140±20/minute). In newborn most accurate method to check pulse is to take the apical pulse for one full minute.
7.3.1 Purposes
- To assess the heart rate of an infant on admission
- To determine baseline value for comparison
- To detect any deviations
- To evaluate the therapeutic measures given

7.3.2 Equipments
- Wristwatch or
- Stopwatch
- Stethoscope

7.3.3 Procedure
- Explain the procedure to the mother/care taker.
- Make the infant comfortable.
- Place stethoscope between infant’s left nipple and sternum.
- Count apical pulse for full one minute with stethoscope.
- Note the time in stopwatch/wristwatch.
- Record the findings.

7.4 RESPIRATION
It is the act of breathing. It involves two processes i.e. inspiration and expiration followed by pause. Normal range in newborn is 40-60/minute.

7.4.1 Purposes
- To assess asphyxia in newborn
- To assess the respiratory rate of an infant on admission
- To determine baseline value for comparison
- To detect any deviations
- To evaluate the treatment given

7.4.2 Equipments
- Wristwatch or
- Stopwatch

7.4.2 Procedure
- Explain the procedure to the mother /caretaker.
- Quiet the newborn.
- Expose the chest of the newborn.
- Count the respiration before checking pulse and temperature.
- Note the time in stopwatch or wrist watch.
• Count for full one minute.
• Check complete cycle of respiration i.e. inspiration and expiration.
• Note rise and fall of chest and abdomen.
• Note for chest in-drawing (indicates respiratory distress).
• Listen for abnormal sounds in breathing/grunting.
• Note cyanosis, nasal flaring, dyspnoea etc.

7.5 BLOOD PRESSURE

Blood pressure can be termed as a product of peripheral vascular resistance and cardiac output.

7.5.1 Purposes

• Assess neonates who are at risk of hypotension or hypertension
• Early detector of hemodynamically unstable babies

7.5.2 Indications

• At risk and unstable babies
• During management of serious illnesses like sepsis, birth asphyxia, or hypothermia
• Babies on drugs like steroids (change the blood pressure)
• Babies on isotopes of dopamine, dobutamine, epinephrine

Fig. 7.2: Application of BP cuff

7.5.3 Procedure

• Blood pressure can be measured by non invasive and invasive methods.
• In non invasive method, cuff size should cover 2/3 of the length of the arm (from shoulder to elbow).
• Cuff bladder should fully encircle the arm or if it encircles part of the circumference, then the bladder should lie over the artery.
• The cuff of 2.5 cm width for preterm and 4 cm width for term babies is used.
• The infant to be placed in supine position with limb fully extended in level with the heart.
• The cuff should be applied firmly and not loosely over the arm.
• Inflate the cuff rapidly to a pressure of a 15 mm Hg above the point at which the distal pulse disappears. Refer Fig.7.2 for application of BP cuff in neonates.
• Deflate the cuff slowly, document and report the findings.

In invasive method: A catheter is placed in the arterial blood vessel, associated system consisting of pressure transducer, tubing and an electronic processor. It is used for infant on aggressive ventilator support, unstable infants prone to severe hypotension.

7.6 **BLOOD SUGAR MONITORING**

LBW and sick neonates are prone to develop low blood sugar which increases mortality and morbidity. It is important to monitor, diagnose and treat early for a favorable outcome. Hypoglycemia is defined as blood sugar level of less than 45mg/dl in all newborns.

7.6.1 **Purposes**

• To monitor blood sugar to detect hypoglycemia (blood sugar level less than 45 mg/dl with or without symptoms).

7.6.2 **Indications**

• Premature and L.B.W. neonates especially those weighing less than 2 kg.
• Infants of diabetic mother.
• Sick neonates (asphyxia, hypothermia, poor and/or delayed feeding, sepsis, shock, respiratory distress).

7.6.3 **Equipments**

- Glucometer / test strips
- Alcohol for skin preparation
- 26 gauze needle or lancets
- Soap to wash hands

7.6.4 **Procedure**

• Heel is most common site used for this procedure.
• Wash hands and make sure the heel is not cold. Make warm by rubbing if required.
• Prepare the site with 70% isopropyl alcohol/spirit, using a swab and scrubbing skin in circular motion.
• Do not use povidine/ betadine as specimen contamination may allurate some results.
• Allow spirit to dry, failure to allow spirit to dry may contaminate the specimen and give fallacious results.
• Make a needle stick puncture on the posterio-lateral aspect of the heel. Avoid the middle portion of the heel and avoid making deep punctures.
• Follow the instructions on the dextrostix or glucometer for obtaining blood for analysis.
Pulse oximetry is a method to determine the saturation of haemoglobin with oxygen ($\text{SpO}_2$)

### 7.7.1 Purposes
- Non invasive arterial $O_2$ saturation monitoring
- Pulse rate monitoring and to guide oxygen therapy

### 7.7.2 Indications
- Useful adjunct in the assessment of response to the resuscitation
- Important measurement to aid in titration of oxygen therapy in newborn
- Acts like apnea monitor
- Valuable companion during transport of newborn

### 7.7.3 Equipments
- Oxygen saturation monitor
- Sensor probe (Refer **Fig. 7.3** for application of sensor probe)
- Tape to hold the probe

![Application of oxygen saturation probe on feet](image)

![Application of oxygen saturation probe on hand](image)

**Fig. 7.3**: Application of sensor probe
7.7.4 **Procedure**

- Assemble all necessary equipment.
- If saturation monitor probe is reusable, clean probe with spirit and dry it.
- Turn monitor on.
- Apply probe to a site that is well perfused.
- Ensure both sides of probes are directly opposite each other.
- Secure probe in place. Avoid edematous bruised sites and excessive pressure.
- Set high and low alarm limits for saturation and HR (2% above and below desired limits).
- Set pulse and alarm volumes.
- Check for correlation of depicted HR on monitor and the actual HR by auscultation.
- Record HR, RR, colour, oxygen saturation and \( \text{FiO}_2 \) hourly.
- Observe and change site at least once per shift.

7.8 **CAPILLARY BLOOD SAMPLING**

7.8.1 **Purposes**

- To draw a capillary blood sample by heel prick

7.8.2 **Indications**

Used for assessing

- Blood sugar
- Blood gas
- Hematocrit
- Sepsis screen
- Bilirubin estimation
- Blood chemistry

7.8.3 **Equipments**

- Pair of gloves
- Cleansing solution as per the institutional policy
- Collection tube for individual tests
- Dry gauze
- Lancet
7.8.4 Procedure (Fig. 7.4)

- Explain the mother/relative about the procedure.
- Choose the site for skin puncture.
- Warm the skin puncture site with warm face cloth.
- Gloves must be worn throughout procedure.
- Cleanse the site, select lancet appropriate for infants size, puncture in the most medial or most lateral portion of the planter surface.
- Following puncture, the first drop of blood should be wiped away with a gauze as it contains tissue fluids which may contaminate the specimen.
- Blood flow from the site will be increased if the puncture site is held downward and a gentle continuous pressure applied to the surrounding tissues.
- Strong repetitive pressure (milking) should be avoided as it may cause hemolysis and increase amount of tissue fluid in the specimen.
- Collect blood in the appropriate container.
- Apply firm pressure using dry sterile swab.

7.9 ACTIVITIES AND GUIDELINES

Activity 1
Assessment and recording of TPR, BP, Blood sugar O₂ saturation and capillary blood sampling.

- Select four newborns in the nursery/postnatal ward.
- Assess the vital signs.
- Record the TPR in recording form and
- Monitor blood sugar, O₂ saturation and assist in capillary blood sampling.
- Determine any deviations from normal.

Guidelines

- Observe proper hand washing techniques.
- Maintain adequate temperature and humidity of the room[28±2°C, and (50 - 60%) respectively].
- Ensure appropriate physical and lighting facilities.
First take respiration, then pulse and at last the temperature of the baby and check BP.

Check blood sugar and O₂ saturation and assist in capillary blood sampling.

Maintain accurate recording and reporting.

Fill up the TPR sheet (temperature, pulse and respiration record sheet neatly and accurately)

Follow the given guidelines to record your assessment findings:

Place of examination: .................................................................

Identification data:

Name......................... Age ................. Sex .................

Date of birth..............Time of birth..............Birth weight........

Gestational age ..................................................

Time of examination from ..............to .....................................

Category according to birth weight and gestational age ..................

Temperature .................................................................

Pulse ....................................................................................

Respiration .........................Blood Pressure ..........................

Blood Sugar/capillary blood sampling .........................................

**7.10 LET US SUM UP**

In this practical we have learnt that for managing sick neonate’s vital parameters TPR, BP, Blood Sugar, capillary blood sampling is very important.

We have also learnt how to assess these vital parameters. Hope you will develop knowledge and necessary skills from this unit when monitoring essential parameters in the assessment of sick neonate.